Harvesting Hope From the Trees

From urban forest canopies to underground carbon vaults, UMD researchers are creatively fighting climate change.
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 mounting number 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.

To Terps! 

Gregory F. Ball
Vice President for Research
Rising to the Challenges: UMD Awards $30M to Spur Solutions

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

The University of Maryland has announced the awarding of $30 million to support faculty and researchers across disciplines with projects spanning every college and school, in the power of science and scholarship, 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-resistant crop management and warning of extreme weather, says team member Professor Tatiana Loboda, chair of the Department of Geographical Sciences.

**SUSTAINABLE EARTH**

**ADDRESSING CLIMATE CHANGE FOR A SUSTAINABLE EARTH**

Charles Draper, President and Provost Jennifer King Rice. Intractable social inequities.

**MILE**

**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.

**GLOBAL TERTIARY 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 TERTIARY Alliance, led by Amy Sapokta—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 inequitably 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, Sapokta says.

**URGING TEMPERATURES and rising seas. Droughts, famines and poverty. Insurmountable 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, guided 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 $5 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 changed 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 Darryl J. Pines.

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

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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 Matina, assistant professor, atmospheric and oceanic science
PROGRAMMABLE DESIGN OF SUSTAINABLE, ALL-NATURAL PLASTIC SUBSTITUTE
PI: Pe-Yun Chen, assistant professor, chemical and biomolecular engineering
RENOVATION OF METHANE, WATER, AND HEAT WASTE
PI: Daniel Latrille, professor, physics
WATER EMERGENCY TEAM
Leadership team: Rachel Gotelston, assistant professor, Maryland Institute for Applied Environmental Health (MIAEH); Marcus Hendriks, associate professor, urban studies and planning, director of the SIRLab
OBSERVING WILDLIFE THROUGH Drones AND FIRE IMAGING: TECHNOLOGIES
PI: Fernando Raffan-Montoya, assistant professor, fire protection engineering
GLOBAL HEALTH
ENCOUNTERS: A UNIVERSITY-COMMUNITY PARTNERSHIP TO MITIGATE THE MENTAL HEALTH CRISIS FOR LATINO Immigrant YOUTH
Leadership team: Amy Lewis, associate professor, family sciences; Sophia Rodrigues, 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: Blanca Muray, assistant research professor and graduate director, MAEH
PI: Lena Malajji, assistant research professor, MAEH
MODELING THE EVOLUTION OF AVIAN INFLUENZA VIRUSES
PI: Andrea 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: Jeannette Solder, assistant research professor, sociology; adjunct professor, Robert H. Smith School of Business
FOSTERING INCLUSIVITY THROUGH TECHNOLOGY (FIT)
PI: Yi Ting Huang, assistant professor, hearing and speech sciences
MUSIC EDUCATION FOR ALL THROUGH PERSONALIZED AI
PI: Jina Moresanu, associate professor, violin, strings
RACIAL AND SOCIAL JUSTICE RESEARCH-PRACTICE PARTNERSHIP COLLABORATIVE
PI: Christine Nemensky, senior research fellow, College of Education
SEIZING OPPORTUNITIES: SOCIAL CAPITAL, BUSINESSES, AND COMMUNITIES
PI: Woljic (Max) Makotomivic, William A. Lombrana 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

Impact Awards
The problem-solving innovations 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 Moresanu 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 Lazer, 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.

MICROBIOLOGY SCIENCES
Led by Mikhail Posp, professor of computer science and director of UMD’s Institute for Advanced Computer Studies (IIMACS), 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 microorganisms 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
The initiative led by Hal Daumé III, 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.

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 program website: research.umd.edu/gc.
Frontiers

Vision and Impact

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

O ne 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 keystone instrument for exploring the universe ever launched into space.

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 eventful translation of Webb telescope discoveries to the public.

“We’ve been waiting so long it feels almost surreal,” says astronomy Associate Professor Elin 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 involved in operations, mission planning and eventful translation of Webb telescope discoveries to the public.

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 that threaten Earth.

In a White House summit last summer, Dr. Anthony Fauci, 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, Trancmosmos, 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.”

“To think this has to do with needing an approach that can stop transmission.”

Nasal Battle

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

GETTING THAT JAB—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’s most recent 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.”

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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 test study to assess the impact of a nationwide SAT 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’ shift to test-optional admissions 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, Pennsylvania State University and Southern Methodist University. “There also needs to be more research on how inequality affects other parts of the college application.”

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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—AE

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 illnesses and enable the development of sound public health policies. 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—BO

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 a $433,000 awarded by the National Science Foundation in August 2021, two University of Maryland researchers are honing 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 Nicholas Elman, 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 "iCone", which creates an audio version of a map to allow a user to hear various pitches that correspond to data points, and is working with the Maryland Department of Education to create a computer science data course for blind high school students—ME

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

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

FEW MONTHS AFTER COVID-19 struck the United States, public health Associate Professor Devin 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 of actions to protect migrants’ and seasonal workers’ health.

"Part of the team’s efforts—with fieldwork starting this spring—to better understand health care, and they don’t have sick leave. These are policy decisions made on purpose that are creating vulnerabilities.”

The project will focus on environmental health, including air quality and infectious disease testing; system engagement with farm owners and managers 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—AE

Frameworks for Reducing Emissions 50-52% from 2005 Levels

In the United States, the Biden administration is working on a pathway for the nation to reach net-zero carbon emissions by 2050. The federal government is also strengthening its commitment to the Paris Agreement, which calls for global greenhouse gas emissions to peak between 2030 and 2035.

The report, released by the United Nations Climate Change Conference in Egypt in November 2022, found that the United States can meet its 2030 climate target but that much more work is needed to achieve the net-zero goal by 2050.

The report recommendations include:

- A buy clean industrial facility standard
- Advancing methane leak recovery and climate-smart agriculture
- Setting “buy clean” industrial facility standards.

The report also underscores the importance of reducing emissions from sectors such as power, transportation and buildings.

The report is the latest in a series of studies that have helped to shape federal climate policy in recent years, including the Paris Agreement and the Inflation Reduction Act of 2022.

The report is co-authored by Alicia Zhao, CGS research manager and lead author of the report. Zhao, a graduate student in Geography and Geophysical Science, worked with her advisor, Michael Bloomberg, to develop a methodology for quantifying the greenhouse gas emissions from specific sectors.

The report also includes contributions from experts in fields such as economics, policy and technology, including Michael Bloomberg, an advocate for the Paris Agreement and a leading voice in the global climate change community.

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 from the National Science Foundation in Washington, after almost four years of trips to the Arctic.

“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’re exhibiting 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 for sustainability research, parents can worry less about their child brain development and memory, and Spencer, an expert on cognition and sleep, “the brain matures, it can either fight sleep based on how full their bucket is,” Riggs 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.”

Keener’s hypothesis was born out of previous research findings from Riggs, 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.

Crab Shell-Based Battery Gets Cracking for Sustainability
Engineers’ Biodegradable Electrolyte Could Shrink EV Pollution Burden

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 Longping 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.

The zinc and chitosan battery has an energy efficiency of 99.7% after 1,000 battery cycles, 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.

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 Riggs, 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 down-regulating 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,” Riggs 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 Riggs, 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.
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.

“Abreast of quantum research and development to the national security, the department announced some of the toughest challenges society is facing today—and prepare for the challenges that have emerged over the last two years, including five on or near the UMD campus.”

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.

The project will draw on expertise 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, five on or near the UMD campus.

“Grant funds, says National Center for Smart Growth Director Gerrit Knaap, will additionally support coursework for UMD students and faculty that promotes social infrastructure to connect neighborhoods to the corridor.”

“Although male managers’ competitiveness generally remained static, they became 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. “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.”

Although male managers’ competitiveness generally remained static, they became more competitive for male protégés, based on 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.”

$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.

“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.”

“While research shows that men generally come to work with a more competitive mindset than women, female managers equally stepped up when advocating for direct reports, University of Maryland research found. "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 whether they’re advocating for a man or a woman.""
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 harvest 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 gunsboats, 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 to monitor crops, but with underwater robots, 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 tributary, Yu’s robot—a mechanical engineer namedweather-trackingspathe 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 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, 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 revitalize 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. —CO
Multi-Institutional Effort to Advance Medical Innovations, Build Regulatory Framework for Extended Reality in Medicine

**Health Care’s Vision of Tomorrow**

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

**U**ltrasonic 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 $80 million from the National Science Foundation (NSF) and technology giants 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 Anindith 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 PI 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 Computing Studies.

Between industry partners, scientists, physicians and federal regulators, Varshney says, "the synergy in MIXR will be contagious."
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.

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

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.”

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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.”

Uprooting Racism in Urban Forests

BY CHRIS CARROLL  PORTRAITS BY JOHN T. CONSOLI

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BY CHRIS CARROLL  PORTRAITS BY JOHN T. CONSOLI
“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 CO\(_2\) 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.

“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 scouting 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.

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.”

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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.

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
To mark the second anniversary of Nana’s murder, dozens gathered outside the square brick building that houses East Knoxville’s JWU 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 turned to new cameras, bleeding again for help finding her still-unidentified killer. “If we don’t get justice in this life, we know that we will get justice in the next,” said Jacqueline 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 to create a straightforward approach to reducing a gray, oatmeal-textured sky.

“Knoxville is the first city to partner with Abt’s Center for the Study and Practice of Violence Reduction, or VRC. The mission is very simple. We want to save lives by stopping violence, using science.”

N. Thomas Abt
University of Maryland associate research professor
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 talk to 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 a 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.

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, where 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 as no’s 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 I. 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.”

Denzel Grant leads Turn Up Knox, a program to keep kids and adults from violence. Such organizations are critical to de-escalating volatile situations.

“We have become pretty good friends,” says Robinson, who quotes Abt’s 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 people work together. Afterward, those gathered released their balloons and watched them soar, far beyond the limits administrators once thought.

More of Turn Up Knox’s youth programming takes place at the YWCA. Much of Turn Up Knox’s youth programming takes place at the YWCA. Much of Turn Up Knox’s youth programming takes place at the YWCA.

Gran Totale Initiative to Reduce Gun Violence—

Other University of Maryland researchers are tackling the problem of gun violence with a variety of approaches. Joseph Richardson III, the 2nd and Kim Fuller Professor of African-American Studies and Anthropology, and Rod I. Brunson, interim criminology and criminal justice chair and professor, are pioneers in the field of violence reduction.

Their work is part of the 120 Initiative to Reduce Gun Violence—a DC-area coalition of higher education institutions founded by UMD President Darryl J. Fleming and George Mason University President Gregory Washington to focus research expertise on 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.
A MEDICAL SOCIOLOGIST who transformed understanding of the social determinants of health was elected in October 2022 to the National Academy of Medicine.

RUTH ENDO ZAMBRANA, a Distinguished University Professor in the Harriet Tubman Department of Women, Gender, and Sexuality Studies, was among 90 new 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 biomedical sciences.

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 on racial discrimination whose research and scholarship examine race, gender and sexuality across society and nationally. 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 2006, 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 physics at the University of Maryland and a member of the National Academy of Sciences, 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 has advised and mentored dozens of undergraduate, graduate and postdoctoral students, and junior faculty members.

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Groundbreakers

**ABRAHAM BIRNBAUM**, the Michael and Elise Joelson Professor of Physics and Astronomy and Professor of Earth System Science at the University of Maryland, was elected a fellow of the American Physical Society.

**ANGELA K. DURTA**, the Michael D. Sheps Chair in Strategy and Entrepreneurship, was named in the Thinkers50 list of global management thinkers.

**BARBARA HAGGH-HUGLO**, a member of the American Musicological Society, was named in the Thinkers50 list of global management thinkers.

**VIRGINIA HAUFER**, an associate professor of government and politics, and **DOUG RABIN**, an associate professor of materials science and engineering, received nomination for the Inventors Foundation's Invention Hall of Fame.

**CHRISTOPHER M. WANG**, an associate professor in the Department of Electrical and Computer Engineering, was named a fellow of the National Academy of Inventors.

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

**Laurie Logasci**, former U.S. representative 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. Lushnik**, dean of the School of Public Health, was appointed to the board of directors for the National Fitness Foundation, the official charity of the President’s Council on Sports, Fitness and Nutrition.

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

**RICHARD J. WALKER**, the Department of Geology focuses on the origin and evolution of early solar system materials and the geochronological 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.

**Walter** is a member of the American Academy of Arts and Sciences and is a fellow of the Geoscientific Society, European Association of Geoscientists and Engineers, and the American Geophysical Union.

**Barbara** was appointed to the Federal Reserve Bank of Chicago and the Bureau of Labor Statistics.

**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 advisor 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, dynamic of large, intercon- nected networks, chaotic dynamics of fluids, models of brain dynamics and learning, and weather prediction.

**OTI** 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**, the Department of Geology focuses on the origin and evolution of early solar system materials and the geochronological 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.

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Books Written by UMD Faculty in 2022

THE DISTRIBUTIVE POLITICS OF ENVIRONMENTAL PROTECTION IN LATIN AMERICA AND THE CARIBBEAN
Isabelita Alcántara, associate professor of government and politics, and Ricardo A. Gómez

This volume seeks to address the lack of research on the principles of beam physics and particle accelerators with an emphasis on numerical examples employing readily available computing tools.

RIDDING TO ARMS: A HISTORY OF ORDNANCE, HORSESHOES AND MOUNTED WARRIORS
Charlie Caramello, professor emeritus of English

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

A PRACTICAL INTRODUCTION TO BEAM PHYSICS AND PARTICLE ACCELERATORS
Settipe Rermal, 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.

ENGINEERING FOR SOCIAL CHANGE REVISED
Demetrios K. Avramidis, professor emeritus; Dylan A. Hazlett, senior researcher; Michael G. Puchta, distinguished university professor; Vincent P. Nguyen, senior lecturer; and Samir Alanis, senior lecturer, all of mechanical engineering

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A HISTORY OF THE MINISTRY OF DEFENCE
J.A. Pownall, professor of history

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.

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ARE WE EVERY 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.

THE MULTIMODAL PERFORMANCE OF CONVERSATIONAL HUMOR
Elisa Geronzetti, 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.

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

ARCHITECTURE THROUGH FREEHAND DRAWING - EXPANDED AND UPDATED EDITION
Eric Jenks, 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.

ENGAGING COMMUNITIES THROUGH ISSUES FORUM: A HOW-TO GUIDE FOR ONLINE AND OFFLINE COMMUNITY ENGAGEMENT
Jesse M. Ketterman Jr., assistant professor of English

Koslaurinov combines a riveting reading of Helen DeWitt’s famed novel “The Last Samurai” with a behind-the-scenes look at her fraught experiences in university extension work.

ISRAEL’S MOMENT: INTERNATIONAL SUPPORT 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.

THE LAST SAMURAI REREAD
Lee Konstantinou, associate professor of English

The authors reconstruct the history of arguments over sentence scaffoldling, 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-recursive systems.

THE WORLD FOOD PROBLEM: TOWARD UNDERSTANDING AND ENDING UNDERNUTRITION IN THE DEVELOPING WORLD
Howard D. Leathers, associate professor of agricultural and resource economics, and Kenneth A. 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.

GREEN LIGHT ETHICS: A THEORY OF PERMISSIVE CONSENT AND ITS MORAL METAPHYSICS
Halee Libert, assistant 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.

ENGINEERING STATISTICS: AN INTRODUCTION
Edward B. Hyegh, professor 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.

GRANULAR WAVES IN PHYSICS AND ASTRONOMY
H. Coleman Miller, professor of astronomy, and Norbert Yunes

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

No Appetite for Racist Stereotypes
Professor’s Book Chews Over the Consequences of Food Shaming

For BLACK AMERICANS, the single 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.

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 was heavy and plantations were set up to ensure Black bodies. And it’s moved straight into the contemporary moment. People feel they’ve been given permission to discriminate against Black people’s lives, from music to clothing to language to food, because those 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. And 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. A look at “the stroke belt,” which stretches across the South, are states with restrictive policies and laws. There’s a lot of wage inequality, people who are uninsured, people who are unemployed. Societies 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.
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.

SYSTEM SUSTAINMENT: ACQUISITION AND ENGINEERING PROCESSES FOR THE SUSTAINMENT OF CRITICAL AND LEGACY SYSTEMS
Peter Sanders, Keystone Professor of mechanical engineering, and William Lwowsky, 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 lifecycles, and the importance of sustaining critical systems.

RAPE IN PERIOD DRAMA
Julie Tedes, 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.

THE INSIDER: HOW THE KIPLINGER NEWSPAPER BRIDGED WASHINGTON AND MALL STREET
Rob Wells, associate professor of journalism
“The Insider” chronicles how Willard M. Kiplinger, a widely read newsletter that launched a business publishing empire, not only developed a new role for the journalist as a political actor.

QUANTUM STEAMPUNK: THE PHYSICS OF YESTERDAY’S TOMORROW
Nicole Yunger Halpern, professor of physics
Yunger Halpern pairs accessible science writing, quantum physics, and Victorian sensibilities in an overview of quantum physics.

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.

THE KIPLINGER PRIZE ANNUAL
Willard M. Kiplinger, research professor
The Kiplinger Prize Annual chronicles the political actor Willard M. Kiplinger’s role in launching a business publishing empire but also forged a new role for the journalist as a political actor.

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.

CITIZENS OF THE WORLD: POLITICAL ENGAGEMENT AND POLICY ATTITUDES OF MILLENNIALS ACROSS THE GLOBE
Stella M. Rouse, Richard N. Engeström and Michael J. Hamer, professors of government and politics, and Jared McDonald
Three UMD researchers and an alumn argue that millennials have a distinct generational identity that makes them more similar to their counterparts across the globe than with older adults within their own countries.

Space Terrapin
In Fall 1955, 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.
IMAGINE A CLIMATE OF HOPE

CLEAN POWER. REVIVED FORESTS. PLENTIFUL FOOD. Our more than 200 researchers and experts and robust partnerships with NASA, NOAA and other federal agencies are creating vital solutions for a global crisis. From using satellites to track forest loss and improve agriculture to developing tools to better predict extreme weather and natural disasters, we’re committed to saving the planet—and the turtles.

Investing in research to solve the climate crisis: Another way the University of Maryland is leading Fearlessly Forward.