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Enterprise

2023 THE UNIVERSITY OF MARYLAND RESEARCH MAGAZINE

Harvesting Hope From the Trees

FROM URBAN FOREST CANOPIES TO UNDERGROUND CARBON VAULTS,
UMD RESEARCHERS ARE CREATIVELY FIGHTING CLIMATE CHANGE 18

From the Vice President for Research



IT'S BEEN MORE than a year since I became vice president for research at the University of Maryland, yet I'm still amazed on a daily basis by the breadth and depth of research and scholarly activity happening across our campus. I continue to be inspired by Terps' dedication to discovering new knowledge and developing creative solutions to address the most pressing issues of our time.

In particular, I was tremendously proud of how our research community came together to support the Grand Challenges Grants program—the largest and most comprehensive initiative of its kind in the university's history. We committed \$30 million in institutional funding to support 50 grant awardees, representing 185 faculty researchers across all 12 colleges and schools at UMD.

You'll read about some of those grants in this issue of Enterprise, and about how these projects are reaching across disciplines and breaking down institutional barriers to accelerate solutions to complex problems like climate change, global health crises, educational disparities, racial and social injustice and many others.

The numbing repetition of high-profile tragedies and everyday deaths helps to keep one of these grand challenges—gun violence—top of mind; in a gripping feature by Sala Levin '10 in this issue, you'll learn about innovative faculty efforts, including a new campus center, to stem this bloody tide. Another new feature story reveals how our researchers are unlocking new methods for preventing or mitigating climate change developed by looking to trees for scientific inspiration.

I hope you enjoy this second annual issue of Enterprise, which also contains some of our most exciting and impactful research and funding news from the past year, as well as a collection of faculty honors and awards. I suspect that many of you will be as energized as I was to learn about the work of our world-class community of scientists and scholars propelling us all fearlessly forward.

Go Terps!

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Vice President for Research

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Photo by John T. Consoli

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The mayor of Knoxville, Tenn., picked up a UMD researcher's book on preventing gun violence. The resulting partnership will be a model for how cities can create safer streets.

Learn more about the University of Maryland's diverse, dynamic research enterprise at research.umd.edu.

Rising to the Challenges: UMD Awards \$30M to Spur Solutions

Unprecedented Program Funds Research on Climate, Racial Justice, Energy and More

SURGING TEMPERATURES and rising seas. Droughts, famines and poverty. Intractable social inequities.

The world’s toughest problems can prompt despair—or propel people and institutions to redefine themselves, strive for solutions and rise to the grand challenges of our time.

That outlook of hope, girded by a belief in the power of science and scholarship, is behind an unprecedented \$30 million investment the University of Maryland made earlier this year in 50 research projects spanning every college and school and a host of disciplines.

The university’s Grand Challenges Grants program is led by three projects that will each receive \$3 million Institutional Grants over three years to increase literacy, explore the nexus of food, water and energy systems, and protect Marylanders from the effects of climate change.

“Since day one of my presidency, I have charged our campus to tackle the grand challenges of our time by taking advantage of the brilliant work being done by our faculty and researchers across disciplines,” says UMD President Darryll J. Pines.

In addition, six Impact Award winners—other finalists in the institutional category—were each awarded up to \$500,000 over two years; and 16 Team Project Grants and 25 Individual Project Grants winners will receive three-year totals of \$1.5 million and \$150,000, respectively.

The UMD faculty energetically answered the call for proposals; about 135 poured in from across campus, says Vice President for Research Gregory F. Ball.

“In total, they cover a kaleidoscopic array of pressing topics and societal

priorities, and we can’t wait to see what our world-class researchers accomplish in the months and years ahead,” he says.

The full list of funded projects spans subjects as diverse as preparing for future pandemics, fighting racism, developing human-centered artificial intelligence, better understanding the processes of our body’s microbial communities and strengthening democracy.

Institutional Grants in particular, which require cross-disciplinary, multi-

institutional work, have the potential to spark profound changes, said Senior Vice President and Provost Jennifer King Rice.

“This collaborative approach allows us to realize novel insights and never-before-explored connections, which supports our overarching goal of creating meaningful solutions that advance the public good for our state and around the globe,” she says.

Researchers leading the Institutional Grants explain the soaring ambitions of their projects:



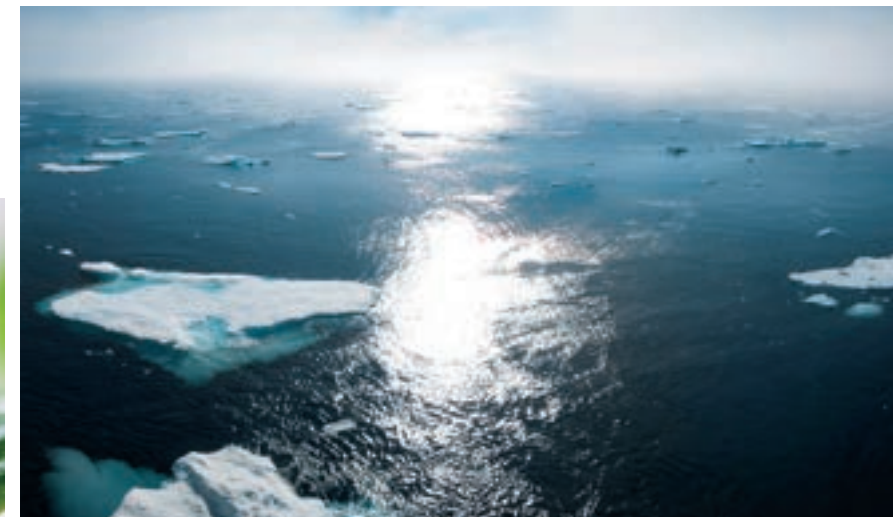
Institutional Grants

ADDRESSING CLIMATE CHANGE FOR A SUSTAINABLE EARTH

Led by **Ellen Williams**, Distinguished University Professor of physics and director of the Earth System Science Interdisciplinary Center, the initiative brings together leaders from departments around campus focused on Earth system science. This discipline encompasses all the connections of climate change—from how the oceans store carbon to atmospheric reactions near the boundary of outer space to human impacts on

ecosystems. The project is designed as a step toward the creation of a new school at UMD for translating Earth science and climate science research into action for the region, nation and world.

“We want to build a transdisciplinary collaborative bigger than the sum of its parts so we can most effectively address challenges posed by climate change—starting in the state of Maryland,” including helping farmers with climate-related crop management and warning of extreme weather, says team member Professor **Tatiana Loboda**, chair of the Department of Geographical Sciences.



GLOBAL FEWture ALLIANCE: FOOD-ENERGY-WATER SOLUTIONS FOR A CHANGING CLIMATE

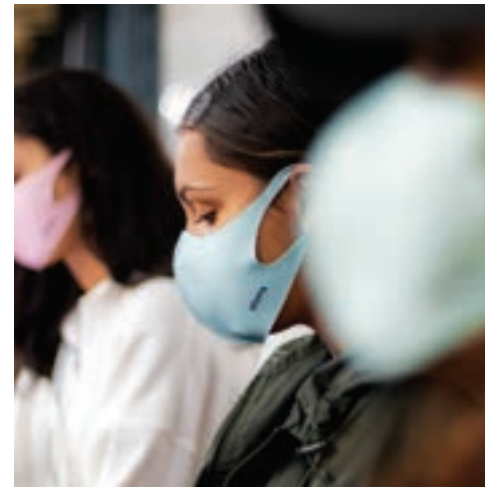
Worldwide, 1.3 billion people are food-insecure, 770 million lack adequate access to energy sources and 2 billion lack access to safe drinking water. Climate change magnifies these challenges, and communities of color often bear the heaviest burdens. The Global FEWture Alliance, led by **Amy Sapkota**—MPower Professor of environmental health in the School of Public Health and director of the CONSERVE Center of Excellence—acknowledges that our vital resources are inextricably linked.

“Instead of addressing food, energy or water challenges individually, we must work across disciplines to develop holistic technology-based and policy solutions that focus on all three areas,” working with partners in Israel, Nepal and Tanzania on experiential learning and capacity-building, Sapkota says.

MARYLAND INITIATIVE FOR LITERACY AND EQUITY (MILE)

The COVID-19 pandemic produced the greatest decrease in literacy scores in more than 30 years. But for adults and children living in marginalized communities, “access to literacy achievement is not something that was ‘lost’—full literacy has always come with barriers,” says **Donald “DJ” Bolger**, associate professor of human development and quantitative methodology, and leader of the initiative.

The project aims to close opportunity gaps that have contributed to longstanding societal inequities even as they threaten to create new ones. A bedrock goal is to better connect literacy research to U.S. teacher preparation and professional development, sharing evidence-based practices with schools, communities and policymakers. Team members of MILE also intend to change how literacy studies are done to reap more relevant knowledge by greater focus on those—multilingual learners, underserved communities of color—who stand to benefit the most from the research, he says.



Impact Awards

The problem-solving innovation behind the six other finalist proposals for Institutional Awards was too valuable to lose, said university leaders, who created the Impact Awards category to allow them to take root.

DEMOCRACY RESEARCH, EDUCATION AND CIVIC ACTION

Led by **Lena Morreale Scott**, director of the Civic Education and Engagement Initiative in the College of Education, the new inquiry will focus on cutting-edge research, inventive teaching, and learning and impactful civic engagement, identifying solutions to ensure a

future for democratic institutions like elections, public schools and news media.

MARYLAND INITIATIVE FOR DIGITAL ACCESSIBILITY

The initiative led by **Jonathan Lazar**, a professor in the College of Information Studies, aims to change technology design research and practice by involving the disability community as an equal partner—so accessibility is proactively built into the technology our society relies on.

MICROBIOME SCIENCES

Led by **Mihai Pop**, professor of computer science and director of UMD's Institute for Advanced Computer Studies (UMIACS), this initiative will build a deeper understanding of critical

microbial communities in the bodies of humans and animals as well as in the environment, helping to safeguard these microbiomes against climate change while leading to new interventions and economic opportunities.

PANDEMIC PREPAREDNESS INITIATIVE

The initiative led by **Cynthia Baur**, endowed chair and director of the Horowitz Center for Health Literacy, and **Brooke Fisher Liu**, professor of communication, integrates social and behavioral sciences to better understand how people responded to COVID-19 and other disasters to prepare for future public health emergencies.

URBAN EQUITY COLLABORATIVE

This collaborative led by **Willow Lung-Amam**, an associate professor of urban studies and planning, seeks to strengthen community-based institutions and the work of community activists around issues of urban inequality, incubating and disseminating research and policy strategies that promote economic, racial and gender justice.

VALUES-CENTERED ARTIFICIAL INTELLIGENCE

Led by **Hal Daumé III**, a professor of computer science, the initiative will work to change the practice of AI innovation from technology-centered to human values-centered, combining top-down ethical considerations and bottom-up community insights to improve realms such as health care, education, transportation and communication.

Team Project Grants

Sixteen multidisciplinary teams will tackle challenges ranging from ending plastic pollution to fighting anti-Black racism and understanding how future pandemics might arise in order to head them off.

Climate Change and the Environment

EFFECTIVE AND EQUITABLE WEATHER FORECASTING IN A CHANGING CLIMATE WITH MACHINE LEARNING

PI: **Maria Molina**, assistant professor, atmospheric and oceanic science

OBSERVING WILDFIRES THROUGH UAVS AND FIRE IMAGING TECHNOLOGIES

PI: **Fernando Raffan-Montoya**, assistant professor, fire protection engineering

PROGRAMMABLE DESIGN OF SUSTAINABLE, ALL-NATURAL PLASTIC SUBSTITUTES

PI: **Po-Yen Chen**, assistant professor, chemical and biomolecular engineering

REMEDIATION OF METHANE, WATER, AND HEAT WASTE

PI: **Daniel Lathrop**, professor, physics

WATER EMERGENCY TEAM

Leadership team: **Rachel Goldstein**, assistant professor, Maryland Institute for Applied Environmental Health (MIAEH); **Marcus Hendricks**, associate professor, urban studies and planning, director of the SIRJ Lab

Global Health

ENCUENTROS: A UNIVERSITY-COMMUNITY PARTNERSHIP TO MITIGATE THE MENTAL HEALTH CRISIS FOR LATINO IMMIGRANT YOUTH

Leadership team: **Amy Lewin**,

associate professor, family science; **Sophia Rodriguez**, assistant professor, teaching and learning, policy and leadership; **Kevin Roy**, professor, family science

HELPING OUR BODIES CLEAR RESPIRATORY INFECTIONS

PI: **Louisa Wu**, associate professor, cell biology and molecular genetics

MARYLAND SAFE DRINKING WATER (WATER ANALYSIS AND TESTING FOR EDUCATION AND RESEARCH) STUDY

PI: **Rianna Murray**, assistant research professor and graduate director, MIAEH
PI: **Leena Malayil**, assistant research professor, MIAEH

MODELING THE EVOLUTION OF AVIAN INFLUENZA VIRUSES

PI: **Andrew Broadbent**, assistant professor, animal and avian sciences

Social Justice

AFRICA THROUGH LANGUAGE AND AREA STUDIES (ATLAS)

PI: **Miranda Abadir**, second language acquisition, National Foreign Language Center

ANTI-BLACK RACISM INITIATIVE

PI: **Jeanette Snider**, assistant research professor, sociology; adjunct professor, Robert H. Smith School of Business

FOSTERING INCLUSIVITY THROUGH TECHNOLOGY (FIT)

PI: **Yi Ting Huang**, associate professor, hearing and speech sciences

MUSIC EDUCATION FOR ALL THROUGH PERSONALIZED AI

AND DIGITAL HUMANITIES

PI: **Irina Muresanu**, associate professor, violin, strings

RACIAL AND SOCIAL JUSTICE RESEARCH-PRACTICE PARTNERSHIP COLLABORATIVE

PI: **Christine Neumerski**, senior research fellow, College of Education

SEIZING OPPORTUNITIES: SOCIAL CAPITAL, BUSINESSES, AND COMMUNITIES

PI: **Vojislav (Max) Maksimovic**, William A. Longbrake Chair and professor, finance

USING MACHINE LEARNING TO MEASURE AND IMPROVE EQUITY IN K-12 MATHEMATICS CLASSROOMS

PI: **Jing Liu**, assistant professor, teaching and learning, policy and leadership –CC

In addition to Institutional Grants, Impact Awards and Team Grants, UMD awarded three-year, \$150,000 Grand Challenges grants to 25 individual investigators taking on climate change, energy and sustainability, global health and threats to democracy. Read descriptions of all the winning projects and find complete listings of team members at the Grand Challenges Grants program website: research.umd.edu/gc.





Vision and Impact

UMD Researchers Played Key Roles in Two Spectacular Space Missions That Paid Off in 2022

ONE WAS A DRY RUN for an audacious method to protect the Earth by knocking an asteroid around like a cosmic cue ball. The other was the culmination of decades of work to create the keenest instrument for exploring the universe ever launched into space.

University of Maryland astronomers, engineers and other researchers were at the center of two space missions—the James Webb Space Telescope (JWST) and the Double Asteroid Redirection Test (DART)—that launched in late 2021 and returned eye-popping data in 2022.

James Webb Space Telescope: NASA, the European Space Agency and the Canadian Space Agency rolled out the first full-color images from the JWST in July. It has since provided, among other things, the deepest view of the distant universe ever recorded, along with images and data for nebulae, galaxy clusters and distant planets, with much more to come.

The telescope was built around the corner from the university at NASA Goddard Space Flight Center, and dozens of UMD faculty and alums have orbited the project throughout its development. They helped design, construct and test the long-awaited successor to the Hubble Space Telescope (still going strong with plenty of Terp support) and are closely involved in operations, mission planning and eventual translation of Webb telescope discoveries to the public.

“We’ve been waiting so long it feels almost surreal,” says astronomy Associate Professor Eliza Kempton, who studies

exoplanet atmospheres and was one of the first astronomers to use the new telescope. “It’s like a dream the astronomy community is waking up from, and suddenly it’s here.”

Double Asteroid Redirection Test: Rather than explore, another mission with Terp leadership and several participants established our ability to turn aside asteroids that threaten Earth.

In September, NASA sent a 1,300-pound “impactor” at 14,000 mph straight into the asteroid moon, Dimorphos, raising a dust cloud visible from Earth. The test’s objective was to change, by 10 minutes, the moon’s 11-hour, 55-minute orbit. Measurements a few weeks later showed it was altered by a whopping 32 minutes.

“We smacked Dimorphos really good,” says Astronomy Professor Derek Richardson, an expert in the composition of “rubble pile” asteroids like the target, and the dynamics lead for the mission. “I think DART has unequivocally demonstrated we could” protect our planet from a dangerous asteroid.—**CC**

PHOTO COURTESY OF NASA

Nasal Battle

New Protein-based Technology Fights Infection Where It’s Most Needed

GETTING THAT JOB—more accurately, a succession of them—has been the main weapon against serious COVID-19 complications since late 2020, but if a University of Maryland researcher succeeds, most needles could give way to a few quick sniffs.

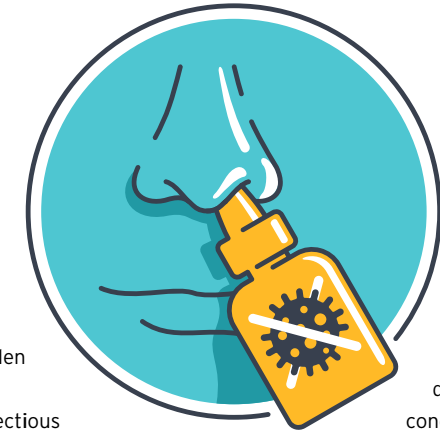
Xiaoping Zhu, a professor of veterinary medicine, has developed an inhalable coronavirus vaccine that goes directly to work in the parts of the body—like the nose and sinuses—where even those with all their shots can be vulnerable.

“They’re wonderful vaccines that protect people from hospitalization and death, but don’t prevent transmission,” Zhu says. “The

nasal vaccine produces an antibody that stays in the upper respiratory tract to stop transmission.”

In a White House summit last summer, Dr. Anthony Fauci, then-chief medical adviser to President Joe Biden and director of the National Institute for Allergy and Infectious Diseases, said nasal vaccines promise “not only to protect against disease, but to protect against acquisition and by acquisition, transmission. And that’s really the holy grail.”

Unlike inhaled COVID vaccines recently approved in China and India, Zhu’s does not rely on live or attenuated virus—making it safe for children and the immunocompromised—and instead uses a patented, engineered protein based on the body’s own mechanism for transporting substances like vaccines across



cellular barriers. Zhu and colleagues were developing it to fight flu, but began adapting it to COVID even before a pandemic was declared. They’ve since conducted two rounds of animal trials, recording high

effectiveness. Now, a company Zhu helped found, Transmucosis, is preparing for human clinical trials even as Zhu and colleagues work on an improved second-generation vaccine.

It’s time to follow our noses when deciding on vaccines, Zhu suggests.

“We regularly see news stories that COVID is bouncing back again,” he says. “I think this has to do with needing an approach that can stop transmission.”—**CC**

Testing Test-Optional Admissions

\$1.4M Gates Foundation Award Supports Study of Effects on Equity

A \$1.4 MILLION GRANT from the Bill and Melinda Gates Foundation, announced in February 2022, is supporting a University of Maryland-led study to assess the impact of a nationwide shift to make the SAT and ACT optional for college admissions, or to eliminate their use altogether.

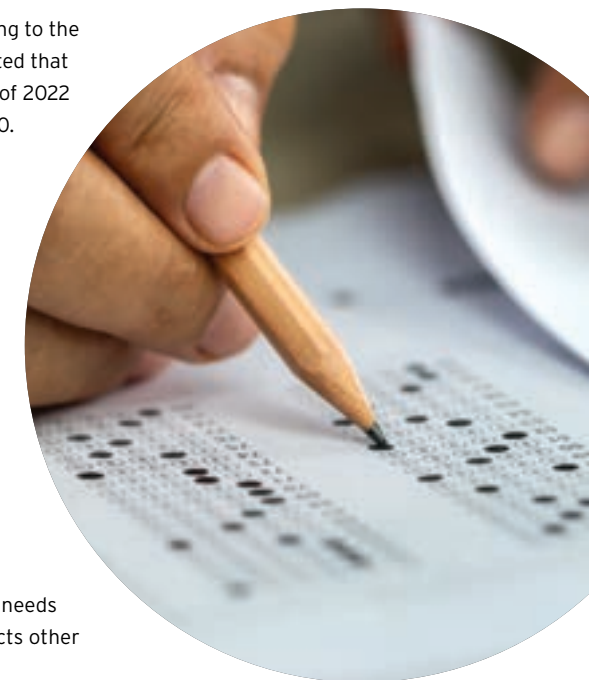
Associate Professor of Education Julie J. Park and colleagues are examining whether higher education institutions’ swift moves to alter admissions processes in response to the COVID-19 pandemic improved college access or equity for different student populations.

More than 1,800 accredited colleges and universities, including UMD, were using test-optional

policies in admissions for Fall 2020, according to the nonprofit FairTest. The College Board reported that 1.7 million students in the high school Class of 2022 took the SAT, a drop from 2.2 million in 2020.

The broad retreat from requiring standardized exam scores came at a time of increasing scrutiny, with critics charging that this traditional gateway to college further stacks the deck against people from underrepresented racial or socioeconomic backgrounds, or with disabilities.

“Test-optional policies are becoming more common; however there needs to be more research and data to inform decision-making,” says Park, who is collaborating with researchers at Colorado State University, Penn State University and Southern Methodist University. “There also needs to be more research on how inequality affects other parts of the college application.”



ILLUSTRATIONS: TOP VIA ISTOCK, BOTTOM PHOTO VIA SHUTTERSTOCK



NIH Grant Funds Study of Structural Racism, Pandemic Effects on Farmworkers

Nationwide Research Focuses on Air Quality, State Policies and Legal Protections

A FEW MONTHS AFTER COVID-19 struck the United States, public health Associate Professor Devon Payne-Sturges began hearing stories about migrant and seasonal farm workers on Maryland’s Eastern Shore getting sick but still going to work—a dangerous choice that didn’t surprise her.

During the pandemic, such workers were deemed “essential” and risked firing if they stayed home.

“Legally, farm workers are exempt from overtime pay,” says Payne-Sturges, of the Maryland Institute for Applied Environmental Health. “They don’t have health care, and they don’t have sick leave. These are policy decisions made on purpose that are creating vulnerabilities.”

The National Institute of Environmental Health Sciences in August 2022 awarded Payne-Sturges a \$3.7 million grant to study structural racism and health among Black and Latinx migrant and seasonal farmworkers around the country.

Data around these issues is lacking, she says. The grant will support her team’s efforts—with fieldwork starting this spring—to better understand health disparities facing these crucial but marginalized workers who are often exposed to unsafe environments and toxic chemicals, yet rarely offered sick leave or health care.

The project includes partners at the Francis King Carey School of Law at the University of Maryland, Baltimore; CATA: The Farmworkers Support Committee; and researchers from Washington University in St. Louis, American University and Indiana University Bloomington.

The team will focus on environmental health, including air quality and infectious disease testing; system engagement with farm owners and managers as well as policymakers and farm worker advocates; and policy and legal analysis of actions to protect migrants’ and seasonal workers’ health.—**AE**

Major Federal Research Partnerships

Several large cooperative agreements created or renewed collaborations with UMD in science and technology:

RESEARCHING SUSTAINABILITY

The Earth System Science Interdisciplinary Center (ESSIC) announced a new five-year, \$95 million cooperative agreement with NASA. Established in 1999, ESSIC is a joint center with NASA’s Goddard Space Flight Center that supports research, teaching and career training in Earth system science. The funding allows UMD to expand collaborations with the space agency and the broader research community to better understand our planet’s complex environment, and human interaction with it, to address challenges of sustainability.—**AR**

SAFEGUARDING OUR FOOD

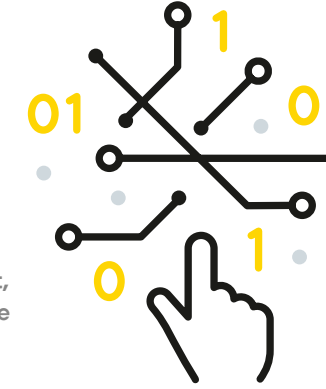
A five-year, \$41 million cooperative agreement with the U.S. Food and Drug Administration (FDA) will expand a University of Maryland-based institute’s work to provide scientific information to fight food-related illness and enable the development of sound public health policy. Established in 1996, the Joint Institute for Food Safety and Applied Nutrition is an FDA Center of Excellence combining the expertise of the federal agency with UMD researchers.—**EM, MG**

STRENGTHENING AGRICULTURE

NASA tapped researchers in the Department of Geographical Sciences to lead a five-year, \$15 million consortium to turn satellite data into down-to-earth, actionable information to support agriculture in the United States. The consortium will expand upon the existing UMD-led global food security and agriculture program, NASA Harvest, with which it shares a common objective: to strengthen food security, agriculture, and human and environmental resilience.—**RG**

Can Sound and Touch Convey Big Data?

NSF Project Would Expand Employment, Education Opportunities for Blind People



FROM FUNCTIONING EFFECTIVELY at work to keeping up with the news, modern society increasingly demands data-savvy citizens. Charts and infographics that can help make a sea of numbers tangible often present a barrier for blind users, and existing digital accessibility tools like screen readers can’t even provide summaries of such visual data, let alone allow detailed searches.

Supported by \$433,000 awarded by the National Science Foundation in August 2022, two University of Maryland researchers are turning to sound and touch to help people analyze large-scale data.

“The fundamental impact that this work will have on the millions of people in the United States and around the world who are blind or have low vision cannot be overstated,” says Niklas Elmqvist, who is leading the

two-year project with fellow College of Information Studies Professor Jonathan Lazar.

The pandemic highlighted this urgent need, with one study showing that half of blind users rely on help from sighted people to access vital data about COVID-19.

The UMD team are working with the blindness community and technology organizations to assess popular accessibility tools and contexts, conducting the research through the lens of two real-world settings that require large datasets—higher education and employment.

The underlying approach, called “sensory substitution,” uses assistive technology to functionally substitute one sense with another, says Lazar, director of UMD’s Trace Research and Development Center, which works to improve accessibility in technology.

For example, Lazar and UMD colleagues built iSonic, which creates an audio version of a map to allow a user to hear various pitches that georeference data. Elmqvist, with an appointment in the University of Maryland Institute for Advanced Computer Studies, led the development of an essential oil diffuser that conveys data through smell, and is working with the Maryland Department of Education to create a computer science data course for blind high school students.—**MH**

Report Lays Out Road Map to Halving U.S. Emissions

Analysis Unveiled at UN Climate Conference Calls for Clean Vehicles, Green Energy

IF “BOTTOM-UP” ACTION from states, cities and businesses combines with ongoing federal leadership, the United States can meet its 2030 climate target of reducing emissions 50-52% from 2005 levels, according to a UMD-led analysis.

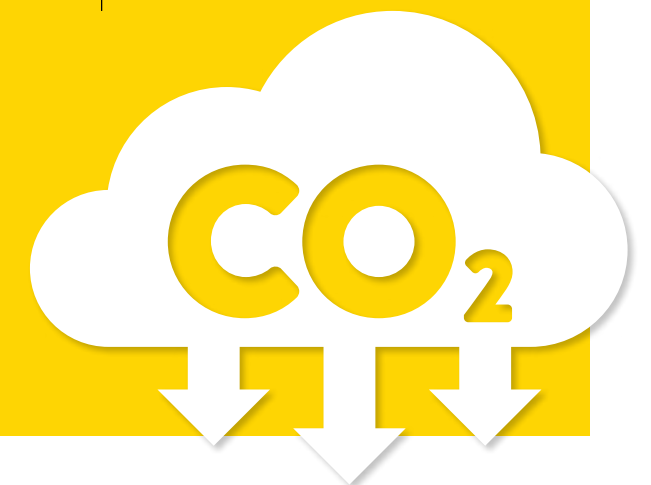
The report from its Center for Global Sustainability (CGS) and the “America Is All In” coalition was presented by its co-chair,

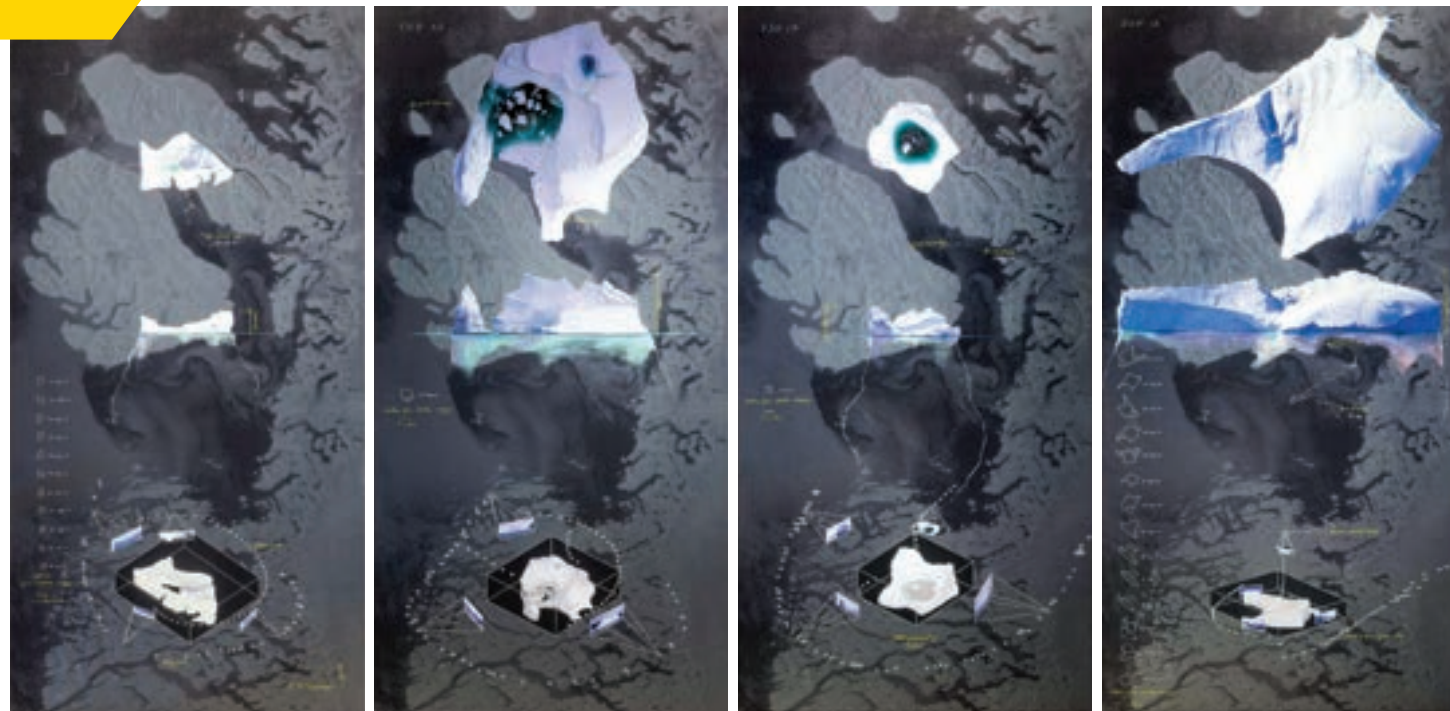
businessman and former New York City mayor Michael R. Bloomberg, at the United Nations’ Climate Change Conference in Egypt in November 2022.

While the Inflation Reduction Act of 2022 makes important climate strides toward the U.S. goal, “getting the rest of the way there will require ambitious, creative and feasible actions from states, cities and businesses, with support from the federal government,” says Alicia Zhao, CGS research manager and lead author of the report.

The report found that implementing current policies would cut greenhouse emissions 39% below 2005 levels by 2030. To close the gap, the report recommends:

- Adopting sales targets and mandates for zero-emission vehicles;
- Retiring all existing coal plants;
- Advancing methane leak recovery and climate-smart agriculture;
- Setting “buy clean” industrial facility standards.





Data, Ice and Art

Professor's Arctic-Focused Creations Capture Endangered Beauty

IMAGES OF MASSIVE chunks of ice collapsing from Greenland's glaciers are emblematic of a changing climate and the need to drastically cut global carbon emissions.

Assistant Professor of Art Cy Keener is working to characterize some of these icebergs—capturing their unique identities and the ways they change as they drift in the sea.

His collaborative "Iceberg Portraiture" series (above) was part of an exhibition that opened in September 2022 at the National Academy of Sciences in Washington, D.C. Keener created it with landscape researcher Justine Holzman, climatologist Ignatius Rigor and scientist John Woods after almost four years of trips to the Arctic to place trackers onto the ice to collect data

with the hopes of making that information tangible and visceral.

The resulting 7-foot-tall digital ink-and-pastel portraits provided a glimpse into the life of four icebergs with vastly different scales and shapes—some the size of a car and others a third of a mile wide—observed and recorded in August 2021 in western Greenland.

"Each of these [icebergs] is a piece of 10,000- to 40,000-year-old ice coming off the Greenland ice sheet into the ocean," Keener says. "In this exhibition we understand them as living things, falling apart in front of your eyes, constantly changing. We show their diversity and beauty."

Another work at the exhibition, the nearly 8-foot-tall "Sea Ice Daily Drawings," was made of aluminum, acrylic, paper and ink and based on some 27,000 data points from sensors buried meters into the ice.

Keener (right) received a \$200,000 grant from the National Science Foundation in 2020 to produce the exhibition. Among his other ice-focused works have been "Sea Ice 71.348778° N, 156.690918° W," an installation he and Holzman created at

VisArts Gallery in Rockville, Md., that used hanging strips of 6-foot-long, blue-green polyester film to reflect the thickness and color of Arctic ice based on buoy data. He also created various versions of "Digital Ice Core," a sculpture that used electronics, data and satellite communication to link a remote field site with a light sculpture composed of 1,000 LEDs. Viewers could see a recreated version of the ambient light in the air, ice and ocean in close to real time.

"I'm using data not to get more statistics, but to make these things that are on their way out physically real—to extend the experience through time and tell a longer story," Keener says.—**JW**



New Nap-Time Theory

Research Suggests Children's Need for Daytime Sleep Depends on Brain Development

MANY PARENTS FIND themselves asking: Why do some young children nap like clockwork, while mine fights sleep like her 3-year-old life depends on it? Am I doing my little one harm by not forcing her to rest?

According to new University of Maryland research, parents can worry less about age-determined nap schedules, because little ones' need for downtime depends more on their brain development.

A paper published in October 2022 in a special sleep issue of *Proceedings of the National Academy of Sciences* by Tracy Riggins, an associate professor in UMD's Department of Psychology, and Rebecca Spencer, a psychology professor at the University of Massachusetts Amherst, shows that children might stop taking naps

when their brains become more efficient in downloading and consolidating what they're learning. Classmates who haven't taken that neurological step yet may require daytime sleep.

"If you think of the hippocampus (the part of the brain largely responsible for learning and memory) as a bucket, you know how much pressure there is for a child to sleep based on how full their bucket is," Riggins says. "When the brain matures, it can either hold more, empty itself more quickly, or both; and that's when a child may begin to transition out of napping."

The researchers' hypothesis was born out of previous research findings from Riggins, an expert on child brain development and memory, and Spencer, an expert on cognition and sleep. In an earlier study likewise supported by the National Institutes of Health and

the National Science Foundation, they found that more sleep for children ages 4 to 8 made for better recall of facts.—**RG**



Crab Shell-Based Battery Gets Cracking for Sustainability

Engineers' Biodegradable Electrolyte Could Shrink EV Pollution Burden

ELECTRIC VEHICLES ARE a major part of the equation for protecting Earth's climate, but not everything adds up yet: The batteries powering these



batteries aren't always sustainable themselves. But now University of Maryland scientists have created a zinc

battery with a biodegradable electrolyte from an unexpected source: crab shells. The discovery was presented in a paper in September 2022 in the journal *Matter*.

"Vast quantities of batteries are being produced and consumed, raising the possibility of environmental problems," says lead author and materials science and engineering Professor Liangbing Hu, director of the University of Maryland's Center for Materials Innovation. The study's other authors are affiliated with the University of Houston and UMD's Department of Materials Science and Engineering.

For example, he says, polypropylene and polycarbonate components of lithium-ion batteries will take hundreds or thousands of years to degrade, while electrolytes in batteries

are frequently flammable or corrosive.

The new battery, however, uses a nonflammable gel electrolyte made from a biological material called chitosan, the most abundant of which is the exoskeletons of crustaceans like crab, shrimp and lobster.

A biodegradable electrolyte means that about two-thirds of the battery could be broken down by microbes, with the chitosan electrolyte decomposed completely within five months. This leaves behind the metal component, in this case zinc, rather than more-toxic lead or lithium.

The zinc and chitosan battery has an energy efficiency of 99.7% after 1,000 battery cycles, making it a viable option for storing energy generated by wind and sun for transfer to power grids, Hu says.



Maryland Quantum-Thermodynamics Hub Launches With \$2M Grant

Emerging Field Promises Scientific Discovery, Futuristic Tech

THE UNIVERSITY OF MARYLAND is hosting a \$2 million project aimed at making the state of Maryland a focal point for research in the burgeoning field of quantum thermodynamics, which studies the rules that govern how energy flows in quantum systems.

The Maryland Quantum-Thermodynamics Hub, supported by a grant from the Templeton Foundation, will bring together researchers from several universities to galvanize an area of research central to understanding the workings of our universe and to developing robust quantum technologies, ranging from a new class of computers to secure communications networks. Announced in November 2022, it will be based in the Institute for Physical Science and Technology.

Leading the project at UMD are Christopher Jarzynski, a Distinguished University Professor with appointments in chemistry

and biochemistry and in physics, and Nicole Yunger Halpern, a fellow in the Joint Center for Quantum Information and Computer Science (QuICS) and a scientist at the National Institute of Standards and Technology.

“We look forward to building a North American lodestone for quantum thermodynamics, inspired by our international peers,” says Yunger Halpern.

The scientists involved in the Maryland Quantum-Thermodynamics Hub say they’re interested in not only a richer understanding of quantum physics and its use in technology, but also how it connects to the flow of time and the laws of classical physics we constantly see playing out in everyday life.

In addition to cutting-edge research in the new field, the hub team also plans to organize symposia, seminars and even a science-fiction short-story contest.—**BKB**

UMD Center to Help State Department Stay Abreast of Quantum Technologies

UMD’S QUANTUM TECHNOLOGY Center (QTC) will provide technical guidance on the latest developments in the rapidly expanding world of quantum research and development to the U.S. State Department to help protect U.S. national security, the department announced in December 2022.



The research center, which is dedicated to translating the complexity of quantum science into revolutionary technologies and applications, will supply the department with

technical information while facilitating discussions with other government and industry partners. The department plays a key role in protecting American strategic interests and closely monitors potentially revolutionary emerging technologies.

“I’m thrilled to work with the Department of State to aid their understanding of quantum technology and how it can address some of the toughest challenges society is facing today—and prepare for the challenges of tomorrow,” says QTC Director Ronald Walsworth, a UMD professor of electrical and computer engineering and physics.

\$1.5M FTA Grant Bolsters Work on Equity in Mass Transit

UMD-Led Coalition to Plan for More Affordable Housing, Pedestrian and Bike Access

A \$1.5 MILLION Federal Transit Administration grant announced in November 2022 is funding a University of Maryland-led plan for equitable and sustainable transit-oriented development along a 16-mile light-rail route that will link the northern Washington, D.C., suburbs.

The two-year project by UMD’s Purple Line Corridor Coalition prioritizes initiatives from researchers, policymakers and advocates to add affordable housing, preserve small businesses and improve access for walkers and cyclists in neighborhoods at risk for gentrification and displacement along the Purple Line. Scheduled for completion in 2027, it will have 21 stops, including five on or near the UMD campus.

“This grant will enable us to dive deep on critical challenges in equitable development that have emerged over the last two years,

while putting social justice and community engagement at the forefront,” says Sheila Somashekhar, director of the Purple Line Corridor Coalition, which is administered out of UMD’s National Center for Smart Growth.

The project scope includes planning to convert strip malls along the corridor to ensure the survival of businesses, many of which are in low-income or immigrant neighborhoods. The project will also help create an affordable housing pipeline—new construction, rehabilitated housing and a plan for generating capital and funding sources. The project team will further identify locations for bike and pedestrian infrastructure to connect neighborhoods to the corridor.

Grant funds, says National Center for Smart Growth Director Gerrit Knaap, will additionally support coursework for UMD students and faculty that promotes social and climate justice, equity and the unique identities of corridor neighborhoods.

Awarded to the Maryland Transit Administration and administered by the coalition, the grant is the second-largest of 19 distributed in 2022 through the federal agency’s Pilot Program for Transit-Oriented Development Planning program, and follows a \$2 million FTA grant in 2018.—**MTH**



Women Managers Go to Bat for Subordinates

Men Tend to Compete Harder Only When Advocating for Other Men, Study Shows

WHILE RESEARCH SHOWS that men generally come to work with a more competitive mindset than women, female managers equally step up when advocating for direct reports, University of Maryland research found.

Led by Associate Professor Cristian Dezsö, the study also showed that male managers compete harder when advocating for male subordinates, according to research published recently in *Strategic Management Journal*.

Dezsö, in the Department of Logistics, Business and Public Policy, co-authored the research with Nathan Barrymore Ph.D. ’22 and Ben King Ph.D. ’21, a postdoctoral research associate.

In a series of experiments in a simulated organizational setting, they found that when rewards to subordinates accrue, female managers become more competitive whether they’re advocating for a man or a woman.

“These results suggest that female managers are effective sponsors: They are willing to go to bat for their protégés at levels similar to those of their male colleagues,” Dezsö says.

Although male managers’ competitiveness generally remained static, they became more competitive for male protégés, based on a mistaken belief that men have higher risk tolerances and are willing to take on higher-stakes assignments.—**KJ**

The Modern Battle for Maryland's Oysters

Researchers Use AI and Robotics to Save a Treasured Chesapeake Bay Species and Revive a Struggling Industry

MORE THAN 150 years ago, Maryland launched its "Oyster Navy" to fight off illegal harvesting by rapacious pirates who'd stripped the shellfish from the waters of their own states and were now plundering the bounty of the Chesapeake.

Despite the seagoing police force's efforts—sometimes backed by rifles and cannons—centuries of overharvesting, mismanagement and devastating diseases squandered those natural riches. Maryland's yearly oyster harvests plummeted from 19th-century highs of 15 million bushels to just 26,000 in 2003. The 540,000 bushels taken in the 2021-22 season—the most in 35 years—is still less than 4% of the 19th century record.

Today, led by an A. James Clark School of Engineering professor, a multi-institutional team of researchers is developing a modern-day analog to the Oyster Navy, fighting to restore oyster populations not with gunboats, but with underwater robots.

The project funded by the U.S. Department of Agriculture and the National Science Foundation seeks to infuse the Maryland shellfish industry with technologies that have revolutionized land-based agriculture. So-called "precision farming" often uses robotic aerial drones mounted with sensors to scan fields for factors like topography and soil content,



Environmental Science, Rajasekaran hunched over his laptop directing the robots to gather visual and sonar imagery of oysters.

"The idea is: The sonar can see the oysters through the turbid water from a distance although with low resolution, while the camera has high resolution, but

Keshav Rajasekaran Ph.D. '22 searches for oysters with an underwater drone. Seafood company owners Nick Hargrove (bottom, left) and Benny Horseman haul up oysters using a dredge.



can only see the oysters close up—so we plan to use both," he says.

With all that and a type of artificial intelligence known as machine learning, Yu and collaborators at UMD and beyond are teaching computer systems to recognize sonar signatures of marketable oysters. One day, a robot—even a swarm of them—could zoom through an area and quickly provide an oyster farmer with a map showing a host of metrics, including where oysters are ready to harvest, where they're immature, and empty zones.

Beyond oyster visibility, the project could lead to a range of revolutionary practices, Yu says: underwater robots planting tiny oysters affixed to shells, or "spat," in perfect spots, or harvesting with delicate precision that takes only viable shellfish and leaves growing ones and the bay bottom undisturbed. "People think we're dreaming if we mention all that," Yu admits.

Another aspect of the project, led by bioengineering Professor Yang Tao, is examining how to plot perfect dredging paths to avoid immature oysters while using as little fuel as possible. Other collaborators hail from the UMD Department of Computer Science, University of Maryland Eastern Shore, Louisiana State University, Pacific Shellfish Institute, Virginia Polytechnic Institute and State University, Georgia Tech and the Fraunhofer Center for Experimental Software Engineering. Together, their technologies could be applied to other types of seafood, from mussels to crabs.

Don Webster, a University of Maryland Extension principal agent focused on aquaculture and one of the co-leaders of the project, says advanced aquaculture technologies could reshape the industry and make oysters once again a staple in the American diet.

"As I tell my growers, 'I want to see Wendy's, Popeye's and Burger King arguing over who's got the best oyster sandwich,'" he says. —CC

Seafood company owner Casey Todd (above, steering boat) prepares to dump oyster shells near Crisfield, Md., to help young oysters grow. Professor Miao Yu (right) is overseeing the robotics project.



giving farmers data to plan seeding or harvesting schedules, or apply fertilizers in exact amounts where needed.

Overall project leader Miao Yu, a mechanical engineering professor whose specialty is robotic sensing, says Maryland's archaic oyster trade needs modern methods to augment its traditions.

"The shellfish industry in the Chesapeake Bay is mostly using the same technology from 200 years ago, with most things done very laboriously by hand," she says. "It has

not evolved, not adapted like terrestrial farming." Decisions as basic as where to plant oyster larvae and steer a boat to find fully grown ones are still based on intuition and experience, rather than objective data.

On a June 2022 data-gathering trip on the Choptank River, a major Chesapeake tributary, Yu's doctoral student, Keshav Rajasekaran, struggled in an open boat against glaring sun and murky water to control a pair of microwave oven-size aquatic drones fitted with optical and acoustic sensors.

Working with Alan Williams, a master's student studying with fisheries scientist and project co-leader Matthew Gray of the University of Maryland Center for





Health Care's Vision of Tomorrow

Multi-Institutional Effort to Advance Medical Innovations, Build Regulatory Framework for Extended Reality in Medicine

ULTRASOUND DATA DISPLAYED directly on a patient via augmented reality headsets. “Grand rounds” for medical students and faculty in different locations. Virtual reality landscapes matched with classical opera to transport people with painful injuries outside of themselves and reduce the need for pain medication.

These medical examples of extended reality (XR)—the umbrella term used for technology based in virtual and augmented reality or other immersive media—are already being prototyped or tested in clinical trials. But technical challenges and sparse regulatory guidelines hamper their widespread use in health care settings.

Now, with \$5 million from the National Science Foundation (NSF) and technology titans including Google, Microsoft and Meta (formerly known as Facebook), the University of Maryland is leading a multi-institutional effort to develop, test and certify XR technologies in medicine and health care.

Behrooz Shirazi, acting deputy division director of the NSF’s Division of Computer and

Network Systems, calls the new Center for Medical Innovations in Extended Reality (MIXR) one of the first national centers at the intersection of medical and computing sciences. “We expect this vibrant collaboration to produce significant societal and health care impacts,” he says.

MIXR will work with regulatory experts at the U.S. Food and Drug Administration, ensuring that safe, effective and innovative clinical solutions make it to patients as soon as possible.

“We’ll work closely with our industry and government partners to answer any scientific questions regarding regulatory evaluations and decisions needed for the wide-scale clinical use of these devices,” says Amitabh Varshney, computer science professor and dean of UMCP’s College of Computer, Mathematical, and Natural Sciences.

He is the lead-site principal investigator on the project, and is joined by partner-site PIs Sarah Murthi, M.D. (left), an associate professor of surgery at the University of Maryland School of Medicine, and Mark Cohen, M.D., a professor and vice chair of surgery at the University of Michigan Medical School.

Varshney and Murthi co-direct the Maryland Blended Reality Center, launched in 2017 as part of MPowering the State, the strategic partnership between the University of Maryland, College Park and the University of Maryland, Baltimore.

Early projects out of the center prototyped new diagnostic tools to assist physicians at the renowned R Adams Cowley Shock Trauma Center in Baltimore, where Murthi is director of the critical care ultrasound program.

MIXR is heavily dependent on powerful computing resources. At Maryland, those resources will be handled by the University of Maryland Institute for Advanced Computer Studies.

Between industry partners, scientists, physicians and federal regulators, Varshney says, “the synergy in MIXR will be contagious.”—**TV**

PHOTO COURTESY OF MARYLAND BLENDED REALITY CENTER

New Health Computing Institute Announced

Initiative Will Tap Into Power of Machine Learning, Artificial Intelligence to Fight Disease



THE UNIVERSITY OF MARYLAND Strategic Partnership: MPowering the State (MPower) announced plans in November 2022 to establish the University of Maryland 3-Institute for Health Computing, led by the University of Maryland, College Park and the University of Maryland, Baltimore, in collaboration with the University of Maryland Medical System and Montgomery County, Md.

The institute will leverage advances in artificial intelligence and computing to create a premier learning health care system that evaluates de-identified and secure digitized medical health data to diagnose, prevent and treat diseases in patients across the state.

It is the latest initiative from MPower, which brings together the complementary strengths of the two universities to boost Maryland’s innovation economy, advance interdisciplinary research, create opportunities for students and solve important problems.

“Scaling up research to address grand challenges in the life sciences has shifted from collecting data to using cutting-edge technology to discover meaningful patterns hidden in the data,” says Darryll J. Pines, UMCP president.

The institute is expected to open in leased space in 2023, with completion of laboratory and office space at the North Bethesda Metro location in 2028.

Combined Research Strength

\$1.14
BILLION

FY21 University of Maryland
(College Park and Baltimore campuses)
research expenditures



10th

Rank among U.S.
public research
universities
(17th overall)

↑26%

Increase over
UMCP’s and UMB’s
FY 2011 totals

*SOURCE: NATIONAL SCIENCE FOUNDATION HIGHER EDUCATION RESEARCH AND DEVELOPMENT SURVEY

PHOTO BY MATTHEW D’AGOSTINO, UNIVERSITY OF MARYLAND, BALTIMORE

Harvesting Hope From the Trees

From Urban Forest Canopies to Underground Carbon Vaults, UMD Researchers Are Creatively Fighting Climate Change

BY CHRIS CARROLL PORTRAITS BY JOHN T. CONSOLI

Since trees first arose nearly 400 million years ago to dominate our planet's landscapes, they've exemplified what Swiss-German poet and novelist Hermann Hesse called "the ancient law of life." Growing in size, diversity and complexity as they evolved, trees spread across continents in forests that supported teeming ecosystems; they helped form Earth's hospitable atmosphere as they took in carbon dioxide and exhaled oxygen; they witnessed the reign of the dinosaurs and the later rise of mammals while providing food and shelter for myriad species, including us.

Trees that died and were subject to millions of years of geologic forces were important in the formation of hydrocarbons like coal and crude oil. Humanity

in recent centuries learned to exploit this "fossil energy" in earnest, building industrial societies, speedily traversing the globe and creating technology and wealth that previous generations couldn't have imagined. Today, as the bill for relentless, nearly uncontrolled pollution comes due—in rising global temperature, surging sea levels, the spread of new diseases and the struggle of whole ecosystems to endure—many tree species face threats from global warming.

In research on the benefits of urban forests, on trees as vehicles to pull carbon permanently out of the atmosphere and on trees as sources of truly green energy, University of Maryland researchers are leveraging these ancient symbols of solidity and permanence to fight climate change and mitigate its effects.



Uprooting Racism in Urban Forests

A DRIVE THAT WINDS south through Baltimore—from the north end of leafy Roland Park through the hipster haven of Hampden and finally into the underserved neighborhoods surrounding downtown—displays more than just a panorama of declining socioeconomic status, but one of urban ecological decline.

From the 1930s until the passage of the 1968 Fair Housing Act, these close-in areas were "redlined," or declared hazardous for investment, in a nationwide real estate assessment by the federal Home Owners Loan Corporation. The scheme cut off access to affordable financing and trapped many residents, often from racial or religious minority communities, in a cycle of urban decline that continues a half-century later.

A study of Baltimore street trees, published in *Ecology* in fall 2022 and led by entomology Assistant Professor Karin Burghardt, showed that large trees were nine times less likely to be growing in formerly redlined areas than elsewhere in the city, while the diversity of trees was far lower. The problem extends beyond aesthetics.

"The shade that trees provide, and the cooling effect that occurs when trees take up water and release it into the atmosphere—both of those fight the 'urban heat island' effect," where heavily built-up areas absorb more heat during the day and retain more at night than surrounding environs, she says. "A healthy tree canopy makes the neighborhood a healthier place to live."

While Baltimore overall has a diverse portfolio of tree species, past reforestation programs in redlined areas focused

too much on a few species like red maple. It's a wonderful tree, Burghardt says, but one that could be wiped out locally by an insect infestation or other environmental issue and leave neighborhoods bare again.

The study she conducted with partners at the U.S. Forest Service, Johns Hopkins University and University of Maryland, Baltimore County can help guide Baltimore in future reforestation efforts, she says.

And with support from UMD's Grand Challenges Grants program (see pages 2-5), Burghardt will continue research to find tree species best able to survive an uncertain climate future.

"We don't know a lot about what's going to happen to all these species in the temperatures that are coming down the pike in urban areas," she says. "That's another reason to spread risk over a diverse community of street trees."



A Proper Burial to Clear the Air

THE GNARLED CHUNK of wood that atmospheric and oceanic science Professor Ning Zeng dug up on a research trip and now keeps in his home lab may point the way to healing Earth's climate.

"It stayed there a few feet underground for hundreds or thousands of years, very well preserved," he says. "Because of the conditions of the soil, it never decomposed, and the carbon in the wood stayed there."

Trees have always captured and stored carbon dioxide in wood, even as R&D is ramping up globally to develop mechanical "direct air capture" of greenhouse gases. Many carbon offset programs, in which institutions or individuals make investments in fighting climate change to compensate for emissions they cause, are based on planting various tree species.

A problem, Zeng says, is that once those farmed trees die—or when a wild forest is bulldozed for grazing land or when a tree behind your back fence crashes to the ground and rots—the stored carbon filters back into the atmosphere through decomposition or burning.

Properly burying trees could vastly extend the time they're able to sequester carbon, from decades to millennia. For nearly

15 years, Zeng has worked on what started as back-of-the-napkin calculations about how to alter the Earth's climate trajectory by sinking dead wood in clay-rich soil that keeps out oxygen and prevents its breakdown.

He's pursued the idea with his students, and last year launched a startup company, Carbon Lockdown, to begin moving toward a worldwide system of regional wood dumps that take dead trees from municipalities and homeowners, demolition waste and trees harvested from carbon offset projects.

After an earlier project in Quebec showed his technique prevented decomposition for years, he's scoping out a larger test site in the Baltimore-Washington area to open the first such collection point this year.

While scaling up wood dumps globally would be neither simple nor the project of a single team or company, a built-out system as he envisions it could absorb 10 gigatons of carbon a year, or more than 25% of humanity's output.

"We could strongly alter the trajectory of climate change without any new technology or other changes in society," Zeng says.



"Poplar" Alternative to Boost Biofuels, Free Up Farm Fields for Food

HERE'S AN ENTICING proposition for fighting climate change: Instead of unearthing long-buried carbon and pumping it into the atmosphere as fossil fuels, society can power itself with plant fuels composed of carbon pulled from the atmosphere, a CO₂ recycling process that's potentially carbon-neutral.

But real-world biofuels, like ethanol mixed with gasoline or biodiesel, have a drawback: The "biomass" that's fermented to make them, often corn or soybeans, is grown on productive agricultural land, pushing up crop prices and increasing food insecurity for

hundreds of millions of people.

With support from a \$2.6 million Department of Energy grant in fall 2022, Gary Coleman, a UMD associate professor of plant sciences and landscape architecture, is working with the poplar tree genome to enhance poplars' ability to grow on "marginal land"—a source of biomass that could allow traditional farm fields to return to food production.

"These are lands with reduced water availability or reduced nutrient availability," he says. "They're not ideal places to grow anything, so the question is, what can you do to maximize biomass production there?"

Coleman and his team are applying genomic technology—like CRISPR-Cas9

gene editing—to the genes that control the metabolism of poplars to maximize their ability to acquire nitrogen and other essential nutrients from the soil, and how they use it to grow.

Leaves, for example, are green in the summer, and in the fall they turn yellow and other colors: That's the tree pulling those nutrients back out of the leaves to store them for the winter before the leaves drop, Coleman said. "But when a leaf falls, it still takes important nutrients from the tree with it—so can we engineer that process to be more efficient and enhance growth?"

If he and his team can find a way, trees could play an even larger role in preserving a global environment they've helped shape.



The mayor of Knoxville, Tenn., picked up a UMD researcher's book on preventing gun violence. The resulting partnership will be a model for how cities can create safer streets.

BY SALA LEVIN '10
PHOTOS BY JOHN T. CONSOLI

An End to the Bleeding

ONE EVENING IN FEBRUARY 2021, Janaria Muhammad stepped out of her house in Knoxville, Tenn., to meet friends at her favorite restaurant, Kings and Wings. Recently turned 15, Nana, as everyone called her, was a perpetual source of energy for those around her. She reminded her brothers to keep their grades up, helped her dad navigate new technology so much that he teased she was his secretary, shimmied with the dance team at Austin-East High School, and babysat neighborhood kids and cut hair for pocket money.

"She was like the sun," her father, Lawrence Muhammad, told *The Washington Post*. "When you saw her, you lit up."

That night, Nana didn't make it past her yard on Selma Avenue before the darkness got her: She was hit twice by a drive-by shooter. Her father rushed outside and held her as she died—the third of five Austin-East students lost to gun violence before the end of spring.

To mark the second anniversary of Nana's murder, dozens gathered outside the squat brick building that houses East Knoxville's YWCA Phyllis Wheatley Center, where she regularly came after school to do homework, play basketball and snap pictures with friends. Friends and relatives, along with community members and leaders, clutched purple balloons—the color she'd chosen for her bedroom—under a gray, oatmeal-textured sky.

Her parents spoke to news cameras, pleading again for help finding her still-unknown killer. "If we don't get justice in this life, we know that we will get justice in the next," said Jacquelinne Muhammad, Nana's mother.

Confronted with 40 other homicides that year and desperate to lead her city to a safer future, Knoxville Mayor Indya Kincannon picked up a book that promised a straightforward approach to reducing gun crime: "Bleeding Out: The Devastating Consequences of Urban Violence—And a Bold New Plan for Peace."

In it, author Thomas Abt, a University of Maryland associate research professor, delivers a set of evidence-based action items: focus a range of prevention efforts on those likeliest to be perpetrators or victims; keep a closer eye on areas likeliest to experience violence; and employ people who know the world of street violence intimately to act as mediators.

As Kincannon read the book, she was struck by the feeling that "it was written for mayors," she says. "It's research-based, but it's also very, very practical." She emailed Abt to ask him more about his ideas, laying the groundwork for what's becoming a central part of the city's anti-violence strategy.

Knoxville is the first city to partner with Abt's Center for the Study and Practice of Violence Reduction, or VRC. Formed shortly after his arrival at UMD's Department of Criminology and Criminal



Justice, the center, funded partly by the private philanthropy organization Arnold Ventures, seeks to conduct research on minimizing gun violence, and to offer its expertise for free to municipalities around the country. Partnerships with other cities, including Boston, are in the works.

"The mission is very simple," says Abt. "We want to save lives by stopping violence, using science. As we measure our progress, that will be the question: Have we saved lives?"

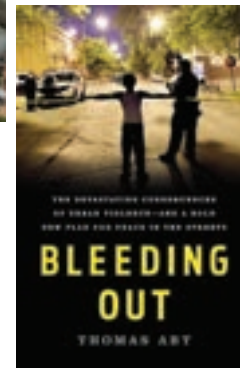
KNOXVILLE POLICE OFFICER Conner Wiesenberg has the kind of "how's your dad doing" familiarity with neighborhood regulars that Abt prizes, because it opens doors for peaceful solutions to problems that could escalate to bullets flying. He graduated from Knoxville Central High, and played on its basketball team with kids from Lonsdale, a neighborhood that experienced violence then, too. "It would not be uncommon for us to be on a traffic stop and somebody rolls by, calls my name out, it's somebody that I know," he says.

On foot patrol one bone-chilling February evening in Lonsdale Homes, a

subsidized housing community, Wiesenberg and his partner, Andrell Cummings, point out a small square of pavement where someone has spray-painted a design, including the word "Pache," the nickname of a neighborhood resident accidentally shot and killed last May during a dispute he'd been trying to defuse.

Knoxville and cities around America are increasingly littered with symbols of tragedy. In 2020, amid a pandemic, political toxicity and civic upheaval, the U.S. reached a startling new peak: 79% of murders involved a gun, the highest since at least 1968, according to the Pew Research Center. Other numbers also painted an unsettling picture: In 2021, the nonprofit Gun Violence Archive recorded the most gun deaths, 45,107, since its 2013 founding.

While suicides and domestic violence make up a significant number of gun deaths, Abt's focus is urban or community violence, defined in "Bleeding Out" as occurring "outside the home, on the streets or in other public spaces where people congregate." Muggings gone too far, gang rivalries, personal disputes that play out in parking lots or on street corners—those are



Knoxville police officers Andrell Cummings (left) and Conner Wiesenberg look at a memorial to a resident killed last year. The police department is incorporating violence reduction methods presented by UMD's Thomas Abt (above).

his terrain.

Knoxville, a hilly city of roughly 190,000, outstrips most other

U.S. cities of its size in rising violence. In 2022, the city's homicide rate was 21.4 per 100,000, more than double in 2018 and roughly triple 2022's national rate. While U.S. cities saw a 30% increase in homicides from 2019 to 2020, Knoxville's surged 68%.

In 2022, Kincannon, in conjunction with the Knoxville Police Department, hired Abt (then chair of the Violent Crime Working Group at the think tank Counsel on Criminal Justice) and other experts to analyze gun violence in the city, determining who and what was fueling it and recommending policies to reduce it.

This data-centric approach appealed to Kincannon, who aimed for a plan not based on emotion or rhetoric—the sort of thing that makes news for a day or two and then disappears. "I didn't want to just do a headline. I wanted lasting change."

Abt and the team examined the 82

The mission is very simple. We want to save lives by stopping violence, using science."

—Thomas Abt

University of Maryland associate research professor

homicides and 188 nonfatal shootings in Knoxville from 2019 through 2021. The trio found that, in a city that is 75% white, a large majority of victims and perpetrators were Black men aged 18 to 34, and at least 59% of shootings involved members of gangs (or groups, as Abt calls them). At least 63% of shooters and victims had had previous

contact with the criminal justice system.

"The single most reliable indicator about whether someone's going to be involved in violence or whether violence is going to happen in a certain place is whether it's happened in the past," Abt says.

He bases his approach on three principles: focus, balance and fairness. First, he says, law enforcement and city services should be concentrated where crime occurs most and the narrow subset of people responsible for the worst offenses. They're who criminologist Lawrence Sherman, a UMD distinguished university professor, calls "the power few."

Taken too far, this risks the problems New York City had with "stop and frisk" policing, in which 90% of those stopped by the NYPD from 2003 to 2021 were people of color. Baltimore experienced what critics say were similar excesses during former Maryland Gov. Martin O'Malley's mayoral tenure, when he approved widespread arrests for minor offenses like loitering.

Abt says law enforcement can avoid discriminatory overpolicing in part by working with community members to determine who in the neighborhood poses a true threat. "You go to these neighborhoods, and people will tell you who is doing what—but only if they trust you," says Abt. That's far different, he says, from an approach that treats every person of color or inhabitant of

certain neighborhoods like a suspect.

Abt's second tenet is balance, or "the notion that balancing prevention and punishment works far better than either approach in isolation." Street outreach workers who locate suspected members of the power few might try to connect them with therapy, get them involved in community programs or direct them to housing or job assistance. "You need to target services and support to some of the supposedly least sympathetic people," says Abt.

Finally, fairness—or legitimacy—is the linchpin in assuring that these interventions work according to plan. The impact of laws must be "felt equally across social groups," Abt writes; they must be enforced "according to widely accepted values, including transparency, impartiality, proportionality and equality."

These concepts and conclusions from the data led Abt and his team to make a number of recommendations to the city in fall 2022. A few months later, the city is "under construction with a new way of policing," Knoxville Deputy Police Chief Tony Willis says. "What we want is our officers to get a call, and it's no longer 12 Cherry St. It's the Smith house."

BORN AND RAISED in Cambridge, Mass., Abt was exposed early to the idea of using data to address social problems by his father, Clark Abt, an MIT-trained researcher whose social science think tank, Abt Associates, takes on issues like public health, education and economic mobility.

Abt's interest in violence reduction was fueled by his own close-to-home shock. In 1999, while attending Georgetown University Law Center, he taught a class at a local high school. One student "sat in the back, was extremely disconnected, often

slept through major portions of class,” he recalls. Gradually, as Abt worked to engage him, he became more responsive. One of Abt’s mentees from the program later asked if he’d heard about the guy in the back of the class: He’d been murdered.

Years later, as he began writing “Bleeding Out,” Abt searched unsuccessfully for details. “I contacted the homeroom teacher. He was like, ‘Thomas, I can’t tell you how many students I’ve lost. There’s just no way I could possibly pick this one out among all the others.’”

Abt went on to examine this problem of violence from the perspective of a teacher, a prosecutor, a government official and an academic. After law school, he worked as an assistant district attorney in New York County, followed by time at a law firm and as voter program director for the 2008 Obama presidential campaign. Post-election, Abt joined the Department of Justice as chief of staff to Assistant Attorney General Laurie O. Robinson,

“What we want is our officers to get a call, and it’s no longer 12 Cherry St. It’s the Smith house.”

—Tony Willis
Knoxville Deputy Police Chief

who prioritized “bringing sound science and reliable data into the criminal justice decision-making process,” he says.

Robinson calls Abt “somebody who can cross those lines and bring important knowledge from research into the world of hard decisions on the practical side.” He would demonstrate that as New York’s deputy secretary for public safety, where he initiated the Gun Involved Violence Elimination (GIVE) program, and later in a five-year fellowship at Harvard, when he wrote “Bleeding Out.”

Critics like Jeffrey Butts, director of the Research and Evaluation Center at the John Jay College of Criminal Justice, say Abt’s philosophy takes a fast-action approach to

problems with deep roots, potentially neglecting “people who talk about fundamental causes and long-term solutions,” he told *The Atlantic* in 2019.

Abt agrees systemic approaches like reducing poverty, improving education and creating job opportunities are all essential, but says that unlike preventing shootings—“as a matter of practical reality, those things are not achievable in the near future.”

Two things primarily separate the VRC from other centers focused on gun violence: its all-hands approach, which incorporates a spectrum of ideas on enforcement and prevention; and its work with elected leaders and grassroots activists at no cost to implement new methods and ideas.

Abt is “uniquely qualified to help lead this effort and also to coordinate other initiatives at

the university that are centered around violence research,” says Rod K. Brunson, interim chair of the Department of Criminology and Criminal Justice and senior policy adviser to the VRC. He is “one of the thought leaders in this space.”

DOWN SECLUDED Adcock Avenue in Knoxville, Wiesenberg points out a low-slung house where he used to drop off basketball buddies after school. In

April 2020, Anthony Sanford, one of them, was killed here, shot in the back in what appeared to start as a drug deal.

Later that night, Wiesenberg, an officer on the Community Engagement Response Team (CERT), got a call saying that neighbors and witnesses were stonewalling investigators, but that “there are some people up here that are name-dropping you.” Wiesenberg went to the house alone and gleaned information that eventually led to the arrest of a suspect.

That kind of relationship is essential to CERT, a unit that focuses exclusively on violent crimes with the kind of community-first policing Abt encourages. Each night, CERT officers walk through neighborhoods, asking residents how things are going. An anonymous tip line also lets citizens text officers.

Denzel Grant represents another branch of the violence reduction ecosystem. As leader of the violence interrupter program Turn Up Knox, Grant works with kids at risk and adults who have actually committed

Denzel Grant leads Turn Up Knox, a program to keep kids and adults from violence. Such organizations are critical to violence reduction, says Abt.

violent offenses, offering programming, mentorship and resources for help finding a job or place to live.

Grant saw violence at an early age. In 1998, his cousin, Andre Stenson, was pulled over for driving without headlights. On parole and driving without a license, he ran from police, who wrestled him to the ground and handcuffed him. He died on the way to the hospital, after saying that he couldn’t breathe. (A federal jury later ruled in favor of the officers in a lawsuit.)

“I always had the passion for (community work) ever since,” says Grant, who was in elementary school at the time. “I’ve just been doing it ever since.”

Grant has made unexpected connections. “We have become pretty good friends,” says Deputy Police Chief Willis, “and I would not have bet one dime on that occurring.” But Grant has become “a powerful partner” in helping police de-escalate potentially volatile situations.

Knoxville native LaKenya Middlebrook is responsible for ensuring these disparate

elements cohere. In 2021, the mayor appointed Middlebrook director of community safety, a role in which she links citizens, law enforcement, civilian oversight committees and school districts to implement Abt’s recommendations.

Gun violence is “an issue that is so front-of-mind and so deeply personal for so many folks in our community that people want to help,” says Middlebrook. “They want to be a part, they want to figure out what role they can play, they are really open to thinking about how we can do things a little differently.”

Much of Turn Up Knox’s youth programming takes place at the YWCA. At the ceremony commemorating Nana Muhammad’s death, Grant, Middlebrook and others held their balloons as Nana’s father, Lawrence, talked about his daughter. “She’s that tree where all the seeds fall off and other plants grow,” he said.

Afterward, those gathered released their balloons and watched them soar, far beyond where any tree could snag them. **TERP**

UMD Researchers Lead 120 Initiative on Gun Violence Reduction

Other University of Maryland researchers are tackling the problem of gun violence with a variety of approaches. Joseph Richardson Jr., the Joel and Kim Feller Professor of African American Studies and Anthropology, and Rod K. Brunson, interim criminology and criminal justice chair and professor, are groundbreakers in the field of violence reduction.

Their work is part of the 120 Initiative to Reduce Gun Violence—a D.C.-area coalition of higher education institutions founded by UMD President Darryll J. Pines and George Mason University President Gregory Washington to focus research expertise at the problem. (Its name honors the number of people who die on average daily from shootings in the U.S.)

Richardson pioneered an intervention strategy that begins as soon as gunshot victims are wheeled into the emergency room. He talks with patients in their hospital beds, learning their stories and beginning the process of connecting them with resources like legal aid or mental health counseling.

Brunson’s work focuses primarily on the relationship between law enforcement and the community. His most recent study examined how place-based factors influence the decisions law enforcement officers make.



Accolades

Awards and Honors Earned by Faculty and Staff Researchers in 2022

■ **ELIZABETH APARICIO**, assistant professor of behavioral and community health, received the ECPN John B. Reid Early Career Award from the Society for Prevention Research.

■ Associate Research Scientist **KEITH ARNAUD** and Adjunct Associate Professor **BRAD CENKO** from the Department of Astronomy were honored with the High Energy Astrophysics Division Innovation Prize and Mid-Career Prize, respectively.

■ **BALAKUMAR BALACHANDRAN**, Minta Martin Professor and chair of the mechanical engineering department, was awarded the Robert

R. Scanlan Medal by the American Society of Civil Engineers' Engineering Mechanics Institute.

■ Professor of English and comparative literature **RALPH BAUER** was awarded the Modern Language Association of America's Aldo and Jeanne Scaglione Prize for Comparative Literary Studies for his work "The Alchemy of Conquest: Science, Religion and the Secrets of the New World."

■ **BEN BEDERSON**, professor emeritus in computer science at the University of Maryland Institute for Advanced Computer Studies (UMIACS); **CATHERINE PLAISANT**, senior

research scientist emerita at UMIACS; and **JESSE GROSJEAN**, a former faculty research assistant at UMD's Human-Computer Interaction Lab, received the IEEE VIS Test of Time Award for their work on zoomable tree browsers.

■ Architecture Professor **MATTHEW BELL** was named a fellow by the Congress for the New Urbanism.

■ **TOM BETTAG**, a lecturer at the Philip Merrill College of Journalism, was inducted into the National Capital Chesapeake Bay Chapter of the National Academy of Television Arts and Sciences' Gold Circle.

■ Ten UMD faculty received Early Career Development (CAREER) awards from the National Science Foundation: **CHRISTOPH BREHM** (aerospace engineering), **TRISTAN BUCKMASTER** (mathematics), **KEVIN DANIELS** (electrical and computer engineering, Institute for Research in Electronics and Applied Physics), **DANIEL CRISTOFARO-GARDINER** (mathematics), **ANTONIO DE ROSA** (mathematics), **LEONIDAS LAMPROPOULOS** (computer science); **ALLISON REILLY** and **XIANFENG YANG** (both of civil and environmental engineering), **HAIZHOU**

YANG (mathematics) and **LINDA ZOU** (psychology).

■ Associate Professor of American studies **LA MARR JURELLE BRUCE** received the 29th annual Modern Language Association Prize for a First Book and the Nicolás Cristóbal Guillén Batista Outstanding Book Award from the Caribbean Philosophical Association for his 2021 book, "How to Go Mad Without Losing Your Mind: Madness and Black Radical Creativity."

■ Sociology Professor **JUDE CASSIDY** was awarded the Bowlby-Ainsworth Award.

■ **WILLIAM BOWERMAN**, professor and chair of the Department of Environmental Science and Technology; **SARAH ENO**, professor in the Department of Physics; and **LESLIE PICK**, professor and chair of the Department of Entomology, were named 2021 fellows of the American Association for the Advancement of Science.

■ **LEI CHEN**, an assistant professor of mathematics, **ALICIA KOLLÁR**, an assistant professor of physics, and **PRATYUSH TIWARY**, an associate professor of chemistry and biochemistry with a joint appointment in the Institute for Physical Science and Technology, received Sloan Research Fellowships.

■ Chemical and biomolecular engineering Assistant Professor **PO-YEN CHEN** was selected for a John C. Chen Young Professional Leadership Scholarship by the American Institute of Chemical Engineers.

■ Computer science Professor **RANCE CLEAVELAND** and electrical and computer engineering Professor **CAROL ESPY-WILSON** were elevated to fellows by the Institute of Electrical and Electronics Engineers.

■ **HAL DAUMÉ III**, a professor of computer science with joint appointments in the Language Science Center and UMIACS, was part of a team that received the Test of Time Award from the Association for Computational Linguistics for a paper on computer vision co-authored 10 years ago.

■ Professor of cinema and media studies and French in the School of Languages, Literatures, and Cultures

CAROLINE EADES was awarded a Camargo Foundation residency fellowship to study in Cassis, France.

■ **JOHN ERWIN**, professor and chair of the Department of Plant Science and Landscape Architecture, was appointed to the USDA's new Urban Agriculture and Innovation Production Federal Advisory Committee.

■ Department of Management Science Chair **MICHAEL FU** was presented with the George E. Kimball Medal from the Institute for Operations Research and the Management Sciences (INFORMS) and also won the INFORMS Saul Gass Expository Writing award. In addition, Assistant Professor of Decisions and Operations **XIAOJIA GUO** won the INFORMS Aviation Applications Section Best Paper Award, and **RAGHU RAGHAVAN**, Dean's Professor of Management Science and Operations Management, received runner-up honors for the INFORMS Computing Society Prize.

■ **SYLVESTER JAMES GATES JR.**, the Clark Leadership Chair in Science in the Department of Physics and School of Public Policy, received the Hans Christian Oersted Medal from the American Association of Physics Teachers.

■ **CHENG GONG**, an assistant professor in the Department of Electrical and Computer Engineering, was named Maryland Chemist of the Year by the American Chemical Society.

■ **ALEXEY GORSHKOV**, a fellow in the Joint Center for Quantum Information and Computer Science, was named a fellow of Optica, formerly known as the Optical Society of America. He is also a physicist at the National Institute of Standards and Technology and a Joint Quantum Institute fellow.

■ **SAMUEL GRAHAM, JR.**, dean of the A. James Clark School of Engineering, received the American Society of Mechanical Engineering's Allan Kraus Thermal Management Medal.

■ **KIMBERLY A. GRIFFIN**, dean of the College of Education, was named a top Edu-Scholar by *Education Week*.

■ **KATRINA GROTH**, associate professor of mechanical engineering and associate director of the Center for Risk and Reliability, was awarded the Landis Young Member Engineering Achievement Award from the American Nuclear Society.

Two Professors Elected to American Academy of Arts and Sciences

TWO UNIVERSITY OF MARYLAND professors were named to the American Academy of Arts and Sciences in May 2022.

PATRICIA HILL COLLINS, Distinguished University Professor Emerita of sociology, was recognized for her work as a social theorist whose research and scholarship examine race, gender, social class, sexuality and nationality. She is the author of numerous foundational articles and

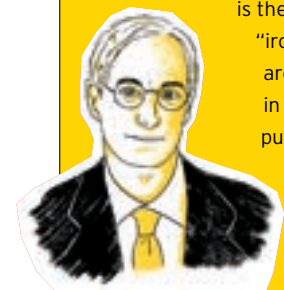
books, including "Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment," which won the Jessie Bernard Award of the American Sociological Association (ASA) and the C. Wright Mills Award of the Society for the Study of Social Problems. A 30th anniversary edition will be published in May 2022. In 2008, she became the 100th president of the ASA, and the first African American woman to lead the organization.

RICHARD J. WALKER, a Distinguished University Professor of geology, was recognized by the academy for his discoveries on the origin and evolution of early solar system materials and the geochemical evolution of the Earth.

Walker's primary research focus is the study of siderophile, or "iron-loving" elements, which are largely concentrated in planetary cores. He has published more than 200

articles and book chapters, and he has advised and mentored dozens of undergraduate, graduate and

postdoctoral students, and junior faculty members.—**LO, AR**



Expert on Health Inequities Elected to National Academy of Medicine

A MEDICAL SOCIOLOGIST who transformed understanding of the social determinants of health was elected in October 2022 to the National Academy of Medicine.

RUTH ENID ZAMBRANA, a Distinguished University Professor in the Harriet Tubman Department of Women, Gender, and Sexuality

Studies, was among 90 new members and 10 international members welcomed to the organization in recognition of their achievement and service related to medicine and health.

A leading authority on racial and ethnic disparities in health across the life course, Zambrana has spent decades shining a light on the experiences of minority groups including Hispanics/Latinos and how their social and material conditions impact health outcomes. She has published over 160 peer-reviewed articles,

books, book chapters, reports and monographs on women's, maternal and child health; racial, ethnic and socioeconomic health disparities; and educational pathways among underrepresented and minority students and faculty. She has also mentored over 100 scholars in public health, medicine and the sociomedical sciences.—**JW**



Groundbreakers

■ **ABBA GUMEL**, the Michael and Eugenia Brin Endowed E-Novate Chair in Mathematics, and Professor **LARRY WASHINGTON** were elected fellows of the American Mathematical Society.

■ **ANIL K. GUPTA**, the Michael D. Dingman Chair in Strategy and Entrepreneurship, was named in the Thinkers50 global ranking of management thinkers.

■ Musicology Professor **BARBARA HAGG-HUGLO** was elected an honorary member of the American Musicological Society.

■ **VIRGINIA HAUFLER**, associate professor of government and politics, and **ODED RABIN**, an associate professor of materials science and engineering, received

U.S. Fulbright Scholar fellowships.

■ **MICHAEL HICKS**, a professor of computer science with an appointment in UMIACS, was recognized by the Association for Computing Machinery with the Special Interest Group on Programming Languages' Distinguished Service Award. He was also part of a team honored with a Distinguished Paper Award at the 31st USENIX Security Symposium.

■ **JOHN HORTY**, professor of philosophy and affiliate professor in UMIACS and the Department of Computer Science, was awarded a Humboldt Research Award by the Alexander von Humboldt Foundation of Germany.

■ **LIANGBING HU**, director of the Center for

Materials Innovation and professor of materials science and engineering, was among the winners of R&D 100 Awards from *R&D World* magazine. In addition, Hu joined eight current and former UMD engineering researchers named 2021 Highly Cited Researchers by Clarivate: **YIFEI MO, CHRISTOPHER MONROE, MICHAEL PECHT, CHUNSHENG WANG, CHAOJI CHEN, JI CHEN, JIAQI DAI** and **YONGGANG YAO**.

■ Minta Martin Professor of Engineering and MPower Professor **CHRISTOPHER M. JEWELL** was named an associate editor of *Nature Portfolio* journal *Regenerative Medicine*.

■ Computer science Professor **JONATHAN KATZ** was named a fellow by the Association for

Computing Machinery.

■ **ALIREZA KHALIGH**, professor of electrical and computer engineering with a dual appointment in the Institute for Systems Research, received the Institute of Electrical and Electronics Engineers Power Electronic Society Vehicle and Transportation Systems Achievement Award.

■ **DONALD KETTL**, professor emeritus and former dean of the School of Public Policy, received the American Society for Public Administration's Dwight Waldo Award.

■ A team of urban designers, including architecture Lecturer **MARQUES KING**, received a Charter Award from the Congress for the New Urbanism in the Neighborhood, District and Corridor Category.

■ **AMNA KIRMANI**, the Ralph J. Tyser Professor of Marketing, was named a fellow of the Society for Consumer Psychology.

■ **TIMOTHY KOETH**, an assistant professor in the Department of Materials Science and Engineering and former director of the Maryland Radiation Facilities, received the Defense Advanced Research Projects Agency Young Faculty Award.

■ The American Psychological Association appointed **WILLIAM MING LIU**, professor and chair of the Department of Counseling, Higher Education, and Special Education, editor of the *Journal of Counseling Psychology*. He also received the Janet E. Helms Award for Mentoring and Scholarship.

■ **LAURIE LOCASCIO**, former vice president for research for both UMD and the University of Maryland, Baltimore, was confirmed by the U.S. Senate to serve as director of the National Institute of Standards and Technology.

■ **RAFAEL LORENTE**, associate dean for academic affairs at the Philip Merrill College of Journalism, was appointed to the Accrediting Council on Education in Journalism and Mass Communications Accrediting Committee.

■ **BORIS D. LUSHNIAK**, dean of the School of Public Health, was appointed to serve on the board of directors for the National Fitness Foundation, the official charity of the President's Council on Sports, Fitness and Nutrition.

■ **PAT MCNAMEE**, a lecturer in accounting and information assurance, was appointed to the Federal Accounting Standards Advisory Board for a second five-year term.

■ Astronomy Professor **RICHARD MUSHOTZKY** was awarded the American Astronomical Society's Henry Norris Russell Lectureship.

■ **CATHERINE NAKALEMBE**, an assistant professor in the Department of Geographical Sciences, was awarded the



Economist, Geologist and Engineer Named to National Academy of Sciences

THE NATIONAL ACADEMY of Sciences in May elected three Distinguished University Professors from UMD to its 2022 class of 120 members and 30 international members in recognition of their exceptional and continuing achievements in original research.

KATHARINE ABRAHAM of the Department of Economics and the Joint Program in Survey Methodology focuses on topics including the contingent workforce, work and retirement decisions of older Americans, labor market adjustment over the business cycle, unemployment and job vacancies, and the measurement of economic activity.

Abraham is a member of the American Academy of Arts and Sciences, a distinguished fellow of the American Economic Association, and an elected fellow of the American Statistical Association and the Society of Labor Economists. She is a past president of the Society of Labor Economists and current chair of the Conference on Research in Income and Wealth. She also serves as an adviser to the Congressional Budget Office, the Federal Reserve Bank of Chicago and the Bureau of Economic Analysis.

EDWARD OTT of the Department of Electrical and Computer Engineering and the Department of Physics has spent his career

conducting research in areas including the basic theory and applications of nonlinear dynamics, wave chaos, control of chaos, fractal basin boundaries, dynamics of large, interconnected networks, chaotic dynamics of fluids, models of brain dynamics and learning, and weather prediction.

Ott was nominated as a foreign member of the Academia Europaea in 2020 and is a fellow of the IEEE, American Physical Society, Society for Industrial and Applied Mathematics and World Innovation Foundation.

RICHARD J. WALKER of the Department of Geology focuses on the origin and evolution of early solar system materials and the geochemical evolution of the Earth. His primary research focus is the study of siderophile, or "iron-loving" elements, which are largely concentrated in planetary cores. He has published more than 200 articles and book chapters, and he has advised and mentored dozens of undergraduate, graduate and postdoctoral students, and junior faculty members.

Walker is a member the American Academy of Arts and Sciences and is a fellow of the Geochemical Society, European Association of Geochemistry and the American Geophysical Union. He was awarded the Geochemical Society Clarke Medal in 1990.—**LO, AR**

Engineering Professors Named to National Academy of Inventors

TWO UNIVERSITY OF MARYLAND researchers in December were named to the National Academy of Inventors' Class of 2022 fellows, joining the ranks of some of the nation's most prestigious and creative academic inventors.

ERIC WACHSMAN, a Distinguished University Professor and director of the Maryland Energy Innovation Institute, is a pioneer in advanced ceramic materials and structures. His inventions include record-high-power-density solid oxide fuel cells, catalytic membrane reactors that convert natural gas to marketable chemicals with no greenhouse gas emissions, and solid-state sensors that can selectively measure levels of harmful pollutants in combustion exhaust.



JI-CHENG "JC" ZHAO, a Minta Martin Professor and chair of the Department of Materials Science and Engineering, is a pioneer in the development of accelerated methodologies for discovery and rapid screening of materials. He is an inventor on 49 U.S. patents, most of which cover new alloys and processes; one alloy he co-invented is widely used in General Electric's electricity-generation gas turbines.



Groundbreakers

Golden Jubilee Medal, Uganda's highest civilian award.

■ **ROCHELLE NEWMAN**, chair of the Department of Hearing and Speech Sciences, was named a fellow of the Acoustical Society of America.

■ School psychology Associate Professor **COLLEEN O'NEAL** received the Shapiro Mid-Career Award.

■ Distinguished University Professor of entomology **MARGARET PALMER** was awarded honorary membership in the British Ecological Society.

■ Communication Professor **TREVOR PARRY-GILES** and Associate Professor of Japanese **LINDSAY YOTSUKURA** were named community fellows with the Humane Metrics in the Humanities and Social Sciences initiative.

■ The Aspen Institute named several UMD faculty and staff to its inaugural class of impact fellows: **PATTY PERILLO**, vice president for student affairs; **RAMSEY JABAJI**, director, Office of Global Engineering Leadership; **DARREN PIERRE**, global leadership lecturer; **COURTNEY HOLDER**, assistant director, leadership and community

service-learning; and **MELISSA ROCCO**, lecturer, College of Education.

■ **MIHAI POP**, a professor of computer science and director of UMIACS, was named a fellow of the International Society for Computational Biology.

■ A multinational team of journalists that included **DANA PRIEST**, the Knight Chair in Public Affairs Journalism, won a George Polk Award in Technology Reporting for "The Pegasus Project," an investigation of how spyware was exploited by authoritarian governments.

■ **KAREN RANE**, director of the Plant Diagnostic Laboratory, received a lifetime achievement award from the National Plant Diagnostic Network.

■ Sociology Professor **RASHAWN RAY** received the Mani L. Bhaumik Award for Public Engagement with Science from the American Association for the Advancement of Science.

■ Senior Vice President and Provost and education Professor **JENNIFER KING RICE** and education Professor Peter Afflerbach were honored as fellows by the American Educational Research Association.

■ **JENNIFER ROBERTS**, associate professor of kinesiology, was appointed an executive council member for the National Academies of Science, Engineering, and Medicine's Strategy Group on COVID-19 and Ecosystem Services in the Built Environment.

■ Finance Professor **CLIFFORD ROSSI** was selected by the Food and Drug Administration to serve on its Pharmaceutical Science and Clinical Pharmacology Advisory Committee.

■ **KEVIN M. ROY**, professor of family science, was elected member at-large of the National Council on Family Relations Board of Directors.

■ **HANAN SAMET**, a Distinguished University Professor of computer science with an appointment in UMIACS, received the Solid Modeling Association's Bézier Award.

■ **RACHELLE SAMPSON**, associate professor of logistics, business and public policy, received the inaugural Panmure House Prize, administered by the Edinburgh Business School at Heriot-Watt University in partnership with FCLTGlobal.

■ **LEMMA W. SENBET**, William E. Mayer Chair Professor of Finance, was inducted as a fellow of the Academy of International Business. He also received the Ethiopian Crown's Victory of Adwa Medal for his contributions to his native country.

■ **PUNEET SRIVASTAVA**, professor and associate dean for research and associate director of the Maryland Agricultural Experiment Station, received the 2022 Best Technical Paper Award from *The Journal of Hydrologic Engineering*.

■ **DEVON PAYNE-STURGES**, an associate professor with the Maryland Institute for Applied Environmental Health, was recognized for publishing one of the year's top papers in the journal *Environmental Health Perspectives*.

■ Distinguished University Professor of Mathematics **EITAN TADMOR** received the AMS-SIAM Norbert Wiener Prize in Applied Mathematics and delivered the Gibbs Lecture at the joint math meeting of the American Mathematical Society.

■ Chemistry and Biochemistry Professor **YUHUANG WANG** was named a fellow of the American Physical Society.

■ Family science Principal Lecturer **KERRY WEIL TRIPP** was recognized with the Cognella Innovation in Teaching Award for Family Science.

■ Aerospace engineering Minta Martin Professor **NORMAN WERELEY** was named a Royal Aeronautical Society fellow.

■ **SACOBY M. WILSON**, professor of applied environmental health in the School of Public Health, was presented with the David P. Rall Award for Advocacy in Public Health by the American Public Health Association; he also received the Dr. Robert Bullard Environmental Justice Award.

■ The American Society of Criminology elected Professor **MIN XIE** of the Department of Criminology and Criminal Justice to its executive board for 2023-24. She serves as an executive counselor for the organization.

■ **JC ZHAO**, Minta Martin Professor of Engineering and chair of the Department of Materials Science and Engineering, was named a fellow of the Minerals, Metals and Materials Society.

Bookshelf

Books Written by UMD Faculty in 2022



THE DISTRIBUTIVE POLITICS OF ENVIRONMENTAL PROTECTION IN LATIN AMERICA AND THE CARIBBEAN

Isabella Alcañiz, associate professor of government and politics, and Ricardo A. Gutiérrez

This volume seeks to address the lack of a comprehensive research agenda in Latin American and Caribbean environmental politics and helps integrate the existing, disparate literatures.

CAMBRIDGE UNIVERSITY PRESS

ENGINEERING FOR SOCIAL CHANGE REVISITED

Davinder K. Anand, professor emeritus; **Dylan A. Hazelwood**, assistant director; **Michael G. Pecht**, Distinguished University Professor; **Vincent P. Nguyen**, senior lecturer; and **Sami Ainane**, senior lecturer, all of mechanical engineering

This book examines how virtual reality, artificial intelligence, bionics, the Internet of Things and other technologies are changing the way society interacts.

CALCE EPSC PRESS

A PRACTICAL INTRODUCTION TO BEAM PHYSICS AND PARTICLE ACCELERATORS

Santiago Bernal, associate research scientist, Institute for Research in Electronics and Applied Physics

This book provides a brief exposition of the principles of beam physics and particle accelerators with an emphasis on numerical examples employing readily available computing tools.

IP PUBLISHING

RIDING TO ARMS: A HISTORY OF HORSEMANSHIP AND MOUNTED WARFARE

Charles Caramello, professor emeritus of English

Caramello examines the evolution of horsemanship and its relationship to the evolution of mounted warfare over four centuries.

UNIVERSITY PRESS OF KENTUCKY

CITY OF INCURABLE WOMEN

Maud Casey, professor of English

In a fusion of the factual and fictional, 19th-century

women institutionalized as hysterics reveal what history ignored.

BELLEVUE LITERARY PRESS

SUPPLY CHAIN SCHEDULING

Zhi-Long Chen, Orkand Corporation Professor of Management Science, and Nicholas H. Hall

The book covers applications, solution algorithms for solving related problems, evaluation of supply chain conflicts and models for encouraging cooperation between decision makers.

SPRINGER

BAD HUMOR: RACE AND RELIGIOUS ESSENTIALISM IN EARLY MODERN ENGLAND

Kimberly Anne Coles, professor of English and of women, gender and sexuality studies



Coles charts how concerns of lineage, religion and nation converged around a pseudoscientific system that confirmed the absolute difference between Protestants and Catholics, guaranteed the noble quality of English blood and justified English colonial domination.

UNIVERSITY OF PENNSYLVANIA PRESS

GREEN STORMWATER INFRASTRUCTURE FUNDAMENTALS AND DESIGN

Allen P. Davis, Charles A. Irish Sr. Chair in civil engineering, William F. Hunt and Robert G. Traver

This book brings into focus resilient measures for the reduction of stormwater flows and associated pollutants that can harm local environmental and ecological systems.

WILEY

NONPROFIT NEIGHBORHOODS: AN URBAN HISTORY OF INEQUALITY AND THE AMERICAN STATE

Claire Dunning, assistant professor of public policy

Dunning explores how federal policy changes and local social movements together shook up the organizational landscape of urban neighborhoods and the practice of urban governance.

UNIVERSITY OF CHICAGO PRESS

BLACK PATIENCE: PERFORMANCE, CIVIL RIGHTS, AND THE UNFINISHED PROJECT OF EMANCIPATION

Julius B. Fleming Jr., associate professor of English



Fleming argues that, during the civil rights movement, Black artists and activists used theater to energize this radical refusal to wait.

NYU PRESS

PLATONIC: HOW THE SCIENCE OF ATTACHMENT CAN HELP YOU MAKE-AND KEEP-FRIENDS

Marisa G. Franco, assistant clinical professor of psychology

The *New York Times* bestseller unpacks the latest, often counterintuitive findings about the bonds between us—like why your friends don't text back and the myth of friendships happening organically.

G.P. PUTNAM'S SONS

Groundbreakers

ARE WE EVER OUR OWN

Gabrielle Lucille Fuentes, assistant professor of English



Winner of the BOA Short Fiction Prize, this collection moves between Cuba and the U.S., with stories tracing the paths of the women of the far-flung Armando Castell family.

BOA EDITIONS LTD.

THE MULTIMODAL PERFORMANCE OF CONVERSATIONAL HUMOR

Elisa Gironzetti, assistant professor of Spanish applied linguistics

This volume is the first monograph exploring the functions of visual cues in humor, advocating for the development of a non-linguocentric theory of humor performance.

JOHN BENJAMINS PUBLISHING CO.

THE TECHNOLOGICAL MANIPULATION OF HUMANITY

Dylan A. Hazelwood, assistant director, Center for Engineering Concepts Development

Hazelwood argues we must change the mindset of those who will create future technologies to head off intentional misuse and unwanted consequences.

CALCE EPSC PRESS

ENGAGING COMMUNITIES THROUGH ISSUES FORUMS: A HOW-TO GUIDE FOR ONSITE AND ONLINE COMMUNITY ENGAGEMENT

Jesse M. Ketterman Jr., University of Maryland Extension educator, and **Bonnie Braun**, professor emerita of family science.

The publication explores the use of forums as a community engagement tool in university extension work.

EXTENSION FOUNDATION

ISRAEL'S MOMENT: INTERNATIONAL SUPPORT FOR AND OPPOSITION TO ESTABLISHING THE JEWISH STATE, 1945-1949

Jeffrey Herf, professor of history

Drawing on new research in public and private archives, Herf exposes how a Jewish state was forged in the shadow of World War II and the Holocaust.

CAMBRIDGE UNIVERSITY PRESS

DRAWN TO DESIGN: ANALYZING

ARCHITECTURE THROUGH FREEHAND DRAWING - EXPANDED AND UPDATED EDITION

Eric Jenkins, architecture lecturer

The book is a guide for students and teachers to understand the need for, the role of, and the methods and techniques of freehand analytical sketching in architecture.

BIRKHAUSER

THE LAST SAMURAI REREAD

Lee Konstantinou, associate professor of English

Konstantinou combines a riveting reading of Helen DeWitt's famed novel "The Last Samurai" with a behind-the-scenes look at her fraught experiences with corporate publishing.

COLUMBIA UNIVERSITY PRESS

STRUCTURE: CONCEPTS, CONSEQUENCES, INTERACTIONS

Howard Lasnik, Distinguished University Professor of linguistics, and **Juan Uriagereka**, professor of linguistics

The authors reconstruct the history of arguments



over sentence scaffolding, covering larger issues that range from the traditional computational notion of structure and how far down into words it reaches to whether its variants can arise from non-generative systems.

MIT PRESS

THE WORLD FOOD PROBLEM: TOWARD UNDERSTANDING AND ENDING UNDERNUTRITION IN THE DEVELOPING WORLD

Howard D. Leathers, associate professor emeritus of agricultural and resource economics, and **Kenneth L. Leonard**, professor of agricultural and resource economics

Updated information and new case studies in this sixth edition reflect the latest research, new policy directions and the significant impact of the COVID-19 pandemic on agriculture, poverty and hunger.

LYNNE REINNER PUBLISHERS

GREEN LIGHT ETHICS: A THEORY OF PERMISSIVE CONSENT AND ITS MORAL METAPHYSICS

Hallie Liberto, associate professor of philosophy

Liberto explores permissive consent, developing a novel theory that explains the moral features of consent in some of the most central domains of human

life, and also providing a study in how to theorize normative power.

OXFORD UNIVERSITY PRESS

ENGINEERING STATISTICS: AN INTRODUCTION

Edward B. Magrab, professor emeritus of mechanical engineering

This book emphasizes topics and concepts that a practicing engineer is mostly likely to use: the display of data, confidence intervals, hypothesis testing, fitting straight lines to data and designing experiments to find the impact of process changes.

SPRINGER

GRAVITATIONAL WAVES IN PHYSICS AND ASTROPHYSICS

M. Coleman Miller, professor of astronomy, and **Nicolas Yunes**

Aimed at advanced undergraduates and graduate students, this book introduces gravitational waves and applications to cosmology, nuclear physics, astrophysics and theoretical physics.

IOP PUBLISHING LTD.

PSYCHOLOGY AND THE SOCIAL CLASS WORLDVIEW: A NARRATIVE-BASED INTRODUCTION

Anne E. Noonan, professor of psychology, and **William**

Faculty Q+A

PSYCHE A. WILLIAMS-FORSON

No Appetite for Racist Stereotypes

Professor's Book Chews Over the Consequences of Food Shaming

FOR BLACK AMERICANS, the simple act of eating can be fraught. Gathering for a barbecue in a public park can lead to run-ins with the police. Dining on traditional dishes, developed through ingenuity and necessity out of generations of slavery and poverty, can lead to racist ridicule. In her 2022 book, "Eating While Black: Food Shaming and Race in America," American studies Professor Psyche A. Williams-Forsen breaks down how unfair scrutiny of what Black Americans eat keeps society from addressing systemic inequities. —KS

Why did you want to write this book?

Shaming Black people for what and where they eat is not new. It began during enslavement; the ways farms and plantations were set up were about surveilling Black bodies. And it's moved straight into the contemporary moment. People feel they've been given permission to overcorrect Black people's lives, from music to clothing to language to food, because these things go against the grain of whiteness and "correctness."

We all need to eat, so it's easy to dismiss the unseen power dynamics around food. But if we are going to have conversations about people's freedoms, we need to talk about food.

What's an example of how Black Americans are food-shamed?

My book opens with the D.C. Metro worker who was eating on the train



in uniform, when a woman took her picture and blasted it on social media. The employee was literally going from one part of her job to the next, trying to fit in a meal. She knew Metro was no longer issuing fines for eating so she did so. Then she has her life exposed.

What are some food misconceptions that you address?

People like to criticize fast-food restaurants, but they are major gathering hubs for the elderly and other people who are alone. Farmers markets aren't utopias. If you don't set up in Black neighborhoods, offer food that's culturally relevant and accept Black vendors, people won't feel welcome. Also, dollar stores can be important sources of food. If you're on a fixed income, and you can go in and buy 20 items with \$20, that can make a difference in people's lives.

How can the conversation about Black food culture be harmful?

We hear a lot about Black people and their diets, and how they're unhealthy and obese because of soul food—but you can't blame ill health squarely on food. Look at "the stroke belt," which stretches across the South. These are states with repressive policies and laws. There's a lot of wage inequality, people who are unhoused, people who are unemployed. Society wants food to do the heavy lifting because it takes our focus away from systemic inequalities that keep people mired in oppression, which contributes to psychological and physical disease.

Ming Liu, professor of counseling psychology

This textbook explores the complex topic of social class, explaining the many psychological nuances of class and classism in people's lives as subjective and phenomenological experiences.

ROUTLEDGE

HUMAN-CENTERED AI

Ben Schneiderman, professor emeritus of computer science



Eschewing doomsday scenarios and blind optimism alike, Schneiderman offers a realistic vision of how artificial intelligence can enhance human life.

OXFORD UNIVERSITY PRESS

CITIZENS OF THE WORLD: POLITICAL ENGAGEMENT AND POLICY ATTITUDES OF MILLENNIALS ACROSS THE GLOBE

Stella M. Rouse, Richard N. Engstrom and **Michael J. Hanmer**, professors of government and politics, and Jared McDonald

Three UMD researchers and an alum argue that

millennials have a distinct generational identity that makes them more similar to their counterparts across the globe than older adults within their own countries.

OXFORD UNIVERSITY PRESS

SYSTEM SUSTAINMENT: ACQUISITION AND ENGINEERING PROCESSES FOR THE SUSTAINMENT OF CRITICAL AND LEGACY SYSTEMS

Peter Sandborn, Keystone Professor of mechanical engineering; and **William Lucyshyn**, research professor of public policy

This book is a mix of engineering, operations research, and policy sciences intended to thoroughly explain the concepts of sustainability and sustainable product life-cycles, and the importance of sustaining critical systems.

WORLD SCIENTIFIC

RAPE IN PERIOD DRAMA TELEVISION: CONSENT, MYTH, AND FANTASY

Julie Taddeo, research professor of history, and Katherine Byrne

The authors set out to explore the assumptions and beliefs that TV audiences continue to hold about rape, rapists and victims.

LEXINGTON BOOKS

COMMUNISM AND CULTURE: AN INTRODUCTION

Vladimir Tismaneanu, professor of government and politics; and Radu Stern

This book examines the interplay between utopian goals and cultural practices in fields such as literature, visual arts, film and humanities in general.

PALGRAVE MACMILLAN

MAKING ITALY ANGLICAN: WHY THE BOOK OF COMMON PRAYER WAS TRANSLATED INTO ITALIAN

Stefano Villani, professor of history

Villani shows how Italy, as the heart of Roman Catholicism, was over a long period of time the very center of the global ambitions of the Church of England.

OXFORD UNIVERSITY PRESS

TECHNO-MAGISM: MEDIA, MEDIATION, AND THE CUT OF ROMANTICISM

Orrin N.C. Wang, professor of English and comparative literature

Wang explores the continuity between the social character of Romantic and post-Romantic media, in terms of commodity culture, revolution and the ecological devastation of the anthropocene.

FORDHAM UNIVERSITY PRESS

THE INSIDER: HOW THE KIPLINGER NEWSLETTER BRIDGED WASHINGTON AND WALL STREET

Rob Wells, associate professor of journalism

"The Insider" chronicles how Willard M. Kiplinger not only developed a widely read newsletter that launched a business publishing empire but also forged a new role for the journalist as a political actor.

UNIVERSITY OF MASSACHUSETTS PRESS

QUANTUM STEAMPUNK: THE PHYSICS OF YESTERDAY'S TOMORROW

Nicole Yunger Halpern, adjunct assistant professor of physics in the Institute for Advanced Computer Studies



Mixing fiction and accessible science writing, Yunger Halpern pairs futuristic technologies with Victorian sensibilities in an overview of quantum physics.

JOHNS HOPKINS UNIVERSITY PRESS

CONSUMING LANDSCAPES: WHAT WE SEE WHEN WE DRIVE AND WHY IT MATTERS

Thomas Zeller, associate professor of history

Zeller explores how what we see while driving reflects how we view our societies and ourselves, the role that consumerism plays in our infrastructure, and ideas about reshaping the environment in the 20th century.

JOHNS HOPKINS UNIVERSITY PRESS



Space Terrapin

In Fall 1956, Maryland researchers and graduate students strong-armed a nearly 15-foot-long, 220-pound rocket into launch position at Wallops Island, Va. Built with U.S. Department of Defense funding, the solid-fuel, two-stage Terrapin rocket would blast past the boundary of space and carry an 8-pound test payload to an altitude of about 80 miles before falling into the ocean—helping to prove the ability of small, cheap, civilian rockets. The next year, the Soviet Union's launch of its Sputnik satellite set off the space race, with Maryland engineers and astronomers playing central roles in the United States' military and civilian space programs ever since. And seven decades later, the student-run Terrapin Rockets organization still propels graduates into aerospace careers.

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