



TO STUDY TRAUMATIC BRAIN INJURY, ASSOCIATE PROFESSOR HANEESH KESARI (LEFT) FITS POSTDOCTORAL RESEARCHER YANG WAN WITH A HIGH-TECH HELMET THAT CAPTURES RAW MOTION DATA FROM HEAD MOVEMENTS.

Fulfilling a Vision of Impact Through Research

By Debra Bradley Ruder '80

Researchers across the University are making discoveries and finding solutions to improve lives, support communities and confront societal problems.

Brown Professor of Neuroscience Stephanie Jones studies brain dynamics in health and illness, including Alzheimer's disease, a devastating neurological condition that affects over 7 million older Americans.

Jones's team recently identified a biomarker — a pattern of electrical brain activity — that could help predict which patients are most likely to develop Alzheimer's dementia. Their leading-edge research used a computational tool that Jones and Brown colleagues pioneered.

"The signal we've discovered can aid early detection," said Jones, who partnered with collaborators in Spain. "Being able to noninvasively observe a new early marker of Alzheimer's disease progression in the brain for the first time is a very exciting step."

Relieving suffering from dementia, as well as probing the complex biology of aging, is a major focus of study at Brown today. The University's Center for Alzheimer's Disease Research, part of Brown's Carney Institute for Brain Science, is working to accelerate cures by quickly moving findings from the laboratory to the clinic — and vice versa.

Research like this — with impact on the lives of patients, communities and society — takes place in diverse fields across Brown. Despite ongoing questions about the level of financial support the federal government will continue dedicating to such research nationally, the University is moving forward with efforts to fulfill a vision shared with the Brown community in 2022 to strengthen research across the humanities, social sciences, physical sciences and health and biological sciences.

"Brown continues to make significant advancements to strengthen research," President Christina H. Paxson said. She noted that Brown's research expenditures last year were \$309.5 million, an increase of \$16.4 million, or 5.6%, from the prior year. "We remain committed to growing the volume and impact of Brown's research."

This impact extends beyond the research itself to include the education and training of students as the next generation of scientists and scholars.

"Students play a vital role in the larger ecosystem of research and learning at Brown," said Greg Hirth, vice president for research. "Not only do they expand our research capacity through their own scholarly projects and their contributions to faculty research, their role as contributors to ongoing research ensures we are training future scientists and innovators who will shape our world."

Improving Medical Therapies

At the intersection of neuroscience and engineering, Brown scientists are pioneering technologies to help individuals lead fuller lives.

Associate Professor of Engineering David Borton and his lab are designing neurotechnology to enhance recovery after a spinal cord injury by stimulating nervous system tissue above and below the injury site. And the research group BrainGate, led by Dr. Leigh Hochberg, a professor of engineering and of brain science, is developing brain-computer interface technology to restore communication, mobility and independence for people with neurological challenges such as ALS, stroke and limb loss.

Meanwhile, Associate Professor of Engineering Haneesh Kesari is creating systems to better detect and prevent traumatic brain injury from military exercises, contact sports and other blows to the head. Kesari's lab has built innovative wearable devices that use accelerometers and sensors to capture raw motion data from a wearer's head (in experimental settings). Researchers can analyze that data to gauge damage from different levels of sustained force, down to the cellular level.

"We have Fitbits and other types of sport watches that monitor our body's health," Kesari said, "so the thought was, why not create a Fitbit-type device that does this for the brain's mechanical health?"

Other Brown investigators are dedicated to improving medical treatments for cancer, infectious diseases, addiction and other health challenges affecting communities around the globe.



AS PART OF THE BREATHE PROVIDENCE RESEARCH PROJECT, PROFESSOR MEREDITH HASTINGS (LEFT) AND STUDENTS USE AIR QUALITY MEASURING INSTRUMENTS ON THE ROOF OF THE JOHN D. ROCKEFELLER, JR. LIBRARY. THE PROJECT, LED BY HASTINGS, IS BASED AT THE INSTITUTE AT BROWN FOR ENVIRONMENT AND SOCIETY.

Dr. Jonathan Kurtis, a professor of pathology and laboratory medicine, leads field and lab studies to identify effective vaccine and drug candidates for the mosquito-borne tropical disease malaria, "the greatest single-agent killer of children on the planet." Kurtis and Brown colleagues are also searching for treatments against the tropical scourge schistosomiasis. Other researchers are pursuing studies that range from developing mobile health software to diagnose and treat dehydration from diarrheal diseases to designing materials to help wounds infected by bacteria heal more quickly.

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"We think this has the potential to be translated to the clinic," said Professor of Engineering Anita Shukla, about a "smart hydrogel" that releases antibiotic-loaded nanoparticles on demand and could be used for wound dressings. It holds promise for improving outcomes for military service members and others.

Unlocking RNA's Power

Dr. Vivian Cheung, a professor of molecular biology, cell biology and biochemistry, is on a different quest — to develop an RNA-based therapy for Alzheimer's. She is among many Brown scientists seeking to unlock the mysteries of human ribonucleic acid (RNA) to address an array of complex diseases.

"Most available treatments for Alzheimer's disease focus only on symptoms; my team is pursuing a different approach," noted Cheung, whose lab studies the genetic mechanisms of disease and plans to target a gene known to increase Alzheimer's risk. Cheung collaborates with colleagues in Brown's Giuliani RNA Center and Center for Alzheimer's Disease Research.

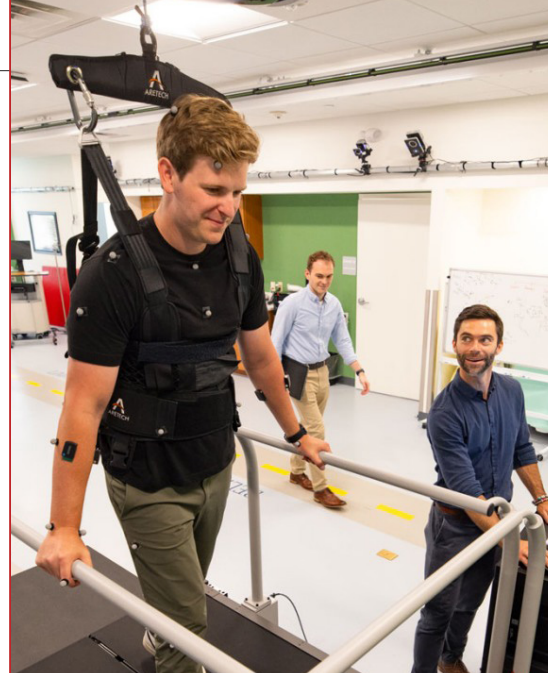
Vaccines created with RNA technology saved countless lives during the COVID-19 pandemic. These mRNA vaccines are more flexible and can be made faster than traditional vaccines, notes Professor of Epidemiology Jennifer Nuzzo, director of Brown's Pandemic Center. Based at the School of Public Health, the center provides high-quality data to help communities and policy makers handle health emergencies and prepare for future pandemics.

Brown epidemiology professor Brandon Marshall, meanwhile, trains his expertise on the opioid epidemic. His team is evaluating the nation's first state-sanctioned overdose prevention center, or OPC, which is located in Providence.

"Our primary goal is to determine how engaging with an OPC impacts the health and well-being of people who use drugs," Marshall said.

Climate Change and Communities

Community impact is also an important theme in Brown-led research on climate. Scholars in various academic fields — many affiliated with the Institute at Brown for Environment and



ASSOCIATE PROFESSOR DAVID BORTON (RIGHT) AND HIS LAB DEVELOPS AND DEPLOYS NEUROTECHNOLOGY TO UNDERSTAND AND ADDRESS CHALLENGES OF NEUROMOTOR DISEASES.

Society — are investigating how environmental change from our warming planet puts individuals and communities at risk. They also study environmental hazards on health, such as lead levels and PFAS "forever" chemicals.

Allan Just, an associate professor of public health and of environment and society, builds high-resolution heat maps to study how differences in air pollution, temperature and tree shade across U.S. neighborhoods affect human health. Across campus, Meredith Hastings, a professor of earth, environmental and planetary sciences with expertise in atmospheric chemistry, has led Breathe Providence, a community-focused project to measure air quality around the city.

"Being able to do this will help us understand the major drivers and causes of local air pollution, so that we can make real progress in improving air quality equitably," Hastings said.

Professor Elizabeth Fussell, a sociologist and demographer, examines how wildfires, hurricanes and weather-related disasters like Hurricane Katrina influence human migration patterns and the health and well-being of affected residents. And on a global scale, hydrologist and professor Laurence C. Smith and his team use cutting-edge remote sensing, computational modeling and field studies to measure environmental changes near the Arctic Circle, including meltwater runoff from

the Greenland Ice Sheet, a major contributor to global sea level rise.

On the policy side, the Climate Solutions Lab at Brown's Watson School of International and Public Affairs seeks to overcome barriers to confronting climate change. In a recent study, Jennifer Hadden, an associate professor of political science and international and public affairs, and her team analyzed data on proposed wind-power projects in developing countries and outlined ways to address local concerns.

"Community opposition to wind power can drive up costs for developers and stymie policymakers' efforts to reduce greenhouse gases," Hadden and her co-authors wrote.

Understanding Our World

Beyond the traditional focus on research in STEM fields, Brown scholars in the humanities and social sciences are expanding understanding about our world, past and present, informing solutions that shape the way we live.

Among them is Tricia Rose, a professor of Africana studies and director of Brown's Systemic Racism and Resilience Project. Her current work explores racism through close reading of 100-plus housing, education, health and other policies. Her recent book, *Metaracism: How Systemic Racism Devastates Black Lives — and*

How We Break Free, and educational website, *Way Outta No Way* (wayouttanoway.com), illuminate this complex topic.

Issues of equity and justice also are at the heart of *Stolen Relations*, a collaborative database created by researchers and librarians at Brown that recovers stories of Indigenous people enslaved in the Americas between 1492 and the 1900s. The digital archive (stolenrelations.org), which went public in May 2025, involved partnering with tribal leaders across the Northeast, along with staff and students at Brown.

"To surface this untold story of millions of individuals who were trafficked in and out for the entirety of U.S. history is important and powerful," said project founder Linford Fisher, an associate professor of history.

At the same time, Brown's expertise and leadership in digital humanities has generated new possibilities for educational enrichment and collaboration, including the use of new generative artificial intelligence and data tools for humanities-related research.

"Every day," President Paxson said, "Brown is building a legacy of impact through critical research that enhances human health, strengthens policy and communities, and advances science and technology to improve lives."



ELLIE PAVLICK (MIDDLE), AN ASSOCIATE PROFESSOR OF COMPUTER SCIENCE, IS LEADING A NEW BROWN-BASED RESEARCH INSTITUTE TO DEVELOP ADVANCED ARTIFICIAL INTELLIGENCE ASSISTANTS CAPABLE OF INTERACTING WITH HUMANS IN AREAS LIKE MENTAL AND BEHAVIORAL HEALTH.

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