

OFFICE OF THE SENIOR VICE CHANCELLOR FOR RESEARCH



CONVERGENCE



University of
Pittsburgh®

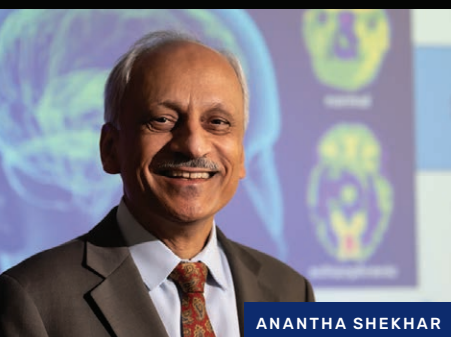
2022-23 ANNUAL REPORT

#3

PITT NUMBER THREE IN NIH FUNDING

The National Institutes of Health (NIH)—the nation’s medical research and development agency—has been a major supporter of academic medical scientists throughout the United States.

In 2023, the University of Pittsburgh was announced as the third-highest recipient of funding from the NIH, improving from a rank of 11th in the previous year. The \$675 million in NIH funding Pitt received puts it behind only Johns Hopkins University and the University of California, San Francisco.



ANANTHA SHEKHAR

Pitt’s School of Medicine is responsible for pulling in a substantial portion of these funds—78% of the grand total. “The last two years’ major increases are thanks to the innovation and dedication of our Pitt Medicine faculty and staff,” says Anantha Shekhar, Pitt’s senior vice chancellor for the health sciences and John and Gertrude Petersen Dean of the School of Medicine. “We’re further cementing our place among the top academic medical institutions in the country.”

In many ways, the rise in rankings can be attributed to the shape of the grants Pitt has been receiving from NIH. Pitt proposes—and wins—bigger, team-oriented awards. Grants of \$5-10 million have nearly doubled. Researchers at Pitt are doing more ... together.

PEER RANKS IN NIH FUNDING

RANK	ORGANIZATION	AWARD
1	Johns Hopkins University	\$839,852,301
2	University of California, San Francisco	\$823,760,533
3	University of Pittsburgh	\$675,447,236
4	Duke University	\$672,506,294
5	University of Pennsylvania	\$668,378,172
6	Stanford University	\$651,714,427
7	University of Michigan, Ann Arbor	\$644,315,349
8	Leidos Biomedical Research, Inc.	\$625,102,662
9	Washington University, St. Louis	\$620,587,925
10	Columbia University Health Sciences	\$616,772,648

University of Pittsburgh ranks third in NIH funding, placing it within a cohort of very prestigious institutions. The ranking list is compiled and announced by the Blue Ridge Institute for Medical Research. This ranking is based on the NIH funding report made available through the NIH RePORTER. The latest ranking available corresponds to Federal Fiscal Year 2022.

Source: Blue Ridge Institute for Medical Research (BRIMR)



From left:
CHANCELLOR JOAN GABEL
SENIOR VICE CHANCELLOR
FOR RESEARCH ROB A. RUTENBAR

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pittresearchannualreport.com



research.pitt.edu



twitter.com/pittresearch



linkedin.com/showcase/pitt-research

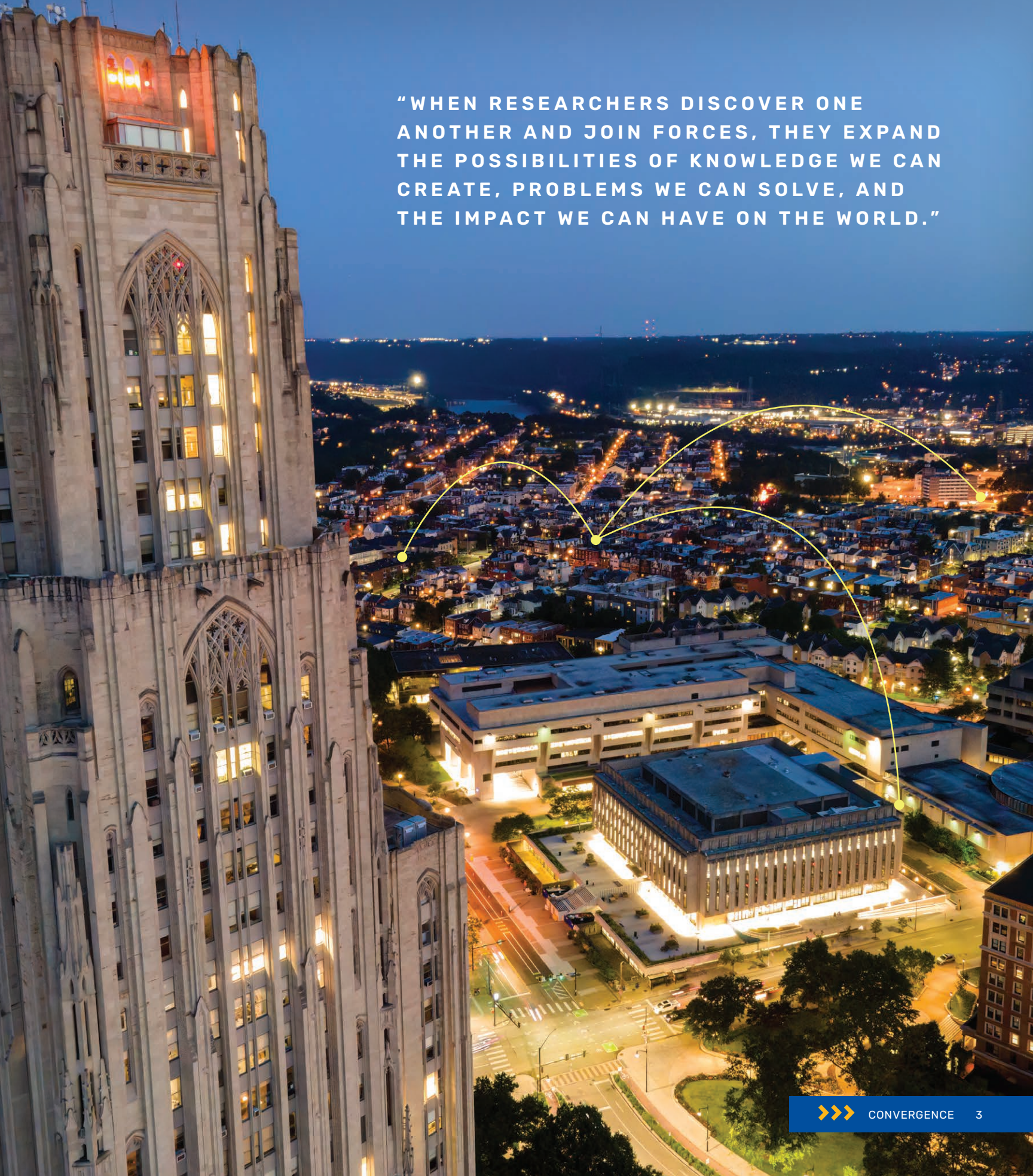
“Grand Challenge” is the formal phrase the research community uses to describe critical research that will help to determine the future. The National Science Foundation (NSF) keeps a running list of grand challenges, and for several years, NSF emphasized the principle of convergence as fundamental to modern research. Today’s grand challenges will not be solved by one discipline alone.

When researchers discover one another and join forces, they expand the possibilities of knowledge we can create, problems we can solve, and the impact we can have on the world.

The University of Pittsburgh’s 2022-23 Annual Report of Research offers examples of civil engineering meeting public health, computer literacy meeting economics and English, nursing meeting artificial intelligence, and Pitt archivists supporting the rich cultural history of horror films and the work of playwright August Wilson.

A proposal developed by a team to win a larger award is different than a proposal by an individual scholar. Our office has developed training to illustrate those differences and show how it’s done right. Pitt’s Big Proposal Bootcamp provides in-depth training for researchers on crafting proposals for large-scale, cross-disciplinary projects. Such a short course is offered by very few research universities. Learn more about how it works in this year’s report.

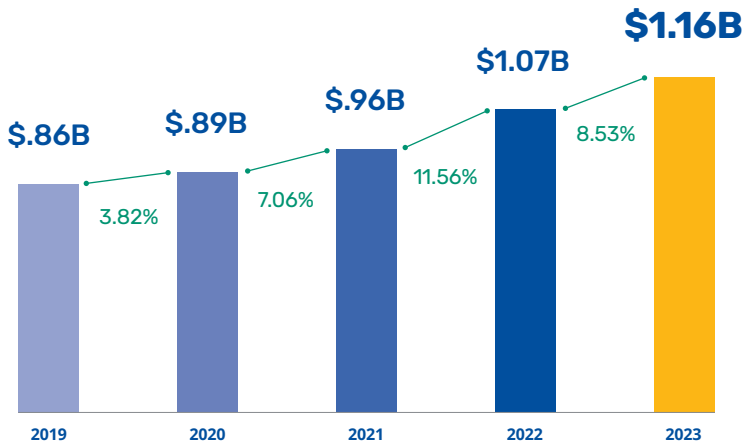
Rob A. Rutenbar
Senior Vice Chancellor for Research



“WHEN RESEARCHERS DISCOVER ONE
ANOTHER AND JOIN FORCES, THEY EXPAND
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RESEARCH BY THE NUMBERS



RESEARCH EXPENDITURES

Annual spending from sponsored research funding in the last five fiscal years. Percentage values between bars show the annual increase in expenditures.

Research spending data is current as of July 2023.

Financial data reports will be finalized in October 2023.

Source: University of Pittsburgh Office of the Chief Financial Officer



4,581
PROPOSALS
SUBMITTED



1,690
GRANTS
AWARDED



\$1.16B
RESEARCH
EXPENDITURES



644
UNIQUE DIRECT
SPONSORS

SPONSORED RESEARCH IN FY 2023

Sponsored research activity at Pitt during FY 2023, represented by the number of research proposals submitted, grants awarded, total research spending and organizations sponsoring research. Proposal and award totals include new grants only; hence, continuation grants have been excluded from this count.

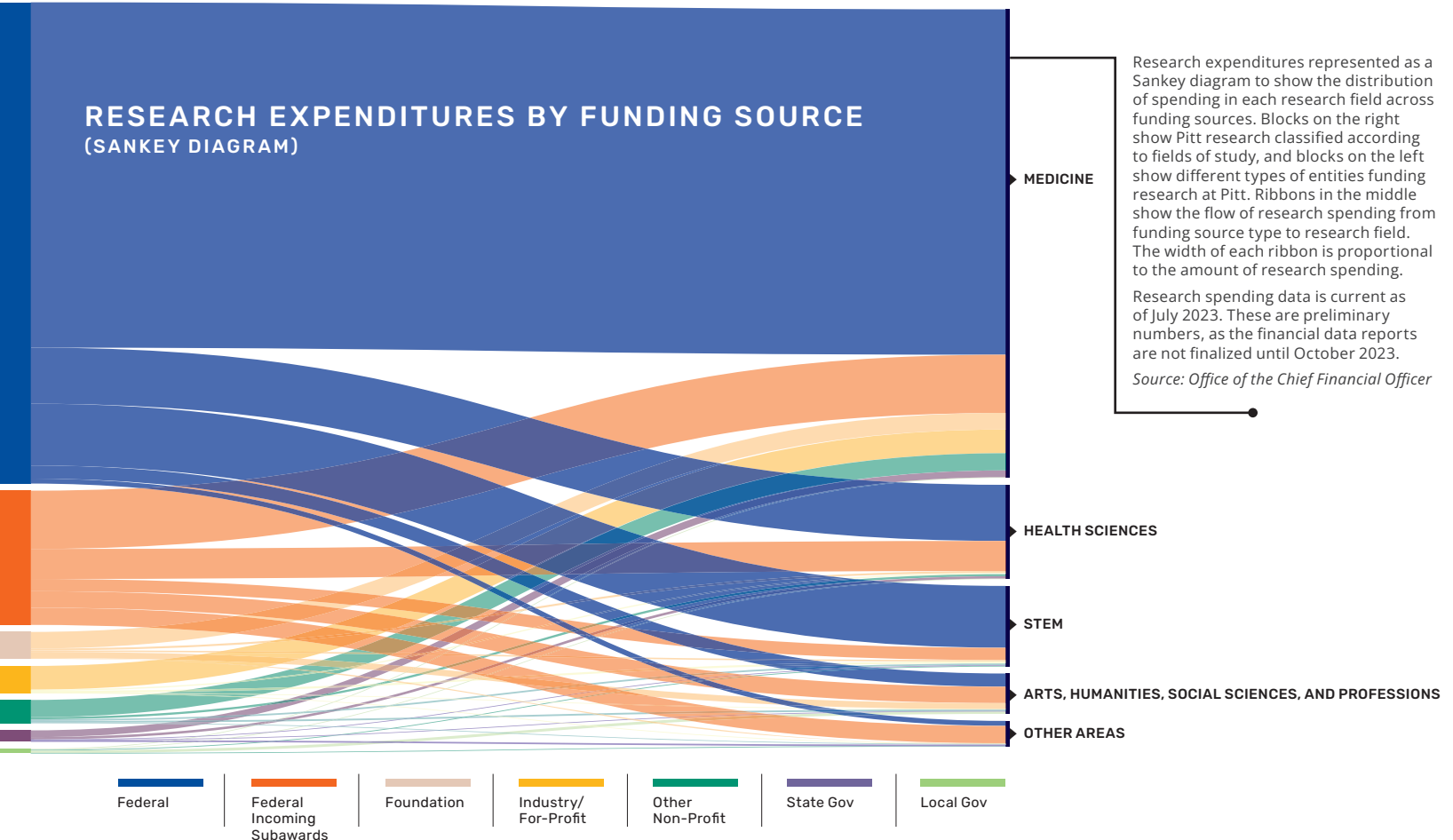
Data is current as of July 2023.

Source: Pitt Electronic Research Information System

PERIS™-MyFunding for Proposal, Award and Sponsor data

Office of the Chief Financial Officer for Expenditure data

RESEARCH EXPENDITURES BY FUNDING SOURCE (SANKEY DIAGRAM)



SELECT FUNDING AGENCIES OR SPONSORS

INDUSTRY PARTNERS

- Boehringer Ingelheim Pharmaceuticals
- Genentech, Inc.
- Generian Pharmaceuticals, Inc.
- Lubrizol Corporation
- Novartis Pharmaceuticals Corporation
- Owkin
- Pfizer, Inc.
- Tmunity Therapeutics
- Sleep Number Corporation

GOVERNMENT AGENCIES

FEDERAL

- U.S. Department of Agriculture
- U.S. Department of Defense
 - Defense Threat Reduction Agency
 - National Security Agency
 - Office of Naval Research
 - U.S. Air Force
 - U.S. Army Medical Research Acquisition Activity
- U.S. Department of Education
- U.S. Department of Energy
- U.S. Department of Health and Human Services
 - Centers for Disease Control and Prevention
 - National Institutes of Health
 - National Institute on Aging
 - National Cancer Institute
 - National Heart, Lung, and Blood Institute
 - National Institute of Allergy and Infectious Diseases
- U.S. Department of Labor
- U.S. Department of Veterans Affairs
- U.S. Nuclear Regulatory Commission
- National Aeronautics and Space Administration
- National Endowment for the Humanities
- National Science Foundation

STATE

- Pennsylvania Commission on Crime and Delinquency
- Pennsylvania Department of Education
- Pennsylvania Department of Health
- Pennsylvania Department of Human Services

LOCAL

- Allegheny County Department of Human Services
- Franklin Regional School District

MAJOR INCOMING SUBAWARDS

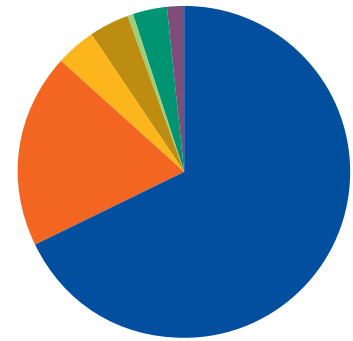
- Advanced Technology International
- Fluor Marine Propulsion, LLC
- Hemophilia Center of Western Pennsylvania
- InnovatePGH
- International Society of Wheelchair Professionals
- George G. Kostas Research Institute for Homeland Security at Northeastern University
- Massachusetts General Hospital
- Pennsylvania Commission on Crime and Delinquency
- Pennsylvania Department of Drug & Alcohol Programs
- Pennsylvania Department of Health
- Southwestern Pennsylvania Commission
- UPMC

FOUNDATIONS

- Coalition for Epidemic Preparedness Innovations
- The Michael J. Fox Foundation for Parkinson's Research
- Bill & Melinda Gates Foundation
- The Heinz Endowments
- Hillman Family Foundations
- Greater Houston Community Foundation
- Charles E. Kaufman Foundation
- Richard King Mellon Foundation
- The David and Lucile Packard Foundation
- The Pittsburgh Foundation
- Simons Foundation
- Templeton World Charity Foundation

OTHER/NON-PROFIT

- The Chan Zuckerberg Initiative
- Environmental Charter School
- The Pittsburgh Promise
- UPMC Enterprises

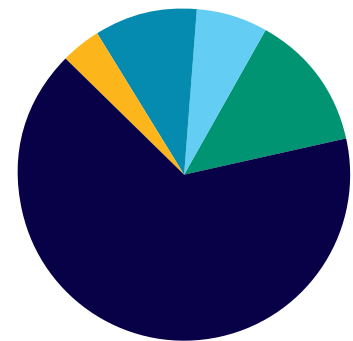


RESEARCH EXPENDITURES BY FUNDING SPONSOR

Research spending in FY 2023 categorized by the type of organization sponsoring research. Federal Incoming Subawards correspond to grants where the prime sponsor is a federal agency, but Pitt has received direct funding from a different organization (e.g., university, company, etc.).

Research spending data is current as of July 2023. Financial data reports will be finalized in October 2023.

Source: Office of the Chief Financial Officer



RESEARCH EXPENDITURES BY FIELD

Research spending in FY 2023 categorized by different research fields or areas. AHSSRF stands for Arts, Humanities, Social Sciences and Related Fields. The category 'Other' includes regional campuses and Pitt administrative offices.

Research spending data is current as of July 2023. Financial data reports will be finalized in October 2023.

Source: Office of the Chief Financial Officer



JASON SPERRY

RETHINKING TRAUMATIC INJURY AT THE CELLULAR LEVEL

When a human body suffers a traumatic injury, whether in a car accident or on a battlefield, time is precious. Techniques that can speed the emergency response or slow the body's reaction are invaluable.

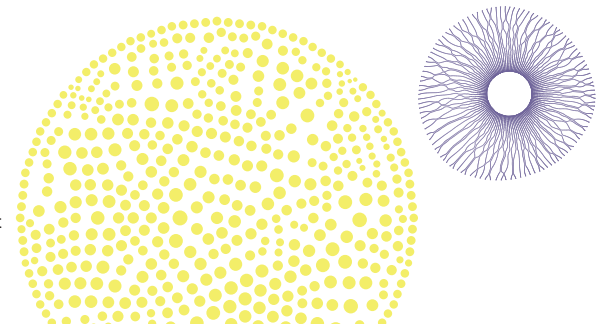
Since 2016, Jason Sperry, Andrew B. Peitzman Professor of Surgery and professor in the Department of Critical Care Medicine, has led a U.S. Department of Defense project to create a nationwide network of trauma systems and centers, conducting detailed research to improve military trauma care in collaboration with Frank Guyette, professor of emergency medicine, and Stephen Wisniewski, professor of epidemiology.

Sperry was the clinical lead and co-author on a 2021 *Journal of the American Medical Association* paper that made an unprecedented advance in understanding the body's response to trauma at the cellular level, which led them to apply techniques used in treating cancer—infusions of thawed blood plasma—that had never been applied to the treatment of trauma.

Along with lead author Timothy Billiar, Distinguished Professor of Surgery and executive vice president of UPMC, the team discovered that human traumatic injury response could be classified into two endotypes, or sub-types, one of which benefitted from infusions of thawed plasma after suffering traumatic brain injury.

Sperry and Guyette have shown that thawed blood plasma administered before the patient gets to the hospital can greatly increase the odds of survival. A clinical trial showed that trauma patients at risk of hemorrhagic shock who received two units of blood plasma while being transported by air were 10% more likely to survive.

"The 10% reduction in mortality borders on unprecedented," says Sperry. "We have never seen such a big impact from such a small intervention. The benefits are extraordinary and practice changing." ■





CONVERGING TO CONNECT BRAIN AND HEART DISEASES

In the past, an interdisciplinary team studying the link between brain and heart diseases would need a brain expert and a heart expert.

“We need both as well as bioengineers,” says Stephen Chan, Vitalant Professor of Vascular Medicine and director of Pitt’s Vascular Medicine Institute. “We also need computational biologists, epidemiologists, clinical trialists, and molecular scientists.” As well as an entrepreneur who gets involved from day one.

With a \$14.3 million grant from the WoodNext Foundation, Chan convened such experts to understand the link between cardiovascular disease and dementia.

For Chan, this project also is an opportunity to reimagine how science is done. Historically the academic model has elevated the individual investigator, working alone. “Now we need to innovate on how to collaborate in positive ways—integrated ways—ways in which we can tackle important problems quickly and simultaneously from completely new and different angles,” he says.

That integration can be seen in the team’s “research pod” structure, wherein researchers from different backgrounds work together toward shared goals, allowing for an agility not found in traditional research configurations. In six months, they have discovered more about the nature of the brain-heart connection; found potential drugs; and started a clinical trial.

“The reason I came to Pitt seven years ago was to be a part of a community and to help to establish something bigger than myself,” Chan says. “Pitt was built on the idea of working together to achieve those dreams.” ■



From left: FELIX E.Y. AGGOR, STEPHEN CHAN



UNLOCKING THE MYSTERY OF NAKED MOLE-RATS' EXCEPTIONAL FERTILITY

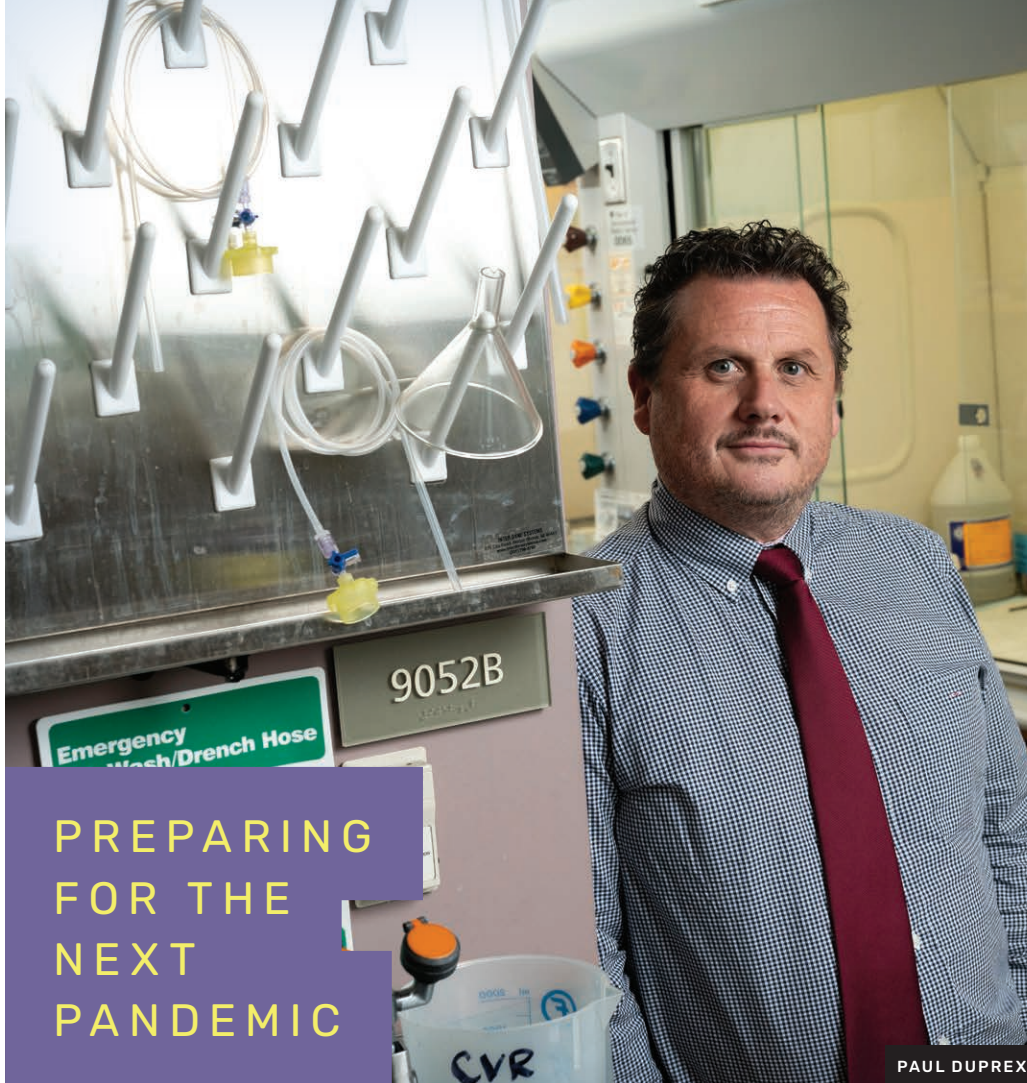


Unlike humans and other mammals, which become less fertile with age, naked mole-rats can reproduce throughout their remarkably long lifespans. Miguel Briño-Enríquez, assistant professor of obstetrics, gynecology and reproductive sciences and an investigator at Magee-Womens Research Institute, is working with colleagues in the United States and Canada to study this unusual longevity. They've begun to demystify the processes that bestow the rodents with what seems like eternal fertility, findings that could eventually point to new therapies for humans.

"They're the longest-lived rodent, almost never get cancer, don't feel pain like other mammals, live in underground colonies, and only the queen can have babies," Briño-Enríquez says.

"The most amazing thing is that they never stop having babies. They don't have a drop in fertility as they age. If we can figure out how they're able to do this, we might be able to develop new drug targets or techniques to help human health," he says. Even though humans are living longer, menopause still occurs at the same life stage, so his goal is to unlock the secrets to understanding how to protect ovary function later in life, prolong fertility, and improve overall health. ■

MIGUEL BRIÑO-ENRÍQUEZ



PREPARING FOR THE NEXT PANDEMIC

PAUL DUPREX

“SCIENCE ALWAYS EVOLVES.”

To pursue that mission, Duprex is reimagining the center’s Regional Biocontainment Laboratory, a high-security facility where researchers safely study dangerous viruses. He’s also overseeing a greater focus on influenza virus and believes it is vital to expand research on arboviruses—those carried by insects and similar species, and are likely to become a bigger threat due to climate change.

»» **Valerie Le Sage**, research assistant professor of microbiology and molecular genetics in the School of Medicine, is designing experiments that more closely mimic how the influenza virus is transmitted through the air. With access to the biocontainment laboratory and the collaborative research environment offered by the CVR, she hopes to expand that more real-world approach to experiments on other viruses of concern.

»» **Amy Hartman**, associate professor in the School of Public Health, studies a group of mosquito-borne viruses called bunyaviruses. She researches how one such disease, Rift Valley fever, can infect animals as diverse as mosquitoes, cows, and humans and is working to prevent the spread of the virus to fetuses. Rift Valley fever causes widespread disease in Africa and the Middle East.

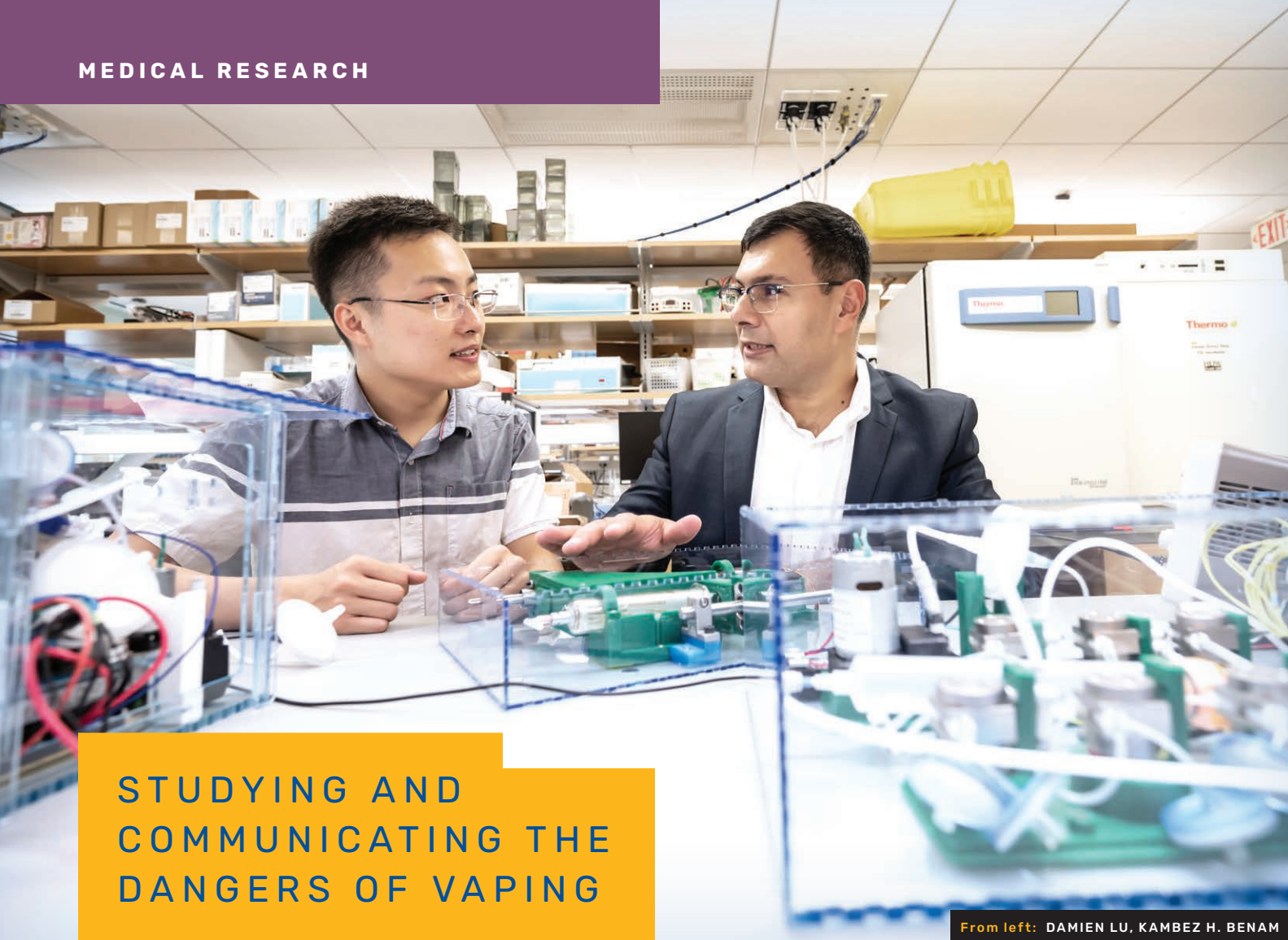
In the early days of the COVID-19 pandemic, it was all hands on deck at Pitt’s Center for Vaccine Research (CVR), where researchers were among the first in the United States to be able to study the actual virus.

Now, with the pandemic waning, CVR scientists are again focusing on basic research on a broad spectrum of viruses—the same kind of expertise that made the center well-positioned to leap into action in 2020.

“I’m really proud of what the center contributed,” says Paul Duprex, Jonas Salk Professor of Vaccine Research in Pitt’s School of Medicine and CVR’s director. “You have to know when to jump in, but you also have to know when to jump out, when you’ve done what you were morally obligated to do.”

Duprex breaks down the center’s mission into three areas: how viruses emerge as a threat to humans, how they make us sick, and how we fight them. Scientists at the CVR tackle these questions across a broad range of different viruses that are or could be a danger to humans.

The recognition garnered by the center for its pandemic preparedness research also sparked new partnerships for the CVR, including growing collaborations with pharmaceutical companies and international organizations. The worst of the pandemic may be behind us, “but it doesn’t mean you go back to where you were,” Duprex says. “Science always evolves.” ■



STUDYING AND COMMUNICATING THE DANGERS OF VAPING

From left: DAMIEN LU, KAMBEZ H. BENAM

“Just because something is safe to consume as food does not mean that it’s safe to inhale,” says Kambez H. Benam, associate professor in the Department of Medicine Division of Pulmonary, Allergy, and Critical Care Medicine, and in the Department of Bioengineering in the Swanson School of Engineering.

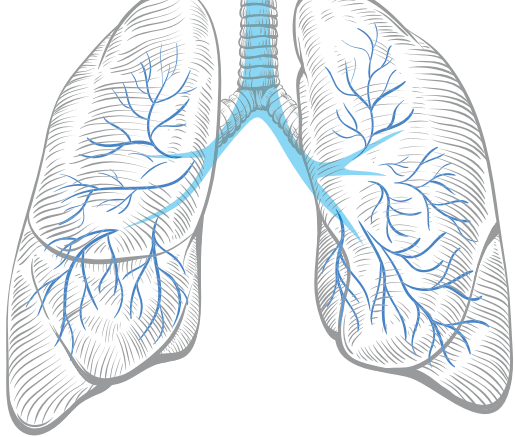
His team discovered that adding menthol flavor to electronic cigarette liquids produces more vapor particles and is associated with worse lung function than in those who smoke. Using a specially designed robotic system that mimics the mechanics of human breathing and vaping behavior—called the Human Vaping Mimetic Real-time Particle Analyzer—researchers in Benam’s

lab showed that commercially available e-cigarette liquids containing menthol generate a greater number of toxic microparticles compared to menthol-free liquid.

In addition, their analysis of patient records from a cohort of smokers with a history of e-cigarette use revealed that menthol vapers took shallower breaths and had poorer lung function compared to non-menthol e-cigarette users regardless of potential confounding factors such as age, gender, race, smoking history, and the use of nicotine- or cannabis-containing vaping products.

Elsewhere on campus, in a study led by Beth Hoffman, assistant professor in the

School of Public Health’s Department of Behavioral and Community Health Sciences, middle school students who participated in the study didn’t originally know about some of the dangers associated with vaping, including the lung disease EVALI (E-cigarette- or vaping-use-associated lung injury). Her team found that watching clips from popular TV shows that depicted young people getting sick from vaping may be an effective health education tool, with some students specifically remarking that it was better than a more formal anti-drug curriculum like the Drug Abuse Resistance Education program (D.A.R.E.). Hoffman noted that a key finding is vocabulary; many young people in the study did not recognize that vaping is synonymous with using an e-cigarette. ■



Out of the 25 million people with asthma in the United States, 5-10% have severe asthma. Treating them constitutes roughly half of asthma-related health care costs, which are estimated to be over \$81 billion, according to the U.S. Environmental Protection Agency. The usual corticosteroid therapy is ineffective at treating severe asthma, leading to more frequent emergency care and hospitalization, along with greater expenditure for medications for those with severe asthma.

Anuradha Ray, professor in the Department of Medicine, Division of Pulmonary, Allergy, and Critical Care Medicine, and UPMC Endowed Professor of Lung Immunology, takes a novel approach to understanding severe asthma at the level of immune cells, leading to an unprecedented conclusion: Severe asthma, at the cellular level, behaves like a different disease. An elevated response of a type of T-cell is found in severe, but not mild, asthma and is not affected by even high doses of corticosteroids.

Her work has attracted a stream of funding and earned her a 2023 Pitt Chancellor's Distinguished Research Award. Most recently, she received a prestigious five-year National Institutes of Health MIRA (Maximizing Investigators' Research Award) intended to provide investigators with greater stability and flexibility, which promises to enhance her lab's scientific productivity and their chances for important breakthroughs.

With the support of Pitt's Innovation Institute, she has applied to patent a technology that significantly reduced symptoms and morbidity in mice. She hopes to develop a similar intervention in the lungs of humans with severe asthma. ■

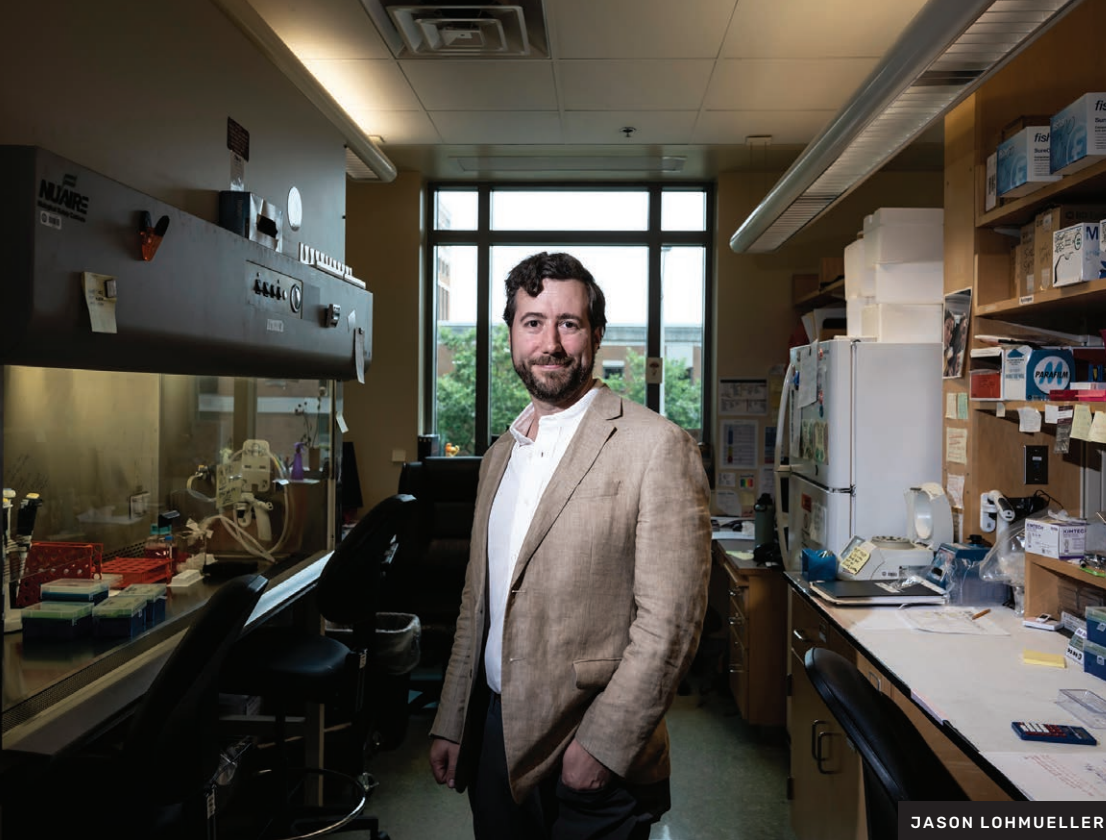
RETHINKING ASTHMA



ANURADHA RAY

THE CUTTING EDGE OF IMMUNOTHERAPIES

T-cells are one important type of the immune system's white blood cells. In the field of immunotherapy—altering individual immune systems to fight cancer—Pitt researchers have developed a universal receptor system that allows T-cells to recognize any cell surface target, enabling highly customizable CAR T-cell and other immunotherapies for treating cancer and other diseases. The discovery could extend into solid tumors and give more patients access to the game-changing results CAR T-cell therapy has produced in certain blood cancers. ■



JASON LOHMUELLER

CUSTOMIZING A BODY'S CELLS TO FIGHT DISEASE

Seeking to customize cell therapies to fight cancer and autoimmune disorders and improve organ transplantation tolerance, Jason Lohmueller, assistant professor of surgery and immunology in the Division of Surgical Oncology and investigator at UPMC Hillman Cancer Center, leads a team of researchers who have developed a plug-and-play immunotherapy approach. The therapy involves engineering a patient's own cells so that when they are infused back into the patient they can be targeted by "adaptor" antibodies to mount a multi-pronged attack against diseased cells.

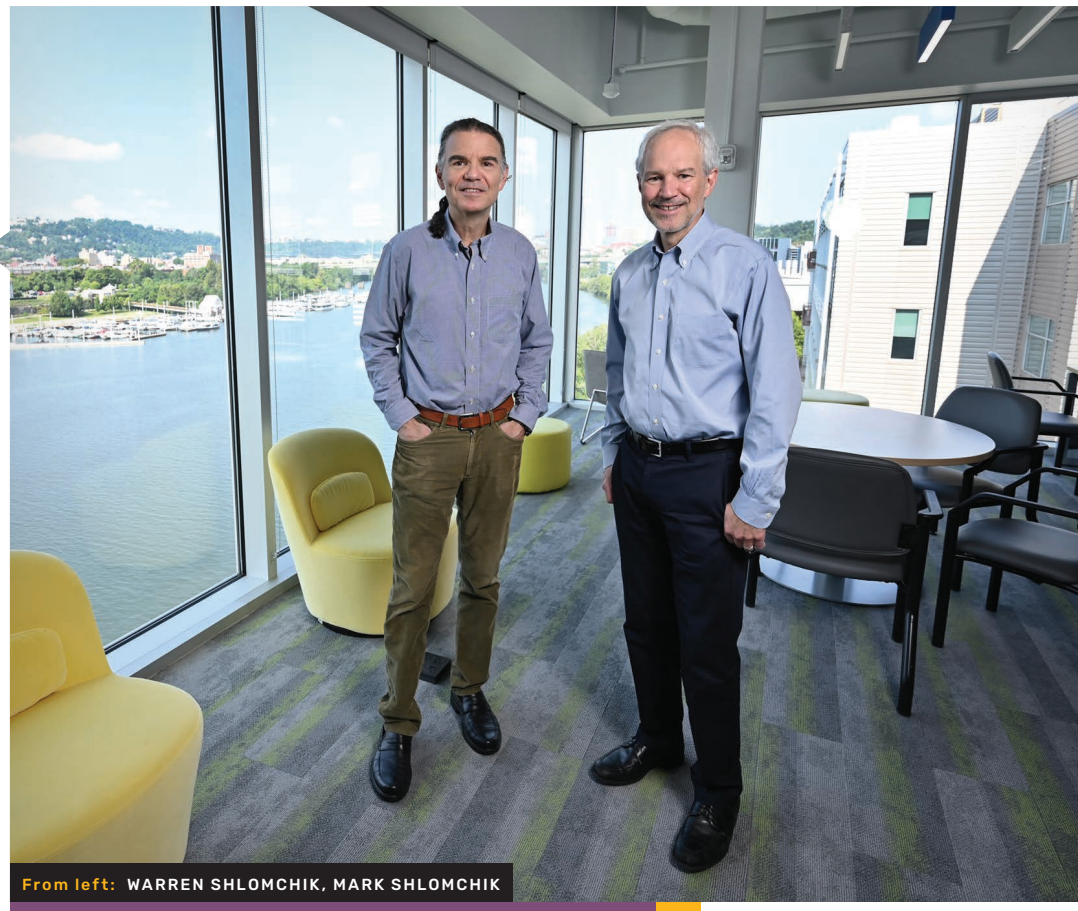
"What's unique about our approach is how the T-cell interacts with the antibody adaptors. They're not just binding but fusing via covalent attachment—the strongest form of chemical bond," he says. ■

IDENTIFYING TUMOR TARGETS FOR T-CELLS

In hopes of developing better immunotherapy for both blood and solid tumor cancers, Mark Shlomchik, UPMC Endowed and Distinguished Professor in the Department of Immunology, and Warren Shlomchik, professor of medicine and immunology, developed methods to quickly identify the areas of cancer cells that T-cells target in order to create gene-modified T-cells that more effectively attack both cancers.

They developed the techniques behind two technologies—now known commercially as NEOXpress™ and TCXpress™—that allow these modified T-cells to be used safely. The T-cells react only with tumor-specific proteins in solid tumors—the proteins that mark the cancer cells that mutate their DNA as they grow out of control.

The techniques developed by the Shlomchiks became the basis of the start-up BlueSphere Bio, the first translational science spinout funded by UPMC Enterprises. The technologies are now patented and proprietary to the company. ■



From left: WARREN SHLOMCHIK, MARK SHLOMCHIK

SCHOOL OF NURSING A RESEARCH POWERHOUSE

According to Christine E. Kasper, dean of the School of Nursing, data collection and analysis have always been part of the nursing profession—going back to Florence Nightingale, who was one of the first public health researchers.

“During the Crimean War, nurses did not just care for wounded soldiers,” says Kasper. “Florence Nightingale was collecting lots of data. Her work dramatically cut the death rate.”

That fundamental focus on applying data to practice has made Pitt Nursing a research powerhouse. Among other standout facts, Pitt Nursing ranked number seven nationally in 2022 National Institutes of Health funding to nursing schools.

“Research here covers a very large scope, from big data to practice and basic science to behavioral science,” says Kasper. “Work here is happening simultaneously in clinical, acute, and tertiary care; genomics; public health; geriatrics; and anesthesia. We run the gamut of health science research.”

CHRISTINE E. KASPER



FLORENCE NIGHTINGALE STAINED GLASS,
HEINZ MEMORIAL CHAPEL, PITTSBURGH, PA



SALAH AL-ZAITI

Salah Al-Zaiti, associate professor in the Department of Acute and Tertiary Care in the School of Nursing, works at the juncture of big data and practice, developing technology to rapidly diagnose heart attacks by using biomedical informatics and machine learning. A recent paper in *Nature Medicine* demonstrated that the machine learning model he developed with collaborators could diagnose and classify heart attacks faster and more accurately than standard emergency room practice.

“That paper sums up 10 years of work,” says Al-Zaiti. He and co-author Christian Martin-Gill, associate professor of emergency medicine and chief of Emergency Medical Services at UPMC, worked with a wide range of collaborators at Pitt and beyond to build a machine learning model with electrocardiogram data from 4,026 patients at three hospitals in Pittsburgh, data that did

not reveal how the patients had initially been classified. Tested against standard diagnostic practices—clinician interpretation, commercial algorithms, and risk factors—the model outperformed all three in accurately reclassifying one in three patients as low, intermediate, or high risk. The next stage for the model will be real-time testing in the field.

Al-Zaiti is interested in applying this diagnostic tool beyond the United States. He recently received a Fulbright U.S. Scholar Award to work for nine months with refugees in Jordan. “The rate of heart attacks among refugees is high,” Al-Zaiti says. “And the average age of first heart attacks among refugees is in the 40s. In the United States, the average age of the first heart attack is in the 60s.” He will continue to work on Pitt projects while collaborating with United Nations clinics and the University of Jordan. ■

PAINIMATION: NUANCED DESCRIPTIONS AND AI IMPROVE DIAGNOSES

“When you ask patients about pain, they want to tell a story, not give a number,” says Charles Jonassaint, associate professor of medicine, clinical psychologist, and co-developer of Painimation. The tool, a union of language, art, and machine learning, takes a nuanced approach to pain communication that goes beyond the classic numeric approach.

Jonassaint and Nema Rao, then a master’s candidate at Carnegie Mellon University’s School of Design during the creation of Painimation, worked with designers to translate the words people use to describe their pain into abstract, moving images.

The animations were then validated by those with neuropathic pain—“Yes, this looks like my pain”—and incorporated into an iPad app that asks people to color in the parts of the body that hurt, then select which animations match their pain. This adjustment is translated as a numerical rating ranging from one to 100.

In composite, the data provide a meaningful description, incorporating the capacity of artificial intelligence (AI) to find patterns and correlations with certain conditions. As more data are collected and machine learning gets cleverer, more connections—among pain, disease, treatment, and recovery—will surely surface. ■

CHARLES JONASSAINT



THEIR FIRST LAB EXPERIMENT

From left: VAUGHN COOPER, ALECIA ROKES, NAOMI BASTIAMPILLAI

“Most high school students don’t do authentic experiments, especially in the life sciences,” says Vaughn Cooper, professor of microbiology and molecular genetics in the School of Medicine.

But Cooper, whose research involves understanding how bacteria become more infectious, knew from day one that he wanted educational outreach to be embedded into his research.

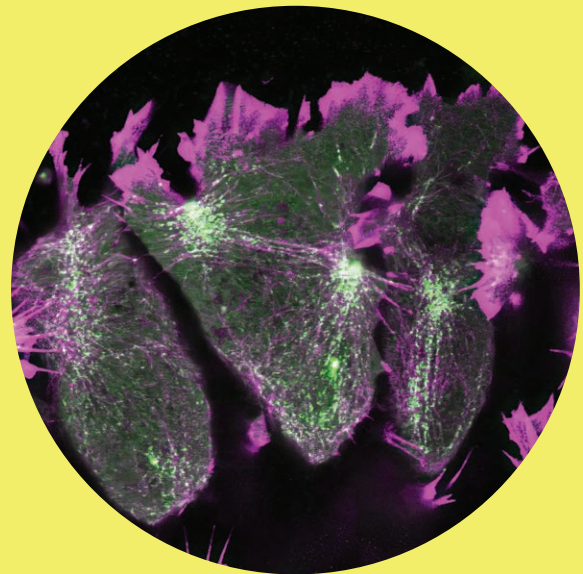
He discovered the key to bringing the two together in the evolution of a pathogenic bacterium known to cause chronic infection in people with cystic fibrosis. The bacteria

colonies quickly changed to look like rosettes or doilies instead of circles. “I thought, ‘Wow, can we turn that into a curriculum?’,” says Cooper.

With funding from the NIH, NSF, and a partnership with Fisher Scientific, he was able to find a safe analogue—a relative of the pathogen—and with the help of enterprising teachers, set up a curriculum to help students better learn the material.

“Even though the curriculum is just two weeks, it led to notable changes in sentiment toward future activities in STEM,” Cooper says, “especially among the young women.” ■

THE MYSTERIOUS MECHANICS OF MORPHOGENESIS



Tissue engineering—creating a “seed” of tissue that could grow into a functional, life-saving organ—sounds like magic. But it could become technology, thanks in part to the work led by Lance Davidson, William Kepler Whiteford Professor of Bioengineering in Swanson School of Engineering.

Davidson’s Mechanics of Morphogenesis Lab works at the interface of physics and biology to understand principles of morphogenesis—in this case, the development of the embryonic form—in the frog. The work not only lays the groundwork to better understand human cell and tissue development, it also has implications for furthering tissue engineering, preventing birth defects, and understanding the effect of tissue mechanics on cancer cell growth and proliferation. NIH granted Davidson a MERIT (Method to Extend Research in Time) Award of \$2.2 million to carry out this work.

“There are a diverse set of chemical and physical pathways that regulate morphogenesis and that interact with the environment,” says Davidson. “We aim to understand the coupling between cell biological and physical mechanisms that drive cell shape changes, control cell behaviors, generate forces, and create tissue properties such as stiffness.” ■



**“AS A NATIONAL
CANCER INSTITUTE-
DESIGNATED
COMPREHENSIVE
CANCER CENTER,
WE WANT TO MAKE
SURE EVERYONE
CAN ACCESS HIGH-
QUALITY CARE
AND ELIMINATE
THE BARRIERS TO
ACCOMPLISHING
THAT.”**

**EVERYBODY
SHOULD
HAVE ACCESS**

MONICA L. BASKIN

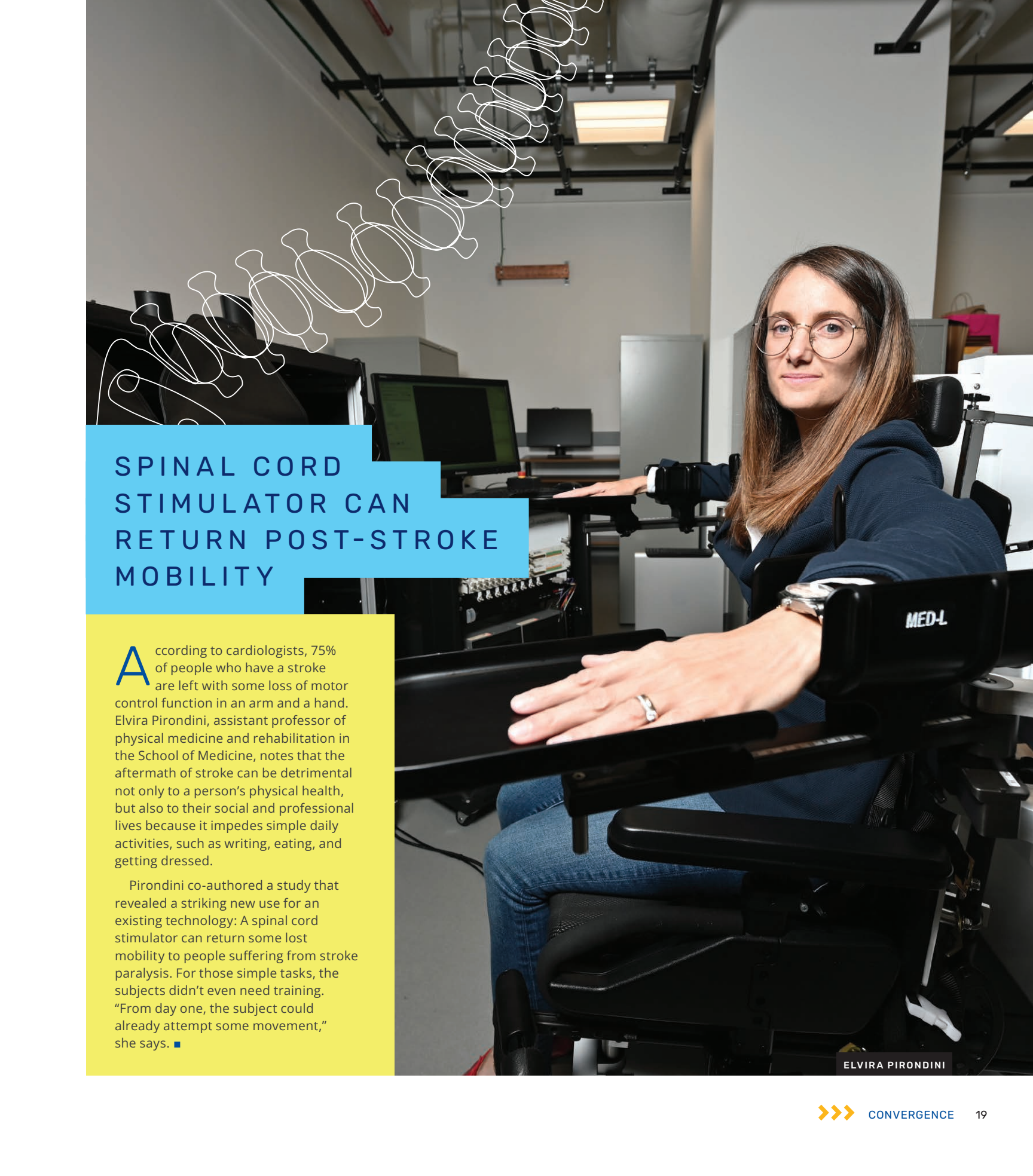
After leading research programs aimed at reducing health disparities, most recently at the University of Alabama at Birmingham, Monica L. Baskin joined Pitt in 2022 as assistant vice chancellor for community health equity and professor of medicine in the Division of Hematology/Oncology. She also serves at UPMC Hillman Cancer Center as associate director of community outreach and engagement and of health equity.

For nearly 20 years, Baskin headed a funded research program aimed at reducing health disparities in the deep South, focusing on linking academics to community- and faith-based networks to better understand and address factors associated with healthy eating, physical activity, obesity, and cancer prevention and control.

Baskin is dedicated to expanding the reach of UPMC Hillman Cancer Center. “As a National Cancer Institute-designated

Comprehensive Cancer Center, we want to make sure everyone can access high-quality care and eliminate the barriers to accomplishing that,” she says.

“We also want to ensure that UPMC Hillman Cancer Center is addressing and enhancing the diversity within the center—not just at the staff level but everywhere, including leadership. That is a critical step to making sure the issues of diversity are always addressed.” ■

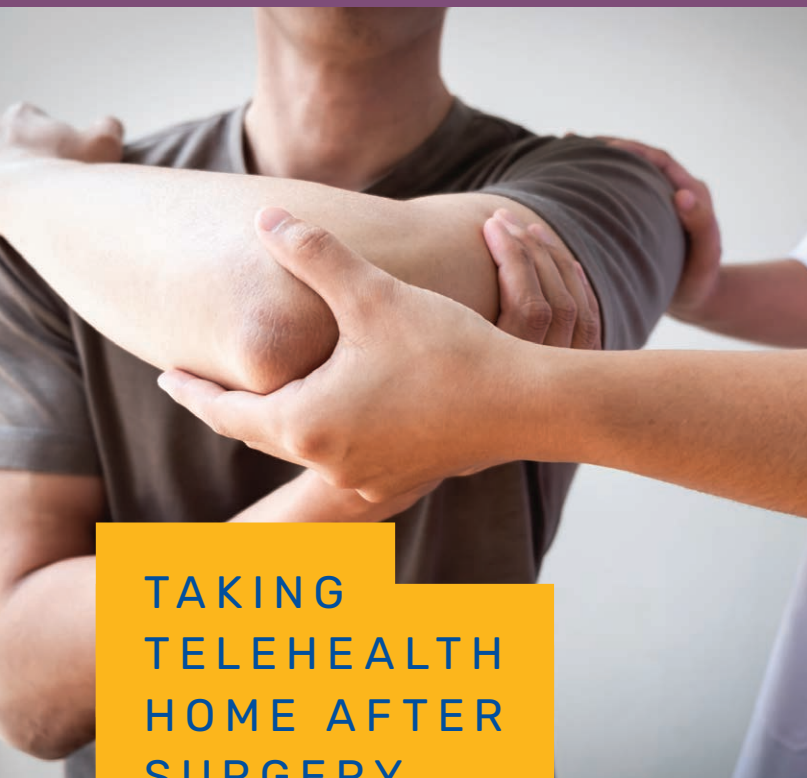


SPINAL CORD STIMULATOR CAN RETURN POST-STROKE MOBILITY

According to cardiologists, 75% of people who have a stroke are left with some loss of motor control function in an arm and a hand. Elvira Pirondini, assistant professor of physical medicine and rehabilitation in the School of Medicine, notes that the aftermath of stroke can be detrimental not only to a person's physical health, but also to their social and professional lives because it impedes simple daily activities, such as writing, eating, and getting dressed.

Pirondini co-authored a study that revealed a striking new use for an existing technology: A spinal cord stimulator can return some lost mobility to people suffering from stroke paralysis. For those simple tasks, the subjects didn't even need training. "From day one, the subject could already attempt some movement," she says. ■

ELVIRA PIRONDINI



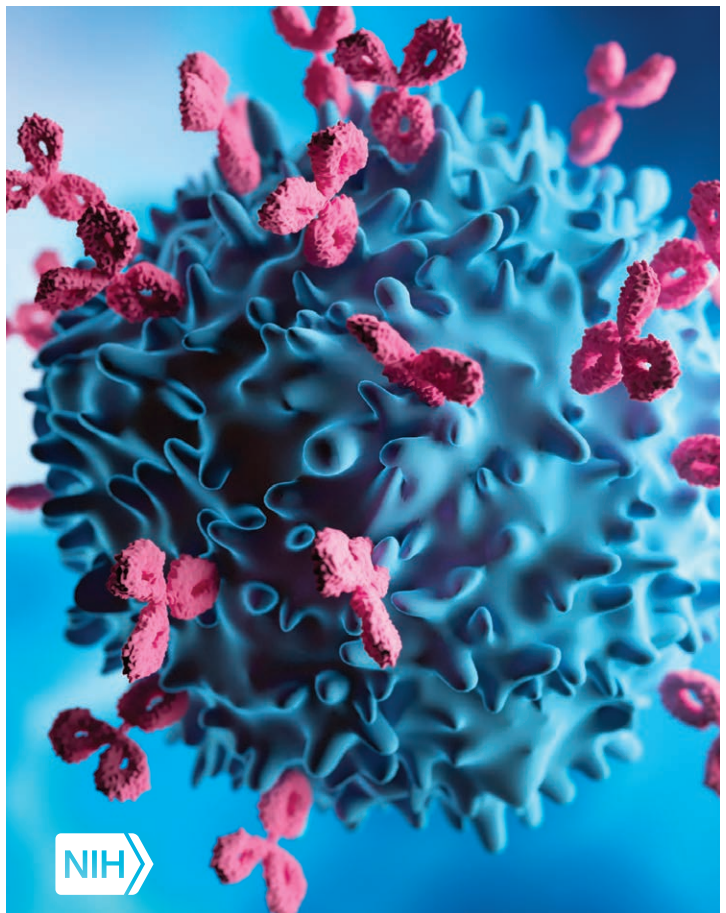
TAKING TELEHEALTH HOME AFTER SURGERY

Rotator cuff tears are the leading cause of shoulder disability in adults and result in \$12 billion in medical bills annually. Physical rehabilitation is critical for patient recovery. Pitt and ēlizur, a supplier of orthopaedic products and services, are partnering to create CuffLink, a telehealth system for at-home rehabilitation post-surgery.

The device combines ēlizur's shoulder strengthening and stabilization machine that assists the patient in kinetic exercise without damaging or overusing the rotator cuff post-operatively with Pitt's motion-tracking software system, called interACTION. CuffLink

will track patients' progress, record pain levels, and host a clinician portal helping to safely move early rehabilitation to the patient's home and shifting insurer-capped physical therapy visits to later in the recovery timeline.

Kevin Bell, assistant professor of bioengineering at Pitt's Swanson School of Engineering, who leads a multidisciplinary team of experts from orthopaedic surgery, physical therapy, and health information management, says that partnerships like this bridge the gap between technology and the patient accessing it. ■



PITT JOINS HEAD AND NECK CANCER RESEARCH COLLABORATIVE

NIH awarded Pitt a five-year, \$11.2 million grant to support a Head and Neck Cancer Specialized Program of Research Excellence (SPORE) in 2022, to promote collaborative, interdisciplinary cancer research, aiming to translate novel scientific discoveries from the laboratory and population studies to the clinic for testing in humans with cancer or at risk for cancer.

The Head and Neck Cancer SPORE, led by Robert L. Ferris, director of UPMC Hillman Cancer Center, and Heath Skinner, associate professor and chair of the Department of Radiation Oncology, builds on years of research, including 15 years of prior funding, that developed an organ-specific database with detailed clinical and pathological information on more than 12,000 patients who were followed for more than 30 years. ■



KEEPING PATIENTS HEALTHY WITH ARTIFICIAL INTELLIGENCE

SHANDONG WU

A personal touch can mean everything in medicine. But to handle big amounts of data, researchers are increasingly turning to artificial intelligence (AI).

“The advancement in AI, especially in deep learning, provides a powerful approach for machine learning on big health care data,” says Shandong Wu, an associate professor of radiology in Pitt’s School of Medicine. “Deep learning enables large-scale data mining with substantially increased accuracy and efficiency in data analysis.”

Wu founded and directs the Center for Artificial Intelligence Innovation in Medical Imaging, which brings together researchers from nine different Pitt schools to improve outcomes for patients by applying cutting-edge computer science to medical images. For instance, one study of Wu’s showed that machine learning can accurately predict whether patients recover six months after a traumatic brain injury based on a patient’s brain scans, vital signs, and other information.

Such studies point the way toward tools that clinicians could use to make more data-informed decisions. They also come with risks, however, like the potential for cyberattacks, another area Wu’s team has studied. “By understanding how AI models behave under adversarial attacks in medical contexts, we can start thinking about ways to make these models safer and more robust,” he says. ■

“THE ADVANCEMENT IN AI, ESPECIALLY IN DEEP LEARNING, PROVIDES A POWERFUL APPROACH FOR MACHINE LEARNING ON BIG HEALTH CARE DATA.”



“THE VERY NATURE OF PITT’S SCHOOL OF HEALTH AND REHABILITATION SCIENCES (SHRS) IS DEFINED BY THE CONVERGENCE OF A WIDE RANGE OF CLINICAL, TECHNOLOGICAL, AND COMMUNITY-ENGAGED RESEARCH PROGRAMS TO EXAMINE HUMAN PERFORMANCE AND ACTIVITY ESSENTIAL TO HEALTH AND PRODUCTIVITY IN THE SETTINGS WHERE PEOPLE LIVE, LEARN, WORK, AND RECREATE.”

BETH SKIDMORE,
SHRS ASSOCIATE DEAN FOR RESEARCH

CHURCH MEMBERS COUNSEL THE BEREAVED



From left: QUIANA GOLPHIN, CHANNING MORELAND, LAURA DIETZ, KHAVAH MURRAY

To help address racial disparities in mental health care, Pitt researchers in the Department of Counseling and Behavioral Health, School of Health and Rehabilitation Sciences, are collaborating with leaders of Black churches in several Pittsburgh neighborhoods to create a program to provide counseling skills and create new entry points for residents to access services. The program, called TRIBUTE—Training Religious Leaders in Bereavement Counseling to Upskill Treatment Experiences—is based on the premise that relying on ordained and lay church leaders in Black communities will reduce the stigma associated with seeking treatment and normalize conversations about mental health.

TRIBUTE also addresses the significant shortage of mental health clinicians of color, say Associate Professor Laura Dietz and Assistant Professor Quiana Golphin. While clergy and paraprofessionals, such as nursing assistants and health care aides, provide support for grieving individuals in communities of color, most do not have formal mental health training. Graduates of this training, called community support advocates, implement the program in their congregations under the supervision of licensed mental health providers on the TRIBUTE leadership team. ■



HOME IS WHERE THE HEALTH IS

From left: JOEY ENGELMEIER, JEMIMA OHWOBETE



This 105-year-old home (at left) may not look like it at first glance, but it is a living laboratory—the Healthy Home Laboratory. Here, researchers from across Pitt and the community are designing and testing real-world evidence-based solutions to support community living among aging adults, people with disabilities, and other vulnerable populations.

The lab is a collective undertaking, a gathering place for health care and technology experts. At any given moment, experts in the lab are designers, craftspeople, engineers; or clinicians from the Health Policy Institute; Pitt’s School of Health and Rehabilitation Sciences, School of Public Health, School of Nursing, School of Medicine, and Swanson School of Engineering; as well as community organizations like Community Aging in Place Advancing Better Living for Elders, Women for a Healthy Environment, and the Allegheny County Area Agency on Aging.

Recognized as a testbed site by AARP’s AgeTech Collaborative, the lab received an almost \$1 million grant from the U.S. Department of Housing and Urban Development to develop assessment tools and interventions to make homes safer for vulnerable populations and a \$5 million grant from the Administration for Community Living to develop and test smart home interventions.

The researchers leading the effort are Everette James, M. Allen Pond Professor of Health Policy and Management; Jonathan Pearlman, associate professor and chair of the Department of Rehabilitation Science and Technology; Pam Toto, professor of occupational therapy; and Steven Handler, associate professor of geriatrics. ■

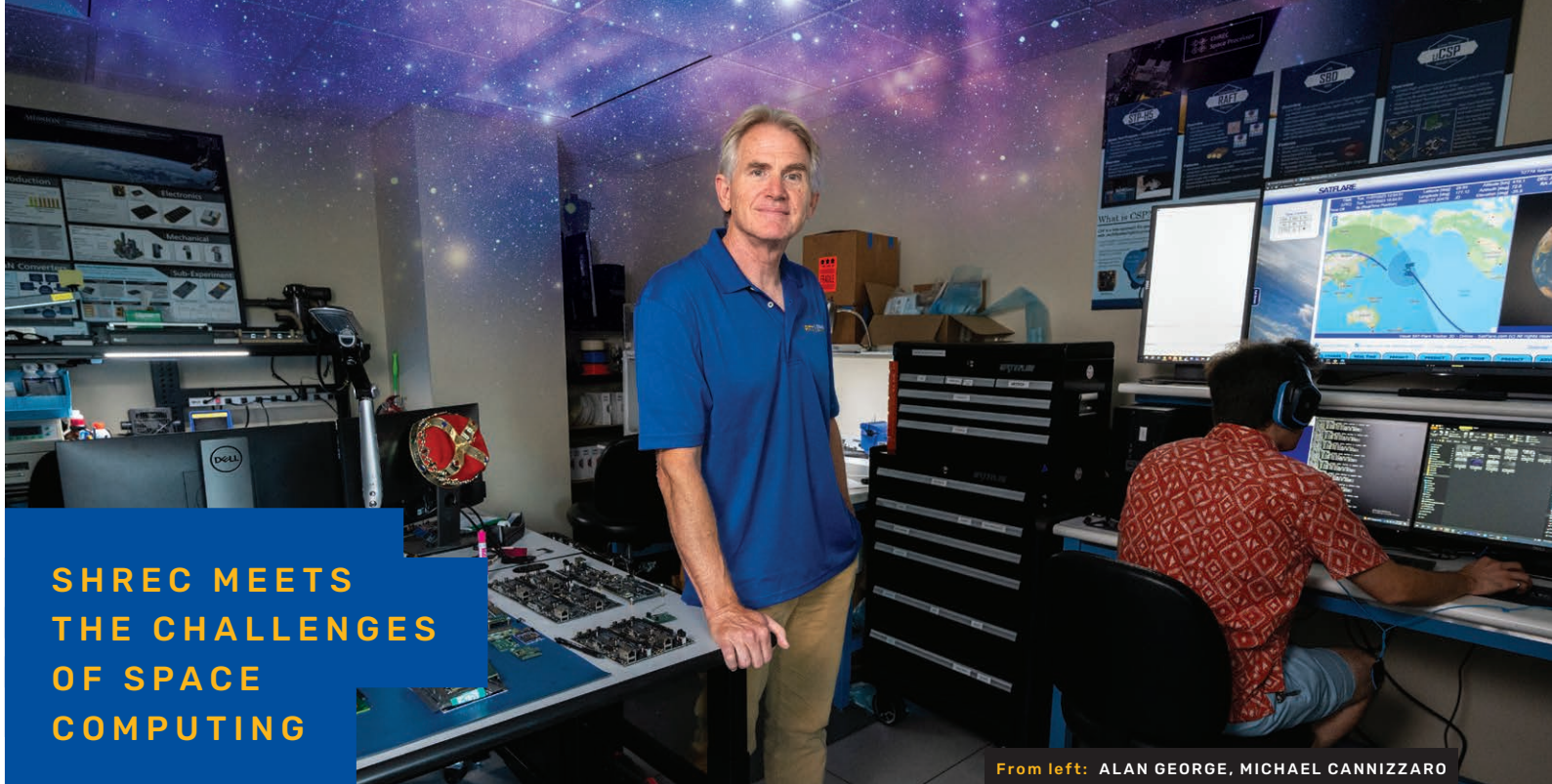
MODELING GALACTIC FORMATIONS TO TEST WORLD'S FASTEST SUPERCOMPUTER

When Oak Ridge National Laboratory prepared to deploy its newest supercomputer—the exascale Frontier supercomputer, the world's first and fastest exascale supercomputer—it needed researchers to perform early test runs. It turned to Evan Schneider, assistant professor of physics and astronomy in the Dietrich School of Arts and Sciences, who in 2022 became the third Pitt faculty member and first woman to be named a Packard Fellow, the first Pitt winner in 25 years.

Her hydrodynamics code—called Cholla—models galaxy evolution and was one of eight research projects chosen to participate in helping to optimize simulation, data-intensive, and machine learning applications to help ready Frontier for prime time. This modeling work was recognized in 2022 with a Packard Fellowship Award, just the third for Pitt since 1988.

She is working to ensure that her code can take advantage of—and keep up with—Frontier. Cholla's simulation will model star formation, supernova explosions, and other astrophysical phenomena that will help researchers better understand the fundamentals of galaxy formation, growth, and evolution. ■

EVAN SCHNEIDER



SHREC MEETS THE CHALLENGES OF SPACE COMPUTING

From left: ALAN GEORGE, MICHAEL CANNIZZARO

Many fundamentals of modern life rely on space satellites—GPS, communications, weather forecasting, tracking climate and geological changes, and defense. Each platform requires advanced computing onboard for remote sensing and data analysis, and that presents major challenges.

Computing in space is not like computing on Earth, according to Alan George, professor in and chair of the Department of Electrical and Computer Engineering in the Swanson School of Engineering, and founder and director of NSF's Center for Space, High-performance, and Resilient Computing (SHREC), led by Pitt.

The challenge of computing in space has two sides: resource constraints and environmental hazards. Examples of resource constraints are size, weight, power, cooling, and cost. Environmental hazards include severe shock and vibration on launch, wide temperature swings in Earth orbit, cooling the computer in the airless vacuum of space where conventional heat sinks and fans are useless, and ionizing radiation emanating from our sun and the cosmos.

Meanwhile, the need for advanced computing on spacecraft is escalating. "New missions are deploying increasingly sophisticated sensors that generate massive amounts of data. With limited communications bandwidth back to

Earth, this data must be processed and managed by computers on the spacecraft. Most spacecraft are unmanned, so these computers must also make key decisions from data analysis," says George.

Hardware and software technology developed by students and faculty in SHREC has been used on many NASA and commercial space missions, including the International Space Station. With dozens of industry and government partners, SHREC operates like a space research consortium, where university research leads to breakthroughs shared with all partners.

"Work at SHREC is performed primarily by engineering graduate students. Alongside basic and applied research for new technology, the other key theme in SHREC is workforce development, where students are educated and trained to join and grow the U.S. space community," says George. "We collaborate closely with our many partners and learn from each group's different perspectives. It's mutually beneficial and students get real-world experience while earning their advanced degrees."

In the flourishing U.S. space community, Pitt has made its mark. More than 100 faculty members at Pitt are active or strongly interested in space research. Says George, "Pitt has the talent and core competency to play a major role in terms of education, research, and service in space engineering, medicine, and science." ■



At the May 2023 Keystone Space Collaborative Conference, government, academia, and industry partners gathered in Pittsburgh to discuss the elements necessary to establish a space ecosystem in the region. This panel recommends funding opportunities to help small businesses de-risk new technology, make advances in robotics and artificial intelligence, and provide support for spin-off companies.

From left: Daniel Lockney, program executive, Technology Transfer, NASA; Theresa Mayer, vice president for research, Carnegie Mellon University; Brian Joseph, president and CEO, Touchstone Research Laboratory; Cheryl Turnbull, senior director, Keenan Center for Entrepreneurship, Ohio State University; and Rob Cunningham, vice chancellor for research infrastructure, University of Pittsburgh



INVESTING
IN QUANTUM
COMPUTING

To usher in the next era of quantum technology, researchers need specialized, made-to-spec equipment that can measure and manage increasingly complex quantum phenomena. In a show of Pitt's commitment to leading the way, the University's Strategic Advancement Fund has approved its first loan of \$11.6 million to support the establishment of the Western Pennsylvania Quantum Information Core.

Pitt's commitment to quantum technology is not new. More than 10 years ago, Pitt established the Pittsburgh Quantum Institute, a collaboration among faculty from Pitt, Carnegie Mellon University, and Duquesne University. Last year, the institute established its first agreements with industry partners in service of making quantum technology widely available, and this year, named as its new director Michael Hatridge, associate professor of physics and director of Pitt's physics and quantum computing major. ■

From left: ROB CUNNINGHAM, MICHAEL HATRIDGE, KRISTA ZOTTOLA



RARE RESOURCE FOR VITAL WORK

When biomedical scientists across the nation need supercomputing heft to shed light on problems as different as how fish oil delivers health benefits, how viruses package their DNA for future infections, or how brain membrane proteins regulate nerve-cell signals, they have a powerhouse partner at the ready. The Pittsburgh Supercomputing Center (PSC), a joint computational research center of the University of Pittsburgh and Carnegie Mellon University, has been at the forefront of powering research for decades. Among its resources is Anton[®] 2, a special-purpose supercomputer designed for cutting-edge molecular simulations. Anton 2 is provided at no cost by D. E. Shaw Research and operationally funded by the National Institutes of Health (NIH). PSC's Anton 2 is the only machine found outside D. E. Shaw Research's own facilities.

PSC also is a prominent institution in the groundbreaking NIH-funded Human BioMolecular Atlas Program (HuBMAP). HuBMAP researchers are developing an open framework to map the molecular landscape of healthy cells in the human body to better understand the relationship between cellular organization and health. They use the latest single-cell and imaging methods to create atlases of healthy tissues that serve as a reference to help understand what goes wrong earlier in disease progression.



ANTON[®] 2 SUPERCOMPUTER

PSC leads the program's infrastructure and engagement component, known as HIVE-IEC. It's co-led by PSC scientific director Phil Blood and Pitt's Jonathan Silverstein, professor and chief research informatics officer in Pitt's Department of Biomedical Informatics.

In July, a set of nine scientific papers was published in the Nature family of journals and the journal Cell Reports, describing breakthroughs in areas ranging from kidney disease to uterine/fetal interactions, using high resolution, multiscale, and multimodal mapping of the human body. Silverstein is a co-author of one of the papers. The

papers are part of a larger group of papers presenting the first collection of maps created by researchers in the HuBMAP consortium.

"The PSC team is the glue that keeps the whole consortium operating and moving forward," says James Barr von Oehsen, PSC director and Pitt vice chancellor for research computing. "Clinicians will be able to use HuBMAP as a reference map for research. Like all PSC computing resources, HuBMAP is a data and tool resource for the Pitt research community and researchers around the world." ■

Anton[®] 2 is a registered trademark of D. E. Shaw Research, LLC.

PITT'S SPECIAL COLLECTIONS INSPIRE AND EMPOWER



KORNELIA TANCHEVA

The themes in Pitt's special collections are three-dimensional cuts across time and culture by way of personal papers, photographs, agency records, recordings, and even accounting books. Movements are documented; individual lives are revealed; moments in history are uncovered. They're not only special, they are unique.

Researchers come to Pitt's special collections for what's yet undiscovered or what may shape a thesis. "A researcher may be the first to discover a letter," says Kornelia Tancheva, director of the University Library System (ULS), "and that begins a new understanding.

"In the collection we hold for jazz legend and composer Errol Garner, a Pittsburgh native, research in the letters reveals not

just context for the music he composed, but the details of the negotiations his manager, Martha Glaser, went through to protect his artistic rights in the entertainment industry," she says.

The archives are live, used by researchers, graduate and undergraduate students, practitioners, the public, and artists seeking inspiration.

One of Pitt's most noted collections is the archive of Pulitzer Prize-winning playwright August Wilson. On top of the usual research fellowships ULS offers, a new creative fellowship has just launched, offering financial support for creative artists who use the archive to generate their own creative output. Wilson's work lives on as a steppingstone to new artistic production.

The country's premier horror studies archive also is here at Pitt, shaped around the archives of the master of the genre, George Romero. The collection is growing, now focusing intentionally on underrepresented voices in that sphere—including those of female African American and Asian authors.

"This year," Tancheva says, "we hosted the reception for the StokerCon convention, which took place in Pittsburgh. We showed some of the materials in our collections. One African American author was amazed to see her work featured and told me, 'Now that I'm in the archives, nobody can erase me.' That's a testament to the power of preserving our cultural heritage." ■



FOLLOWING THE STEPS OF AMERICA'S SHAKESPEARE

LAURENCE GLASCO

Laurence Glasco has often walked the streets of Pittsburgh's historic Hill District, both by himself and with students as part of his work as the preeminent historian of Black life in the city. The experience helps him connect with playwright August Wilson – sometimes described as the American Shakespeare – who walked the same streets observing the lives around him.

Glasco, associate professor in the Dietrich School's Department of History, is writing a biography of Wilson. He says Wilson put the Hill District on the world cultural map through his 10 plays that make up the Century Cycle. "Harlem was once the iconic image of the urban Black experience," Glasco says. "Now the Hill District has become the iconic image of that experience.

"His plays are rooted in his own experience. The people and places are more than the artist's imagination; these are places and people he knew. It is a reality that goes beyond the imagination," he says.

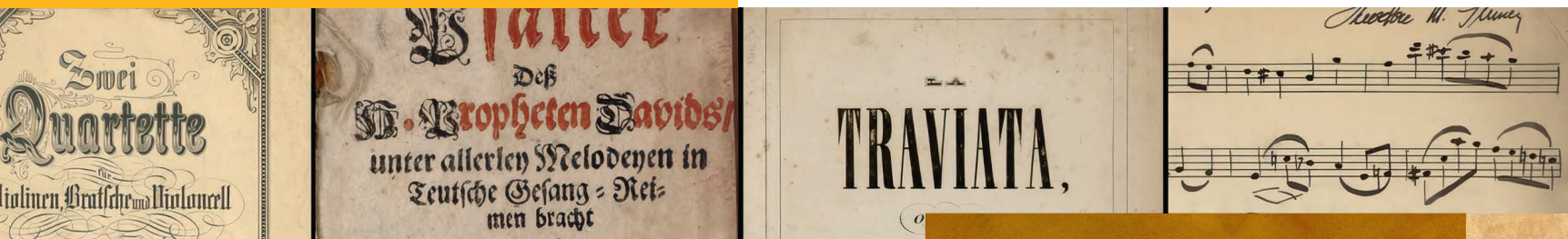
Observing, Glasco explains, was at the core of Wilson's art. He listened and wrote in public places, listened on dates, listened at the reference desk at the library. The famous confrontation in the play "Fences," between Troy Maxson and his son Cory—"Who says I gotta like you?"—was taken practically verbatim from an exchange Wilson overheard.

"HIS PLAYS ARE ROOTED IN HIS OWN EXPERIENCE. THE PEOPLE AND PLACES ARE MORE THAN THE ARTIST'S IMAGINATION; THESE ARE PLACES AND PEOPLE HE KNEW. IT IS A REALITY THAT GOES BEYOND THE IMAGINATION."

"Wilson had a photographic memory," Glasco says. "He wrote the most accurately captured Black dialogue in any medium – accurate dialogue that is poetry at the same time. He thought of himself more as a poet than a playwright."

Glasco identifies four traits in Wilson's character that characterize every male lead in his plays: An outsider who becomes an observer, a warrior who believes life is a battle and takes the punches, a Black Nationalist who follows an individual vision encompassing the complexities in life, and a poet whose love for Dylan Thomas and John Berryman left him outside the prevailing approach of activist poets like Amiri Baraka in the 1960s and '70s.

Glasco's biography of Wilson draws on Pitt's August Wilson Archive. "He saved a lot," Glasco explains. "Material like writing notes, but also receipts, letters from friends, sketches. It is an immensely rich body. With this archive available, mine will not be the last story on August Wilson." ■



WHAT DID SILENT FILMS SOUND LIKE?

If you had walked into the Metropolitan Theater in Washington, D.C., in 1921, it wouldn't just be a crowd and a screen. Between the two would be a 30-piece orchestra—violins, brass, and woodwinds—and leading them all would be Nek Mirsky, a prolific conductor and scorer of silent films.

A yearslong effort to categorize and digitize Mirsky's music collection wrapped up at Pitt this year, making it available for historians and the public amid a renewed interest in silent film. "This is really a spectacular collection," says Dietrich School Department of Music Professor Jim Cassaro. "I think it's going to have wide impact on the study of silent film."

Mirsky's collection was donated to Pitt in 1991, and with a 2021 grant from the National Endowment for the Humanities, the digitization process began. The roughly 3,500 sets of music that make up the collection are now viewable online.

It's surprising the collection survived at all, according to Cassaro, who led the project to digitize the collection as head of Pitt's Theodore M. Finney Music Library. Many collections from the time were degraded or lost due to the brittle and acidic nature of the paper that was common back then.

The collection now stands as a free online resource both for historians looking to understand how composers shaped the representation of characters onscreen in silent films and for those attempting to screen films in the same way viewers experienced them in the 1920s. ■



JIM CASSARO



EXPLORING THE GIFTS OF HORROR

"WE ARE THE FIRST AND ONLY UNIVERSITY-BASED HORROR STUDIES PROGRAM OF ITS KIND—AND HAVING GEORGE ROMERO'S PERSONAL COLLECTION PUTS PITT IN A CLASS BY ITSELF."

ADAM LOWENSTEIN

George Romero and his body of work, beginning with the 1968 classic, "Night of the Living Dead," are an essential part of Pittsburgh's identity. Romero worked in Pittsburgh as an independent filmmaker specializing in the horror genre for more than four decades.

His work lives on, thanks to Adam Lowenstein, professor of English and of film and media studies in the Dietrich School and director of Pitt's Horror Studies Working Group, who played an important role in acquiring Romero's personal collection for Pitt's Horror Studies Archive.

"We are the first and only university-based horror studies program of its kind—and having George Romero's

personal collection puts Pitt in a class by itself," he says, noting that Romero was a huge figure in establishing horror as a serious subject, given his films' juxtapositions of questions of race, class, gender, and humanity. "Romero is the perfect crystallization of horror as entertainment and horror as art, politics, culture, and history."

Lowenstein describes horror as a complex, truth-telling genre that demands people face the bad in the world, a genre that offers no easy catharsis and leaves the audience aware that the monster is still out there—and that they, too, could become the monster. "Horror's gift is to tell us things about the world when our minds are open and other ideas can slip in."

Lowenstein won a Guggenheim Fellowship to support work on an upcoming book, tentatively titled, "The Jewish Horror Film: Taboo and Redemption."

"A Jewish horror film speaks in veiled ways; Jewishness is not explicit," he says. "But think of director David Cronenberg's film "The Fly" in light of Franz Kafka's "Metamorphosis." Or the 1941 "The Wolf Man." The writer, Curt Siodmak, was a Jewish refugee from Germany. There is a scene in which the main character walks into church after being bitten by a werewolf, and the entire congregation turns to stare at him. He suddenly doesn't belong. I describe that feeling as the transformative otherness in horror—the knowledge that the ground beneath your feet can always shift." ■

CHIPPING MIGRATING MONARCHS

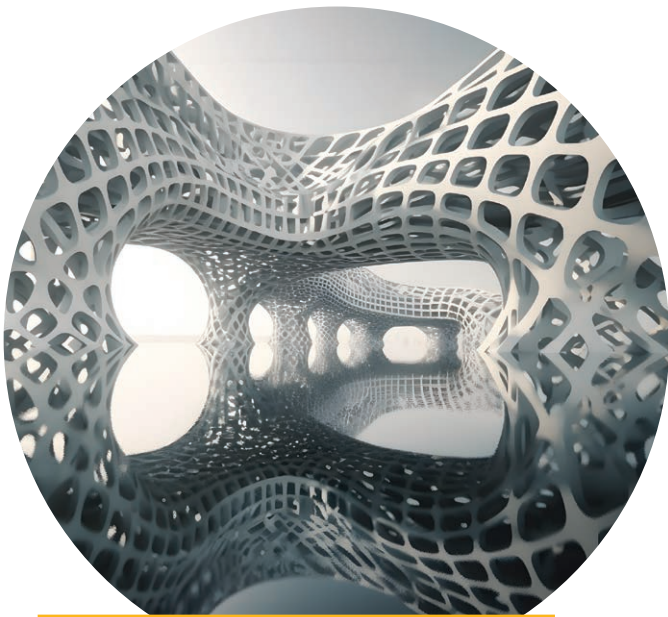


Millions of monarch butterflies migrate each fall to a specific cluster of mountain peaks in central Mexico. How exactly they navigate to their winter home, and the way they choose their path, is a topic of great interest to scientists, especially as climate change redirects their chosen path.

In Hee Lee, assistant professor of electrical and computer engineering in the Swanson School of Engineering, is part of a team developing a tracking system that could be attached to monarch butterflies and transmit data about their location throughout the three-month (or longer) journey south.

“Tracking animal migration is a critical ecosystem indicator,” says Lee. “Migrators travel long distances across entire continents, and it can give us unprecedented insight into their migratory paths, how the environment around them is changing, and how species interactions are impacted by changing movements and distributions.”

The chip is attached to the butterfly’s back and can simultaneously measure light intensity and temperature, wirelessly communicating that information to researchers once the butterflies reach their destination. The system will use a deep learning-based localization algorithm to reconstruct the butterfly’s migration. ■



CRACKING THE CONCRETE CODE

Concrete—the most used material in the construction industry, first used by ancient Romans—is getting a facelift as Pitt engineers reimagine it to create lightweight and mechanically tunable concrete systems that integrate energy harvesting and sensing functionality.

“Massive use of concrete in our infrastructure projects implies the need for developing a new generation of concrete materials that are more economical and environmentally sustainable yet offer advanced functionalities,” says Amir Alavi, assistant professor of civil and environmental engineering in the Swanson School of Engineering. “We believe we can achieve these goals by introducing a metamaterial paradigm into the development of construction materials.”

Alavi and his team have previously developed self-aware metamaterials and explored their use in applications like smart implants. Attributes like brittleness, flexibility, and shapeability can be fine-tuned in the creation of the material, enabling builders to use less of the material without sacrificing strength or longevity. It can even generate enough electricity to power roadside sensors.

Partnering with the Pennsylvania Department of Transportation and working with researchers from Johns Hopkins University, New Mexico State University, the Georgia Institute of Technology, and the Beijing Institute of Nanoenergy and Nanosystems, Alavi says, “Such lightweight and mechanically tunable concrete systems can open a door to the use of concrete in various applications, such as shock-absorbing engineered materials at airports to help slow runaway planes or seismic base isolation systems.” ■



DECIPHERING THE OCEAN'S DEPTHS

The deepest fathoms of the ocean are dark, cold, and under immense pressure. Yet, despite these harsh conditions, complex organisms like fish and crustaceans not only survive but thrive.

Understanding how those organisms have evolved to withstand their environment could be the key that allows humans to explore the depths more easily. Pitt researchers are joining an interdisciplinary team led by the Georgia Institute of Technology to tackle these unknowns.

“This environment on our own planet is as odd to us as conditions on Mars or the moons of Saturn,” says Lance Davidson, William Kepler Whiteford Professor in the Department of Bioengineering at Pitt, who joined this project with Anna Balazs, the John A. Swanson Chair of Engineering and Distinguished Professor of Chemical and Petroleum Engineering.

While Davidson’s work primarily examines the biological and mechanical properties of cells and developing embryos, Balazs’ research looks at the effects of chemistry on cell mechanics, and vice versa. Together, the team combines expertise in marine biology, biomimetic materials, chemistry, hydrogel synthesis, biohybrid material fabrication, and the design, mechanics, and dynamics of architected structures. ■



A TALE OF TWO SUSTAINABLE CITIES

While the circular economy—in which products and materials are by design kept in continual use—is being discussed at the highest levels of government and global organizations, cities, and communities are the front line of implementation. Getting a circular economy to work in practice requires collaboration among government, businesses, local stakeholders, and everyone in between.

To that end, Pitt and the University of Georgia are partnering to develop a circular economy model for cities worldwide. Pitt’s Mascaro Center for Sustainable Innovation (MCSI) and Swanson School of Engineering, along with Georgia’s College of

Engineering, are leading “A Tale of Two Cities: Optimizing Circularity from Molecules to the Built Environment,” supported by \$750,000 from the NSF’s Convergence Accelerator, which is supporting 16 multidisciplinary teams advancing the circular economy.

“We’re connecting and converging a path forward toward a circular economy across multiple materials and scales, and we’re doing it in two large metropolitan areas in geographically different regions,” says Melissa Bilec, MCSI co-director, special assistant to the provost for sustainability, and William Kepler Whiteford Professor in the Department of Civil and

Environmental Engineering in the Swanson School. “If we are successful, this model could be translated to other locations, maybe eventually scaling to thousands of cities.”

Bilec and Pitt Distinguished Service Professor Eric Beckman are co-principal investigators, working with industry, government, and non-profit partners to examine all levels of circularity, from the molecular level to the built environment. Georgia Professor of Environmental Engineering Jenna Jambeck is leading the team.

Over the next year, the researchers will use the Circularity Assessment Protocol developed by Jambeck’s

Circularity Informatics Lab to collect community-level data on material usage and management—looking at local product design and the built environment, waste collection, and infrastructure, and what kinds of materials could contaminate the environment.

Some of the data will be publicly available through the Debris Tracker open-access tool developed by Jambeck’s lab, which allows users to log litter and plastic pollution in their communities. An important part of the project is listening to the community’s needs and opinions concerning pollution, environmental justice, and more, says Bilec. ■

Per- and polyfluoroalkyl substances, known as PFAS, appear daily in the news. Dubbed “forever chemicals” because they do not break down, the compounds are linked to an increasing number of diseases, including kidney cancer. Because of PFAS’ non-stick and stain- and waterproof properties, they are found in a vast array of products as diverse as electronics, fabrics, dental floss, and firefighting foam.

PFAS are so pervasive that the problem of removing them seems almost too big to think about. That reaction is familiar to Carla Ng, associate professor in the Department of Civil and Environmental Engineering, who has become a prominent public voice on PFAS within the research community and beyond.

Work is being done at the policy and industry level to phase out PFAS. Ng cites an NSF Convergence Accelerator project led by IBM to find less-hazardous alternatives for manufacturing microchips. Some companies now advertise their products as being free from PFAS, including clothing and outdoor gear manufacturers. California is banning PFAS in materials like fast food containers, creating market forces in which startups can thrive to meet the public demand for replacements.

Working at the intersection of engineering and public health, including regional soil and water sampling projects, Ng values the interdisciplinary culture at Pitt. “It’s hard to do science today without collaborating, and that collaborative environment is one of the reasons I came to Pitt.” ■

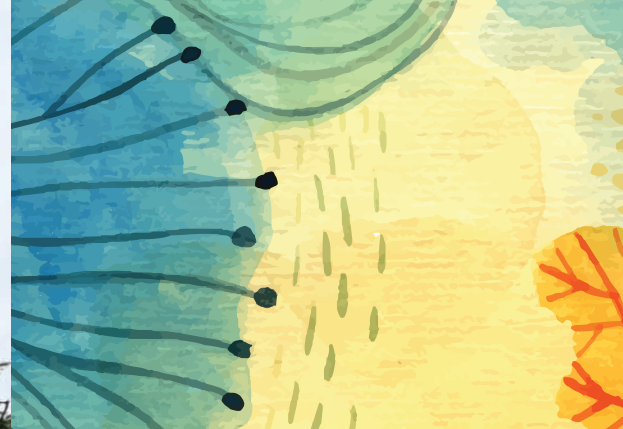
FOREVER CHEMICALS



CARLA NG

AMERICA'S ENERGY GAMBLE

SHANTI GAMPER-RABINDRAN



Shanti Gamper-Rabindran, professor in Pitt's Graduate School of Public and International Affairs, recently published the book, "America's Energy Gamble: People, Economy and Planet," which documents the obstacles, challenges, and benefits of the transition to renewable energy. The book has garnered wide attention from both specialist and popular media. She sat down for the following exchange.

Q: Does America's Energy Gamble provide ammunition for policy changes?

A: "America's Energy Gamble" explains how Americans will need to change our political and policy framework that limits choices in both the public and private sectors. We can either direct more investments into deploying renewable energy, for which the technology is cost-effective and proven, or we can direct more taxpayer subsidies into technologies like blue hydrogen and carbon capture, whose financial and technological outlook is very risky. A National Academies of Sciences, Engineering, and Medicine study found that the United States could decarbonize 75% of its electric grid by deploying clean energy and keeping some existing nuclear and fossil gas power plants.

Q: What are the "Just Transition" principles in energy transition?

A: The Just Transition envisions workers and communities shifting from reliance

on fossil fuel extractive economies to securing quality livelihoods in the greener regenerative economy. Investment in a regenerative economy—renewable energy, energy efficiency, sustainable agriculture, and ecosystem health—can generate jobs. We need to make an orderly shift of funding from the current immense support for the oil and gas industry toward making investments in fossil fuel communities and in the clean energy portfolio.

Q: How does the Pitt research community support energy transition?

A: In my work, I am conducting surveys of farmers in southwestern Pennsylvania to understand how solar projects can be designed to bring local benefits, along with my colleague Tony Kerzmann in the Department of Mechanical Engineering and Materials Science, and a team of student researchers. Many farmers are supportive of community solar projects that enable them to band together to use less-productive areas of their land to generate electricity for use in their communities.

In another project funded by the Carnegie Corporation of New York, my team is interviewing labor unions, non-profit organizations, community colleges, and others who are working on designing training programs for workers to enter the renewable energy, electrification, and energy efficiency sectors, including unions working with battery manufacturers. ■





EXTENDING AN ALLIANCE OF INNOVATION

SWANSON SCHOOL OF ENGINEERING

A novel collaboration between Pitt and an Ohio-based manufacturer is entering 10 years of risk and research—one that provides students with experience that goes beyond the typical lab setting.

Since 2014, The Lubrizol Corporation has maintained a singular partnership with the Swanson School's Department of Chemical and Petroleum Engineering, providing funding that encourages entrepreneurship and risk-taking among faculty and students while helping Lubrizol to develop new initiatives that help to transform the additive and lubrication industry.

According to Steven R. Little, Distinguished Professor and chair of the Department of Chemical and Petroleum Engineering, the alliance has leveraged advancements in manufacturing processes, external funding, and support for nearly 30 graduate and postdoctoral students. "Beyond funding, Lubrizol has shared its engineers as instructors and mentors, so not only are we developing new ideas and processes, we're also graduating the next generation of chemical engineers," he says.

Research has ranged from dispersant and lubricant production and batch reactor design to 3-D printed

filter membranes and computational modeling to create novel catalysts.

Glenn Cormack, Lubrizol's global processes innovation manager, has been involved with the relationship since its inception. "The alliance has fundamentally changed how Lubrizol develops new processes," he says.

Götz Vesper, professor of chemical and petroleum engineering, notes that a five-year U.S. Department of Energy commitment boosted projects to improve energy efficiency and lower investment requirements for American manufacturers seeking to

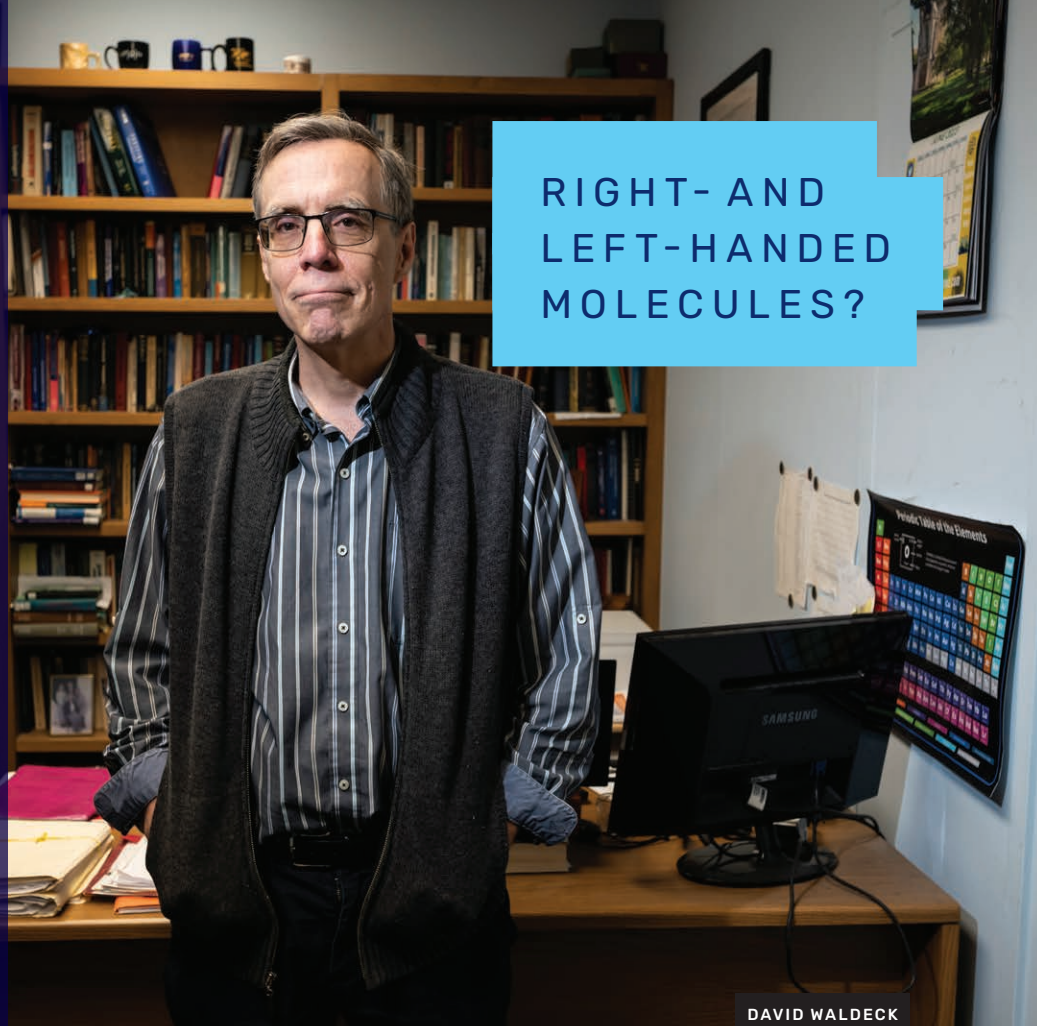
upgrade processes. Lubrizol and Pitt were able to develop prototypes and later install two new, modular processing units at global Lubrizol production sites that are drastically more energy- and cost-efficient as well as safer and smaller than conventional processes.

"For the American chemical industry, bigger has always been better, but competitors in Europe and elsewhere found that process intensification—making more with less—is key to innovation and growth in the 21st century," Vesper explains. ■

Many molecules and materials in the natural world are not superimposable on their mirror image, like your left and right hands. This property is called chirality.

David Waldeck, professor of chemistry in Dietrich School of Arts and Sciences, has earned a five-year, \$7.5 million Multidisciplinary University Research Initiative award from the Air Force Office of Scientific Research to better understand and harness the ways in which the spin of electrons interacts with the handedness of molecules. Although the charge of an electron is widely known, electrons also act like spinning tops. Waldeck has shown that the spin of an electron (clockwise or counterclockwise) affects how it moves through chiral molecules.

Waldeck is leading a team of researchers from half a dozen universities across the United States to develop theoretical models of this phenomenon and to learn how the electron's spin and a molecule's (or catalyst's) chirality can be used to improve the efficiency and selectivity of chemical and biochemical reactions. ■



RIGHT- AND LEFT-HANDED MOLECULES?

DAVID WALDECK

PITT WRITES THE BOOK ON WORKPLACE SAFETY

Ten years after establishing the first industrial engineering program in 1921, Pitt launched a new concept—"safety engineering." After a long hiatus, it relaunched in 2016 under the leadership and innovation of one of the country's leading safety engineers, Joel Haight.

"The safety engineer is a critical role that requires an individual to understand, characterize, quantify, and fix the complex hazards of dynamic industrial processes," says Haight, professor of industrial engineering. "In today's complex working environments, whether an assembly line, hospital, or nuclear plant, safety engineering maintains worker health, ensures efficiency, and helps to reduce costs."

Haight has edited and co-authored all three editions of the "Safety Professionals Handbook," a critical reference for safety professionals. For its newest edition, Haight added three new sections covering global sustainability, management systems, and leadership, and expanded on former topics like ergonomics, fire protection engineering, engineering management, and risk management. Karen Bursic, professor of industrial engineering and undergraduate program director at Pitt, worked with him to expand the sections on economics and people management. ■



JOEL HAIGHT



TRACING THE LIVES OF HEBREW BOOKS

ADAM SHEAR

How did knowledge spread in the time between the invention of the printing press and the advent of mass media?

“Books are the material form in which ideas move around,” says Adam Shear. “If we know one individual’s reading, we can see a micro-history. If we aggregate the data of what books were owned by many individuals where and when, we can see broader trends.”

Shear collaborates on a project documenting evidence for books that circulated in other places and times after they came off the printing press. “Footprints” is a collaboration that includes researchers at Columbia University, the Jewish Theological Seminary, and the University of Pennsylvania working with

Shear, associate professor and chair of the Dietrich School’s Department of Religious Studies.

The initiative develops tools for scholars to collect evidence tracking the locations of Hebrew books printed before 1800, and to contribute information on individual books to a growing body of data giving a picture of the movements of Hebrew books and the people who owned them. The concept is to document physical evidence of one book at one point, touched by one user.

The project recently won a Digital Innovation Award from the Renaissance Society of America for its excellence in supporting the study of the Renaissance.

The concept is now being used in other areas, including in the study of manuscripts

and books in other languages. Shear sees possibilities in expanding databases to incorporate material from book sellers, catalogs, and books mentioned in other sources.

One problematic area of documenting Hebrew books from the period before 1800 is that evidence of a book’s presence at one time may be a mark from a censor. During the Catholic Inquisition, Jews were routinely required to bring their books to be examined by censors, who would cross out objectionable passages and sign the book as approved.

“It was oppression,” says Shear. “But behind the oppression was a Jewish owner of that book. We are recovering the owner.” ■

THE FABRIC OF COMMUNITIES

Public art is fundamental to the fabric of communities, says Caitlin Bruce, associate professor of communication in the Kenneth P. Dietrich School of Arts and Sciences. Her work exploring how murals and graffiti vivify public spaces has led to jaunts through streets and alleys all over the world, as far away as Paris, France, and as close as the neighborhoods surrounding Pitt's campus.

"When people talk about the impact of public art in an area, they often speak of positive, energetic shifts in their neighborhoods. The art can invite viewers to experience a kind of warmth, intimacy, and joy," Bruce says.

Her forthcoming book, "Voices in Aerosol: Youth Culture, Institutional Attunement and Graffiti in Urban Mexico," is a case study of a Mexican city government's shifting relationship with graffiti artists over an 18-year period. Bruce chronicles what happened when writers and officials in León, Mexico, introduced a legal graffiti program and its bearing on urban planning, local politics, and gentrification.

Bruce has contributed to Pittsburgh's public art scene not just as a scholar but also as an incubator. In 2016, she co-founded "Hemispheric Conversations: Urban Art Program" with multidisciplinary creators to provide educational opportunities to youths and adults and create a framework where scholars and street artists can converse about the aesthetics of urban art production.

A 2022-23 Pitt Momentum Funds Priming Grant fosters her work with Hemispheric Conversations, telling visual stories about Pittsburgh communities grappling with crisis and attempting to heal. ■

CAITLIN BRUCE





EXPLORING HOW
DISINFORMATION
SPREADS

From left: YU-RU LIN, MALIHE ALIKHANI

“In this digital age, social media is like a double-edged sword,” says Yu-Ru Lin, associate professor in the School of Computing and Information, and research and academic director for Pitt’s Institute for Cyber Law, Policy, and Security. Lin, who focuses on the spread of disinformation, misinformation, and extremism across social networks, says that social media makes us more connected to others, but also to those disseminating disinformation and misinformation.

Instead of flagging content and people on social media networks to have them removed, Lin wants to understand why people spread this content. What are the dynamics at play among social media platforms, communications networks, and the social and psychological tendencies of people who spread disinformation and misinformation?

With funding from Meta, Lin and her team are developing a model to track and analyze the spread of conspiracy theories and how they influence individuals. “We need to know how the information ecosystem facilitates the dissemination of harmful information in order to counter its misuse,” she says. Funding from the U.S. Department of Defense will support her research into extremism and how it spreads in countries around the world. ■



LOW-PRESSURE
LABS IN
WHICH TO
EXPERIMENT

There’s nowhere quite like the Center for Creativity’s three unique spaces where Pitt students, faculty, and staff from across disciplines are invited to “risk boldness,” and develop the skills any good researcher needs: A willingness to experiment in unexpected ways and the humility that comes with making and fixing mistakes. ■

»» The Workshop is a maker space that offers free materials such as typewriters, paint, a 3-D printer, with an emphasis on creation rather than product.



»» The Text & conText Lab encourages “the creation, manipulation, and/or disassembly of text.” The space offers visitors access to bookbinding, papermaking, and printing presses.



»» The Understory, in the basement of Pitt’s historic Cathedral of Learning, offers a stage, a podcast studio, sewing machines, and musical accoutrements to explore dance, music, theater, and puppetry.



DEVELOPING A TEXTBOOK FOR AN INDIGENOUS LANGUAGE

What do the words “llama” and “jerky” have in common? These words come from Quechua, a family of languages originating in the Andes region of South America, says Alana DeLoge, an instructor in the Department of Linguistics in the Dietrich School of Arts and Sciences, and the Quechua program coordinator in the Less-Commonly-Taught Languages Center. DeLoge investigates the linguistic vitality of Quechua while engaging in practices of language revitalization through an overlap of research and teaching.

Spanning time zones and international borders, the Quechua Innovation and Teaching Initiative (QINTI) project team is developing an open-source textbook on Quechua to support the global community of approximately 8 million Quechua speakers. “Ayni,” or reciprocity, is the title of the textbook because it is a guiding principle of Andean life and astutely acknowledges that communication requires a balance of give and take.

The textbook will cover three varieties of the language in narrative format with characters that speak in each language while still understanding the other. DeLoge, who has done research for nearly 20 years in Bolivia, collaborates on the QINTI project through funding from Pitt’s Center for Latin American Studies and other institutions with colleagues at the University of Illinois Urbana-Champaign and Rowan University, as well as community members across the Americas in hosting events to engage and connect Quechua speakers in meaningful ways. ■



ALANA DELOGE



From left: KRISTEN L. ECKSTRAND, CHRISTINE CALL, NABILA JAMAL-OROZCO, LORRAINE BLATT

MAKING DEMOGRAPHICS INCLUSIVE AND INTENTIONAL

Research scientists have plenty of opportunities to think about how they are asking, why they are asking, and the repercussions of asking—or omitting—particular questions about demographics.

Christine Call, a postdoctoral researcher in the Department of Psychiatry, has been working with colleagues Kristen L. Eckstrand, assistant professor of psychiatry, and Lorraine Blatt and Nabila Jamal-Orozco, both psychology graduate students in the Learning Research and Development Center, to encourage researchers to think differently about how and why they use demographic data.

Their paper on an ethics and social-justice approach to collecting and using demographic data, published in the journal “Perspectives on Psychological Science,” serves as a roadmap.

“We often become entrenched in the patterns in which we do things,” Eckstrand says. “One reason we wrote this was to give people a reason to rethink those patterns. Sometimes we choose to make a decision depending on whether we feel compelled by a rationale to do it. This paper was an opportunity to give people a rationale to think about things a bit differently.”



CONSIDER:

- **ARE DEMOGRAPHIC OPTIONS INCLUSIVE?**
 Listing only “man” or “woman” as options when people don’t identify with either can be a signal that researchers don’t find a person’s identity valid.
- **ARE THEY RELEVANT?**
 If someone is studying racial or ethnic differences, they typically default to U.S. Census categories. But those categories leave out some identities, and they are socially constructed. “Researchers need to ask the right questions to determine what’s most relevant to what they actually want to know,” Blatt says.
- **ARE THEY REPRESENTATIVE?**
 Researchers need to ensure they are recruiting representative samples for their studies. “Right now,” Call says, “we see that is not the case. We still have largely white, educated, industrialized, rich, and Democratic samples.”
- **ARE THEY HARMFUL?**
 “Researchers must be careful that we’re not using data in a way that can harm communities and that we’re not centering the wrong thing. We need to be careful that we’re not attributing the inequity to the social characteristics, but to the factors that create them,” says Call.
- **ARE THEY MADE WITH INTENTIONALITY?**
 “Intentionality in demographic data collection is essential for promoting ethical practices, social justice, and equitable outcomes,” Jamal-Orozco says. “It empowers individuals by valuing their identities and experiences, identifies disparities, informs targeted interventions, and helps build a more inclusive and just society for all.”

AT THE CENTER OF THE ABORTION BATTLEGROUND



GREER DONLEY

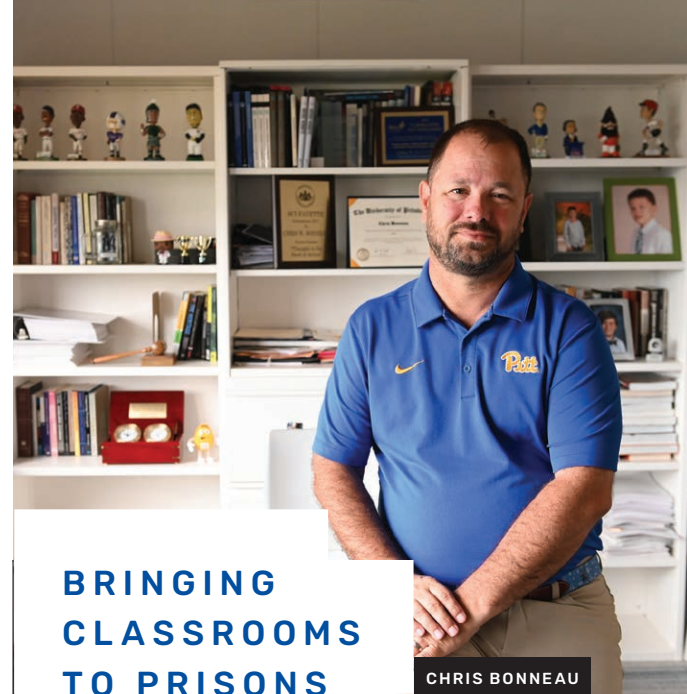
The night that Ruth Bader Ginsburg died, Greer Donley knew that *Roe v. Wade*—the landmark U.S. Supreme Court decision—would be overturned.

A year and a half later, Donley, associate professor of law, associate dean for research and faculty development, and John E. Murray Faculty Scholar in Pitt's School of Law, co-authored a paper titled, "The New Abortion Battleground," that foreshadowed *Roe*'s reversal and the battles it would spark, both among states and between states and the federal government. Four months later, *Roe* was overturned and the interjurisdictional battles began.

It also began a whirlwind year for Donley. The paper was cited in the *Dobbs v. Jackson Women's Health Organization* dissenting opinion, was downloaded tens of thousands of times, and was covered by major news outlets.

Donley and her collaborators worked to put their ideas into practice, drafting legislation and writing opinion pieces, including essays in "The New York Times" on the role of the federal government to protect abortion rights, and the role of abortion-supportive states.

"In some sense, the disruption of *Roe* created openings for people with new ideas," Donley says. Since the *Roe* decision 50 years ago, reproductive scholars have been working within the same framework. Donley has a background in U.S. Food and Drug Administration law, which quickly became relevant as medication abortion (an abortion completed with pills alone) is now a defining difference between a pre- and post-*Roe* America. ■



BRINGING CLASSROOMS TO PRISONS

CHRIS BONNEAU

"I basically have to work two weeks in advance all the time," says Chris Bonneau, political science professor in the Dietrich School. He must send hard copies of reading materials to students early. And if he gets to the classroom and realizes he forgot something? Too bad.

That's because, by design, once you have entered a prison, you cannot come and go as you please.

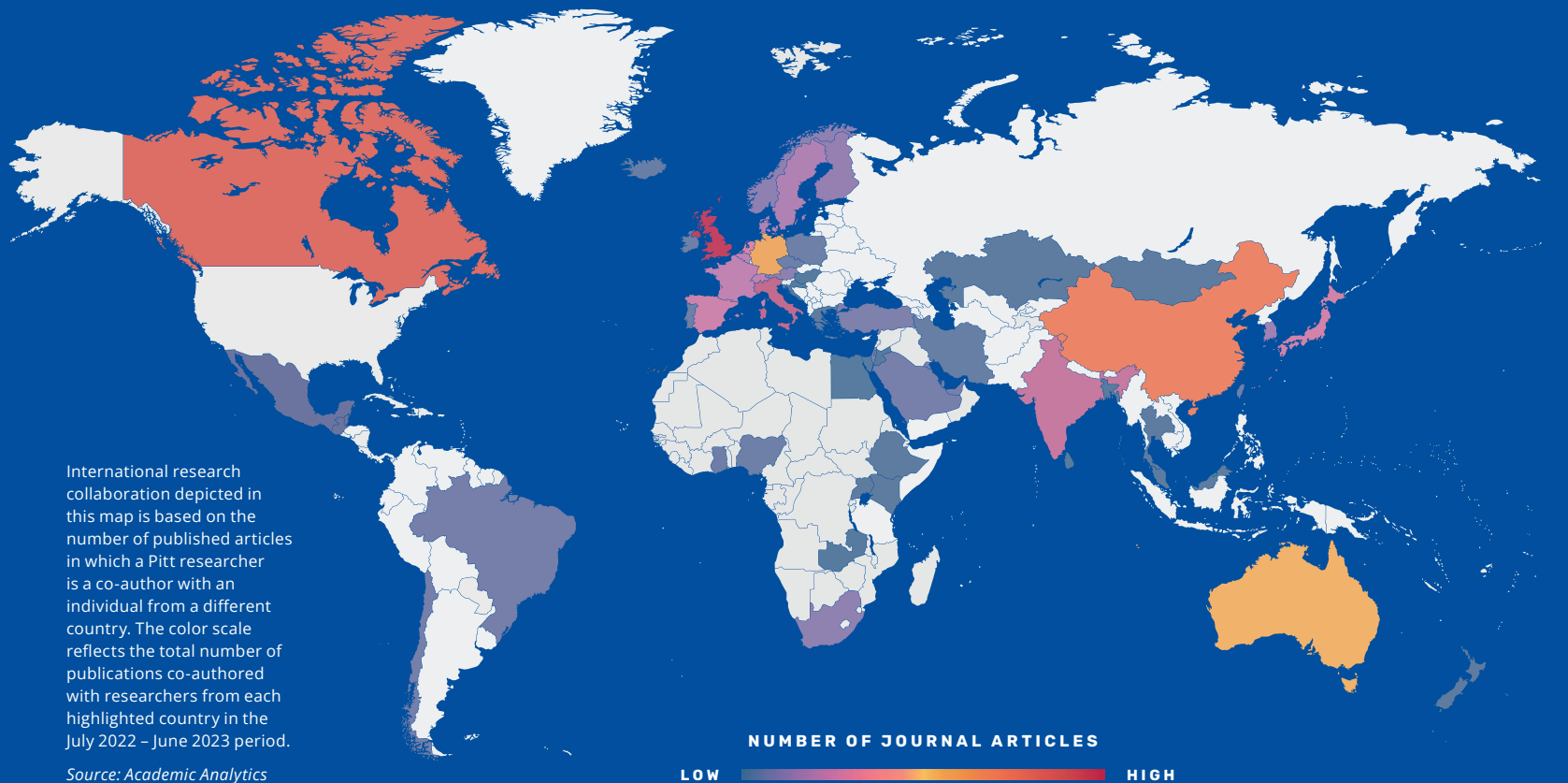
Bonneau co-founded the Prison Education Program (PEP) in 2016. The program offers courses on a variety of subjects for 32 students, 16 from Pitt and 16 from one of the four prisons that the program works with, including its original partner, State Correctional Institution Fayette in La Belle, Pennsylvania.

In many ways, his PEP classes are just like any other. He teaches the same subjects, and all students get college credits. In other ways, however, PEP classes are unlike anything most people will ever experience.

PEP participation has grown—not just in the number of institutions, but also in the number of instructors. From anthropology and English to music and law, the offerings continue to expand, strengthening ties with parts of local communities that have historically been ignored. ■

International research collaboration depicted in this map is based on the number of published articles in which a Pitt researcher is a co-author with an individual from a different country. The color scale reflects the total number of publications co-authored with researchers from each highlighted country in the July 2022 – June 2023 period.

Source: Academic Analytics



NUMBER OF JOURNAL ARTICLES

LOW

HIGH

BREAKDOWN OF TOP 10 COUNTRIES

NUMBER OF JOURNAL ARTICLES

	1	United Kingdom	60
	2	Canada	49
	3	People's Republic of China	43
	4	Germany	34
	5	Australia	33
	6	The Netherlands	19
	7	Italy	18
	8	India	17
	9	Spain	16
	10	Switzerland	15

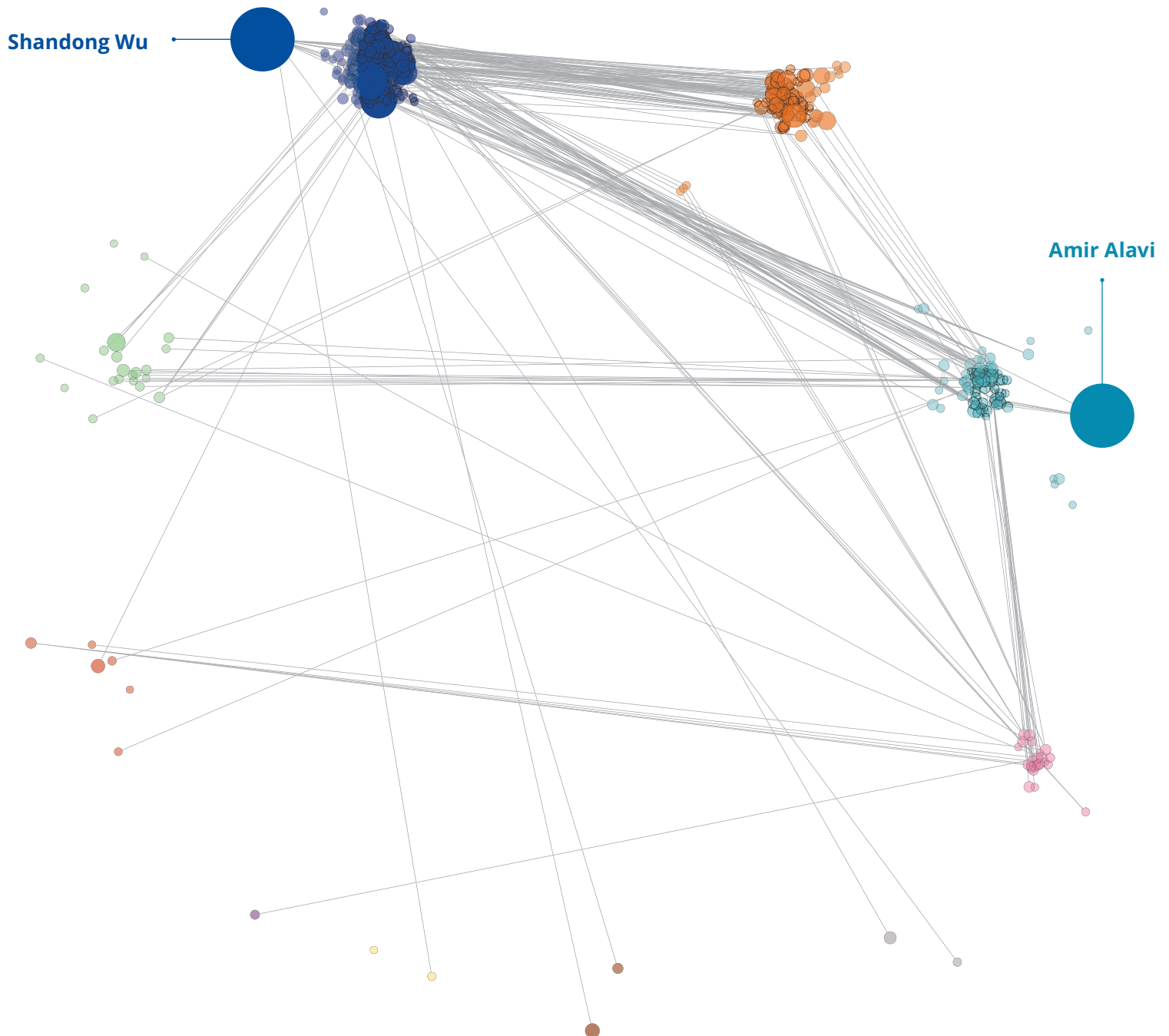
Top 10 countries in terms of number of articles resulting from collaborations between individuals from a given country and Pitt researchers. Total number of articles include journal articles that were published from July 2022 to June 2023.

Source: Academic Analytics

AI CONVERGENCE AT PITT

INSPIRING RESEARCH COLLABORATION
FOR A TRANSFORMATIVE FUTURE

This network graph illustrates collaboration in research proposals covering Artificial Intelligence-related topics submitted during FY 2023. We have extracted the nodes representing principal investigators of these proposals, along with their collaborators, from the research network graph in the underlying page to create Pitt's AI research network.



Shandong Wu

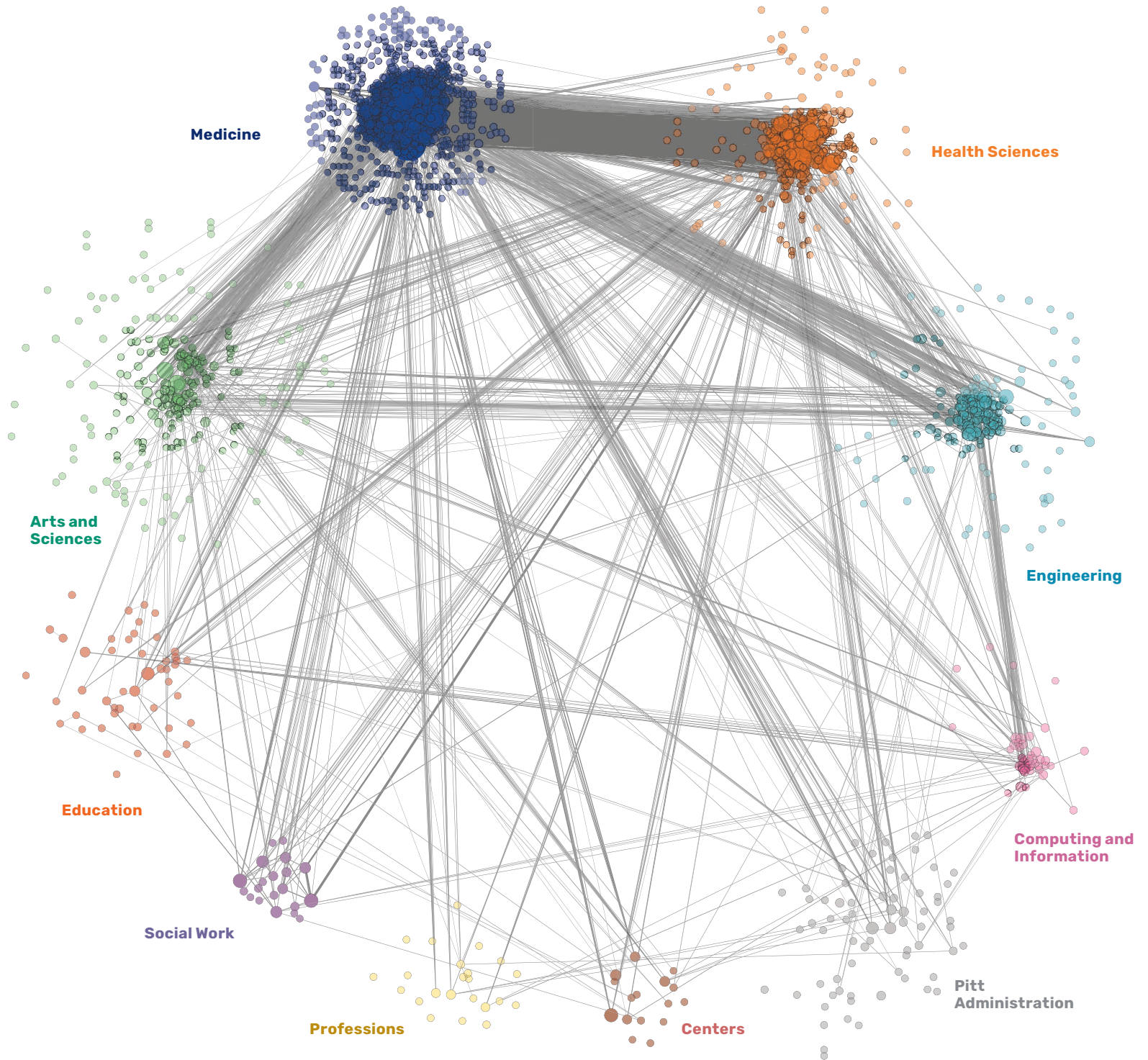
Innovating medical imaging AI for diverse diseases, from breast cancer to brain injury, with a focus on trustworthy clinical applications



Amir Alavi

Creating materials with cognition and primitive intelligence at nano, micro, and macro scales

PITT RESEARCH SOCIAL NETWORK



Our research network graph unveils the power of collaboration for impactful research at Pitt. Lines (edges) connect individuals working together on proposals, who are represented by circles (nodes). The circle (node) color indicates the responsibility center or school to which an individual is affiliated.

LITERACY AND WORK IN
THE DIGITAL WORLD

MORGAN FRANK

Morgan Frank, assistant professor in the Department of Informatics and Networked Systems at the School of Computing and Information, is working to create maps to identify and quantify what skills thrive and decline in the face of technological change, and what areas face the biggest impacts. Maps of how skills are grouped, he believes, will help workers and organizations prepare for the new technology—or adjust on the fly with real-time information.

Even for a researcher whose work is enmeshed in the computing world, Frank says

he could not have imagined the new pace of change. “The worst possibility is mass technology unemployment,” he says. “We hope to prevent that by looking at the probabilities of automation in different jobs.

“Generative AI is the first big jump in my awareness of my own use of the technology. It’s shattering assumptions.” Frank displays a generative AI program that receives plain English commands to generate computer code—for decades a foundational task in tech jobs. “This ability did not exist a year ago,” he says. ■

BEYOND USING ARTIFICIAL INTELLIGENCE (AI), RESEARCHERS AT PITT ARE EXAMINING AI ITSELF. IN WHAT WAYS DOES THE ACCELERATING TECHNOLOGY IMPACT LIFE NOW AND IN THE RAPIDLY APPROACHING FUTURE? IN A WORLD OF GENERATIVE AI LIKE CHATGPT, WHAT WILL WORK AND LITERACY LOOK LIKE?



ANNETTE VEE

Annette Vee, associate professor and director of Pitt’s Composition Program in the Dietrich School of Arts and Sciences’ Department of English, works to develop awareness of the technology we engage. Her 2017 book, “Coding Literacy: How Computer Code Is Changing Writing,” is a basic text in digital humanities and computer science education.

“It is crucial to have general education about our roles as humans in an increasingly digitized world,” she says. “It is literacy for citizenship so we can make informed decisions.

We need to engage and be aware of how the technology works.

“AI raises an existential question: What is the point of writing? Do we need the same kind of writing for all spaces? In history, writing has always been central to bureaucracy. A lot of it is rote, not learning, not thinking,” Vee says. “It is important for any writer to engage and know how to use the tools, from entry-level people to senior leaders, to be able to tailor AI for templated writing.” ■

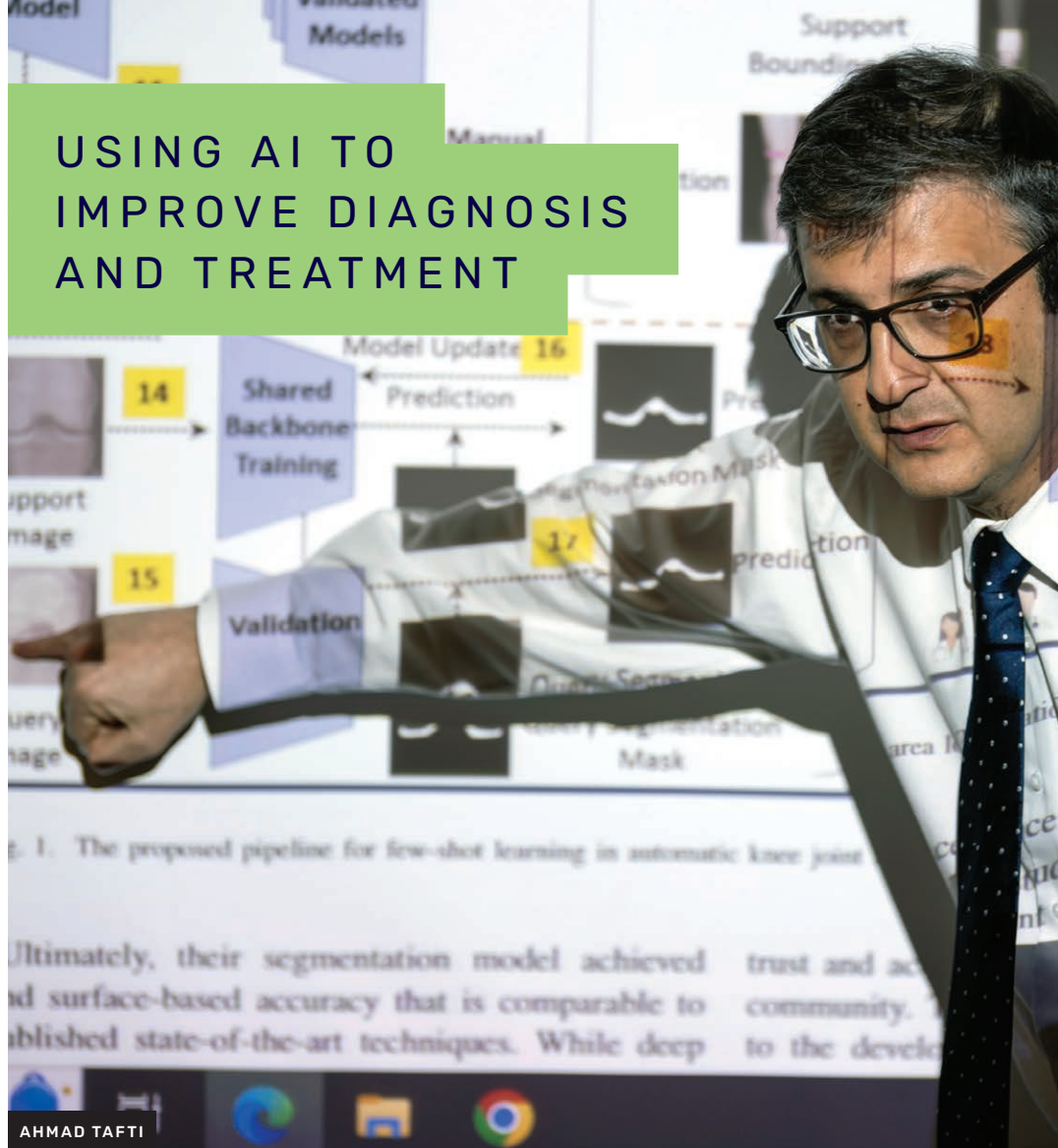
USING AI TO IMPROVE DIAGNOSIS AND TREATMENT

The stresses on health care workers from COVID-19 compounded existing problems with medical errors. Now Pitt is at the center of a collaboration with Pittsburgh's Jewish Healthcare Foundation to reduce medical errors by bringing together the medical, AI, and robotics expertise in Pittsburgh to develop autonomous patient safety technologies. Called the Regional Autonomous Patient Safety Initiative, the project aims not only to reduce medical errors but to put Pittsburgh on the map as a global hub in a new industry.

Pitt's Department of Biomedical Informatics, and Schools of Medicine, Pharmacy, and Public Health are developing technology to reduce adverse drug events when senior patients transition between skilled nursing and other care facilities. At the core of the project is a decision support system bringing together multiple forms of data—such as medications recorded in a patient's electronic health records—to train an autonomous AI-based technology in an easy-to-use format for providers.

"We hope to prevent medication errors such as accidentally overlooking someone's depression medication in a care transition," says Richard D. Boyce, associate professor of biomedical informatics and principal investigator on the project. "Transitions are an intervention point to create automated detection of medication errors."

Elsewhere on campus, at Pitt's HexAI Research Laboratory (where HexAI stands for Health + Explainable AI), led by Health Informatics Assistant Professor Ahmad Tafti, researchers and scientists from medical and rehabilitation disciplines are developing AI models to tackle clinical challenges. From total joint arthroplasty to stroke recovery, the groundbreaking research at the lab is improving the ability of physicians to provide more accurate diagnoses and effective treatments for their patients and helping rehabilitation providers assess the quality and consistency of intervention delivery in real-world settings. ■



CONNECTING
BLACK-OWNED
BUSINESSES
WITH THE
STUDENT MARKET

“OUR ULTIMATE
GOAL IS THAT
THE BUSINESSES
COLLABORATING
WITH US SUCCEED
BROADLY, AND
CONNECTING
THEM WITH PITT
STUDENTS IS
HOPEFULLY
PART OF THEIR
SUCCESS.”

MICHAEL HAMILTON

Michael Hamilton studies pricing strategies in markets ranging from online dating services and virtual objects in video games, to “opaque products,” where the customer finds out about features like color only after the purchase.

He also works to connect businesses with new markets. Hamilton, an assistant professor of business analytics and operations at the Joseph M. Katz Graduate School of Business, is part of a grassroots project that collaborates with community partners to connect Black-owned businesses in the Homewood neighborhood of Pittsburgh with the market of college students. The online platform developed by the project—412Connect—aims to coordinate interactions between student users and participating businesses using targeted recommendations via social media.

The 412Connect platform is not a search engine with large lists of Black-owned businesses, but instead highlights a specific group of businesses that work with the project to improve their digital presence and engagement with university students. The site features interactive games like a scavenger hunt as a way to keep students coming back to the site. Performance is measured by new follows on social media.

The project began with the group Grief to Action within the Center for Analytical Approaches to Social Innovation. Undergraduate

students Colin Griffen and Tyler Olin built the original version of the website with support from Alex DiChristofano, a graduate student at Washington University. The project won the New Horizons Award for Bridging Research and Practice at the first Association for Computing Machinery Conference on Equity and Access in Algorithms, Mechanisms, and Optimization in 2021.

“This project was started during the early days of the pandemic, and in the wake of George Floyd’s murder,” says Hamilton. “It began at a moment in time when members of the University community were looking for a way to make a positive impact in our city. My academic interest in the project is from the perspective of market design—the types of rules you can impose on markets to make them function better.”

It is an all-volunteer project across Pitt, connecting such entities as the School of Computing and Information, Graduate School of Public and International Affairs, and Department of Economics in the Dietrich School of Arts and Sciences.

“Small businesses have problems with reach and it’s really difficult and important to be in the conversation when consumers are looking for a service,” Hamilton says. “Our ultimate goal is that the businesses collaborating with us succeed broadly, and connecting them with Pitt students is hopefully part of their success.” ■



PITT'S UNEXPECTED STATURE IN LATIN AMERICA

CARMELO MESA-LAGO

Pitt hosts one of the most prominent Latin American studies programs in the United States. For several decades, graduate students from all over Latin America have studied at Pitt and returned home to work in academia, government, and business.

The stature of the Center for Latin American Studies is in large part due to the work of Carmelo Mesa-Lago, who directed the center from 1974 to 1986, after he began as assistant director in 1967. One of the world's leading scholars of Cuba (he appears regularly in global Spanish-language media and conferences), Mesa-Lago is Distinguished Service Professor Emeritus of Economics and Latin American Studies at Pitt.

"Being director of the Center for Latin American Studies was one of the most important things in my life," Mesa-Lago says. "We developed a program that is among the best in the world."

Mesa-Lago describes his main field as social security—meaning how a society provides its people with health care, pensions, unemployment aid, and social assistance. He is especially known for his work on the adverse impact of pension privatization in Latin America.

Now 89, Mesa-Lago just finished what he describes as his most controversial book—a comparison of the economies of China, Vietnam, and Cuba. He documents the sad state of the Cuban economy and compares Cuba with two countries that improved their economies and lives of their people while the Communist Party remained firmly in control.

Frustration accompanies working on Cuba for 65 years. "The economic crisis in Cuba now is worse than after the end of aid from the Soviet Union in the 1990s," he says. "At the time of the revolution in 1959, Cuba was the second- or third-most developed country in Latin America. Ninety-five percent of the Cuban

population supported the revolution and there was international good will to help Fidel Castro make Cuba the most economically and socially advanced society in Latin America. Now the advances of the revolution are destroyed."

Mesa-Lago has been criticized by both opponents and supporters of the Communist government. In 2007, he shared an award from the International Labor Organization in Geneva, Switzerland, with former South African President and Nobel Peace Prize laureate Nelson Mandela. As Mesa-Lago began his speech, the Cuban delegation walked out of the room.

"But then people in Miami call me a Communist. I think that is the political price of objectivity." He stresses that he is not a counter-revolutionary. "The revolution and the counter-revolution are now two competing fantasies." ■



KIRK SAVAGE

When art historian Kirk Savage tucked a provocative suggestion into his 2009 book, “Monument Wars,” he figured it would go ignored or be written off as untenable. But, to his surprise, the public art world was ready to embrace the idea of ephemeral monuments.

For Savage, the William S. Dietrich II Professor in the Dietrich School’s Department of History of Art and Architecture, producing ephemeral, or temporary, public art is an opportunity

to sidestep the often inscrutable process of placing permanent memorials and monuments and to tap into fresh ideas and more diverse voices.

The idea caught the attention of the National Capital Planning Commission in Washington, D.C., and Paul Farber, a co-founder of Monument Lab. Over the past several years, the planning commission and the public art nonprofit, alongside the Trust for the National Mall, have grown that idea into Beyond Granite, an initiative designed

to “create a more inclusive, equitable and representative commemorative landscape on the National Mall.” The inaugural exhibition, Pulling Together, funded by the Andrew W. Mellon Foundation, placed work from six contemporary artists of color in and around the Lincoln Memorial and Reflecting Pool.

Savage, who has been studying the impetus and impact of public monuments and memorials for nearly three decades, was thrust into the spotlight in 2017 as



the country grappled with the future of Confederate monuments. He became an in-demand expert, offering analysis and insight.

Savage's contention has always been that permanent, public art should reflect the experiences of the many rather than the specific agendas and ideals of a few. Only then can art truly represent history rather than obscuring it. One way to accomplish that goal is to engage the public in the planning process. Another is to commission temporary works from a range

of artists to "speak to society as its needs and perspectives change," says Savage. Monument Lab seeks to do both.

Savage is also co-authoring a book with his wife, Elizabeth Thomas, about a group from the Cherokee Nation who were able to escape the Trail of Tears. Until now, that story has focused largely on Thomas' great-great grandfather, a white man who acted as their agent, rather than the hundreds of Cherokees who took great risks to fight the relocation. He also authored a magazine article about a North Carolina man who,

upon his death, gifted his land to the enslaved people who worked it as an act of reparation. The family had the will reversed in court, establishing a long-debated civil rights law in the state.

Though neither project specifically involves public art, they pull on the same thread that runs through all of Savage's research—seeking to give voice to those who history made voiceless. "They've been drowned out for too long," Savage says. ■

COLLABORATORY AIMING FOR WHAT WATER CAN BE

In the same way a watercourse guides and shapes the flow of moving water, the Pittsburgh Collaboratory for Water Research, Education, and Outreach is reliant on its community-based collaborators to successfully navigate the serious and complex regional challenges resulting from sewage overflow, aging infrastructure, and industrial contamination.

“We wanted community engagement to be front and center with everything we do,” says co-founder Emily Elliott, professor in the Dietrich School’s Department of Geology and Environmental Science.

Five years ago, Elliott and a handful of peers felt that their research wasn’t getting to those who could use it most, and they couldn’t get a foothold in regional and local conversations about water. Graduate students and faculty were frustrated.

“This is just not enough,” Elliott thought. “Doing important research, publishing it in a journal—it doesn’t matter. It’s not making a difference.”

Five faculty members proposed a pilot program to The Heinz Endowments. Now the Water Collaboratory is a network of faculty members in disciplines from economics

to engineering, with the majority residing in the Department of Geology and Environmental Science. They support a dozen graduate students and work with more than 100 community partners. Investigators have so far received more than \$7 million in funding from the National Science Foundation and other federal agencies.

In 2022, nominated by the Office of the Senior Vice Chancellor for Research, the Water Collaboratory was awarded the Center for Advancing Research Impact in Society Impact Goals award for its commitment to benefiting society by making data and expertise accessible to those who need it; ensuring that research responds to real needs; and preparing students to solve real-world challenges.

Partnerships with community groups, such as Women for a Healthy Environment, have led to the collection of more and better-quality empirical data—facts and figures that can be used to further science, lobby for resources, and help continue to drive positive change. The Water Collaboratory and partners have made scientific findings, revealed inequities and neglect, and are crafting an image of what the future of water in the region could be. ■





From left: EMILY ELLIOTT, HAILEY MCGARRITY



PITT HELPING TO DEVELOP RESEARCH SECURITY TRAINING

Pitt is part of a consortium of academic institutions selected by NSF to develop training modules for the federal government on key issues in research security. New federal mandates intended to protect U.S. research interests from foreign and domestic risks require that recipients of federal research funding receive annual training about issues such as assessing and managing collaborations and protecting unpublished data and intellectual property.

A Pitt team headed by Bill Yates, vice chancellor for research protections, is collaborating with the University of Chicago, University of Pennsylvania, University of Wisconsin-Madison, and Van Andel Institute to create a training module focused on risk management and mitigation. The module will show researchers and their institutions ways to assess, reduce, and manage security risks in research. Volunteers at Pitt from graduate students to professors and research administrators, are participating in focus groups to help develop the new training. ■

BEFORE CONVERGENCE WAS COOL

“We were convergent before convergence was cool,” says Rory Cooper, founding director of the Human Engineering Research Laboratories (HERL), Distinguished Professor in Pitt’s School of Health and Rehabilitation Sciences, and assistant vice chancellor for research for STEM-health sciences collaborations. At HERL, engineers, physicians, therapists, rehabilitation specialists, and sometimes artists work together to improve the mobility and function of people with disabilities.

“The only way to really solve the more complex and interesting problems is by working with teams with different experiences, perspectives, and educational backgrounds,” Cooper says. Bringing many disciplines together to form one discipline was his vision from HERL’s inception nearly 30 years ago.

Cooper isn’t just looking for people with different letters attached to the end of their names, though. “We need ethnic diversity, people with disabilities, veterans, and people with unique life experiences,” he says. “All are needed to solve important problems.” ■



“THE ONLY WAY TO REALLY SOLVE THE MORE COMPLEX AND INTERESTING PROBLEMS IS BY WORKING WITH TEAMS WITH DIFFERENT EXPERIENCES, PERSPECTIVES, AND EDUCATIONAL BACKGROUNDS.”

RORY COOPER

BIG PROPOSAL BOOTCAMP COACHES RESEARCHERS PURSUING BIG AWARDS

Pitt researchers are increasingly reaching for big awards. They’re attacking big problems with interdisciplinary teams within Pitt and beyond.

Big Proposal Bootcamp offers in-depth training for researchers on crafting proposals for large-scale, cross-disciplinary projects. Few, if any, other research universities offer similar training.

Launched in 2019, Big Proposal Bootcamp is an 11-week program that introduces a small cohort of faculty members to the needed skills and connects them to Pitt’s diverse resources. In addition to the training, the final week is a pitch competition with a \$20,000 prize for the most promising proposal concept.

“We want to put in place the resources that will help them put these teams together,” says Rob A. Rutenbar, Pitt senior vice chancellor for research. “Fields differ in the cost of performing research; they differ in the language they use to describe research questions; they differ in methods; they differ in their

cadence of publishing results. All these factors and more can impede creating teams that span fields.”

Big Proposal Bootcamp presents researchers with the common components of bigger awards – some of which are less familiar to many faculty – and uses case studies to illustrate the project planning, complex budgeting, team management, and partner ecosystem development that faculty will encounter in building these big proposals. Research administrators are able to attend a separate Big Proposal Bootcamp offered for staff.

“Knowing how federal agencies and foundations make large strategic investments in team-based research and review big proposals is unfamiliar territory for many faculty,” says Michael Holland, vice chancellor for science policy and research strategies. “We have the expertise in the Office of the Senior Vice Chancellor for Research to know how these investments come together. We want to position our faculty for success as they pursue these funds.” ■

Corinne Richards-Zawacki is a Big Proposal Bootcamp success story. A professor in the Dietrich School's Department of Biological Sciences, she participated in the 2020 Big Proposal Bootcamp and won the pitch day competition prize. That pitch became the core of a successful proposal to NSF for a five-year \$12.5 million grant to develop a biology integration institute and allow Pitt to collaborate with researchers at eight other institutions—including the University of California, Berkeley, and the University of Massachusetts Boston—to study amphibian resilience to disease threats.

The institute—Resilience Institute Bridging Biological Training and Research, or RIBBiTR (frogs are at the center of the work)—integrates researchers across sub-disciplines in biological sciences to better understand how living systems achieve resilience to emerging infectious diseases and other global change stressors.

The teams have successfully developed shared protocols for field data collection and are completing a second year of field data collection in locations as far-flung as Pitt's Pymatuning Laboratory of Ecology, where Richards-Zawacki is director, and California's Sierra Nevada mountain range, Central Panama and the Atlantic Forest of Brazil.

Researchers are sifting through decades of data laying the foundation for a database that is updated in real time with data recorded on smartphones using an app that works even from remote field sites. The team also is detecting rare species using automated acoustic monitoring devices developed at Pitt.

"We detected a critically endangered species—*Atelopus varius*—in a site where we had not seen it for many years," Richards-Zawacki says. The teams also developed a new method for detecting chytridiomycosis (a fungal disease) and can tell if a frog is infected in remote field sites in real time. Richards-Zawacki calls it "a game changer."

RIBBiTR also offers training and education, a core requirement of most big grants. Research experiences for undergraduates at five institutions include a program linking biology and chemistry; along with workshops for graduate students and postdocs in Brazil and Costa Rica. High school students from Pittsburgh Public Schools also are doing research as part of the Gene Team, an initiative of NSF Includes centered at Pitt. ■

CASE STUDY: FROM BOOTCAMP TO DISCOVERY



CORINNE RICHARDS-ZAWACKI



PMF BY THE NUMBERS

PITT MOMENTUM FUNDS

In 2019, Pitt restructured its internal grant funding to motivate the development of innovative large-scale interdisciplinary projects for maximum impact in research, scholarship, and creative endeavors. Pitt Momentum Funds (PMF) help researchers to engage—at the early stages of collaborative projects; then, when building capacity; and at the scalable level. ■



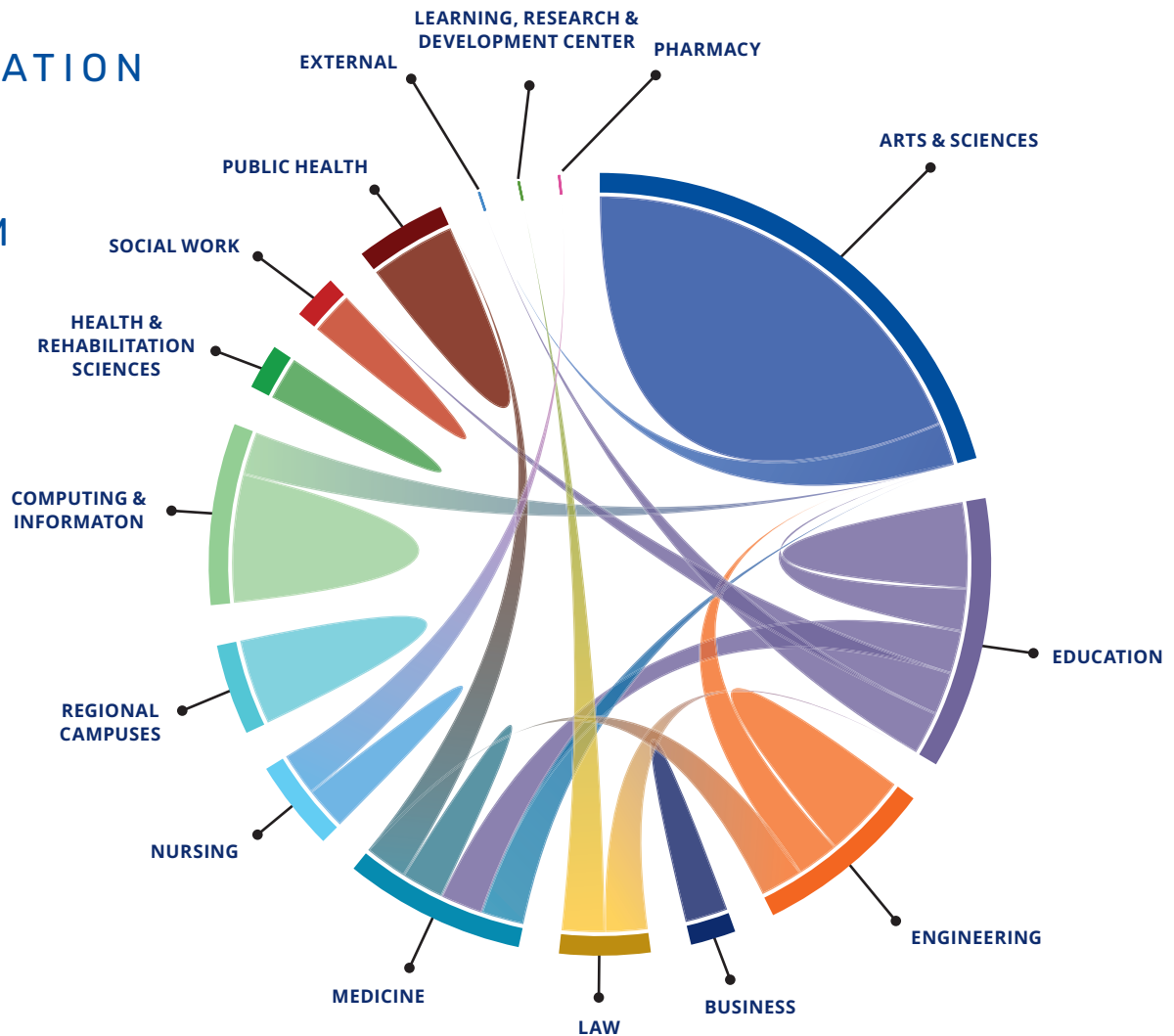
Applications received, grants, and funding awarded in the 2022–2023 cycle of the Pitt Momentum Funds.

Source: InfoReady

FUELING COLLABORATION THROUGH THE PITT MOMENTUM FUNDS

Chord chart shows collaborations in proposals awarded through the Pitt Momentum Funds (PMF) program. A ribbon is created to connect the school affiliation of the lead principal investigator (PI) and co-PIs. Data correspond to the most recent PMF cycle: 2022 – 2023.

Source: InfoReady





From left: MICHAEL G. WELLS, ADI MITTAL

PERSISTENCE PAYS OFF FOR WELLS COMPETITION TEAM

The 12th edition of the Michael G. Wells Student Healthcare Competition witnessed a previous contestant who took the advice of the competition’s benefactor to focus and try again. Adi Mittal (shown above), a Pitt School of Medicine student, working alongside Pitt neurosurgery resident Kamil Nowicki to develop a blood test that can detect cerebral aneurysm formation, pitched in the 2021 Wells Competition but did not win one of the cash prizes. He and Nowicki took Wells’ words to heart and refined their go-to-market strategy. They reapplied for the 2022 competition with their pitch finely honed and received the \$20,000 grand prize.

Second place (\$15,000) went to Isabelle Chickanosky, a PhD candidate in bioengineering, for work on a machine learning tool to non-invasively identify risk, presence, and stage of endometriosis. Third place (\$5,000) went to Jordyn Ting, a PhD candidate in bioengineering, for work on applying deep brain stimulation to the motor thalamus to improve speech after stroke. ■

SEARCHING FOR PROMISING DRUGS

To fund the development of novel therapeutics in the areas of women’s health, autoimmune diseases, and rare neurological diseases, Pitt and UPMC collaborated on a request to UPMC’s innovation and commercialization arm, UPMC Enterprises (UPMC-E). **Two projects were funded this year.** ■

▶▶▶▶ **Dwi Kemaladewi**, assistant professor of pediatrics, is working to create a gene therapy treatment for muscular dystrophy in children. The UPMC-E funding will assist with pre-clinical experiments to gauge the therapy’s effectiveness.

▶▶▶▶ **Edward Burton**, UPMC Endowed Professor of Movement Disorders, professor of neurology and of microbiology and molecular genetics, and principal investigator for the Pittsburgh Institute for Neurodegenerative Diseases, partnered with **Donna Huryn**, professor of pharmaceutical sciences in the School of Pharmacy, to develop a therapy to treat progressive supranuclear palsy, a debilitating and fatal neurodegenerative disease. The UPMC-E funding will assist with experiments to identify promising molecules.



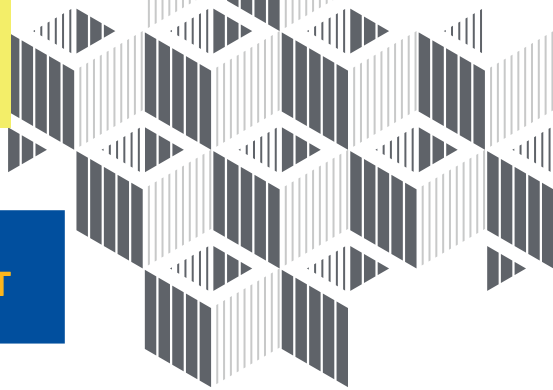
FOCUSED ON PARTNERSHIPS TO TRANSLATE RESEARCH DISCOVERIES INTO PRODUCTS AND SERVICES TO IMPROVE LIVES, GENERATE ECONOMIC GROWTH, AND ACHIEVE IMPACT FOR SOCIETY AND BUSINESSES.



PITT JOINS INTERIOR NORTHEAST I-CORPS HUB

Innovators participating in the Innovation Institute’s Pitt Ventures academic entrepreneurship programming have had access to the National Science Foundation’s Innovation Corps (NSF I-Corps) training since 2015. During fiscal year 2023, Pitt joined a consortium of 10 regional universities as part of I-Corps’ Interior Northeast Region Hub. This new iteration of I-Corps has provided more flexibility for Pitt innovators by offering an expanded number of innovation commercialization short courses throughout the year. Pitt innovation teams that participate in I-Corps programming improve their chances of obtaining funding for their commercialization efforts at Pitt through sources such as the Chancellor’s Gap Fund, Michael G. Wells Student Healthcare Competition, and Pitt Innovation Challenge. These teams have also gone on to form nearly 40 startup companies. ■

NEARLY **40** **STARTUP COMPANIES FORMED**
PITT INNOVATION TEAMS THAT PARTICIPATE IN I-CORPS PROGRAMMING



CHANCELLOR'S GAP FUNDS SUPPORT INNOVATION PROTOTYPES





The Chancellor's Gap Funds help to move promising innovations on the path to commercialization. Former Chancellor Patrick Gallagher established the funds to help Pitt innovators with critical de-risking experiments or the development of prototypes. This year, the Innovation Institute focused on two areas: small-molecule therapies and developing prototypes ("xprojects") for promising Pitt innovations. ■

SMALL-MOLECULE PROJECTS

- ▶▶▶ To identify and develop compounds to treat osteoporosis and mineral ion disorders such as hypercalcemia and hyperparathyroidism—Jean-Pierre Vilardaga, professor, Department of Pharmacology and Chemical Biology, and Peter Wipf, Distinguished University Professor, Department of Chemistry
- ▶▶▶ To identify a small molecule to help resolve symptoms for people suffering from sickle cell disease—Toren Finkel, Distinguished Professor of Medicine and director, Aging Institute; Bill Chen, professor of medicine; Yuan Liu, assistant professor of medicine
- ▶▶▶ To develop structurally engineered fatty acids to treat chronic liver disease and underlying inflammatory conditions—Francisco Schopfer, associate professor of pharmacology and chemical biology; Fei Chang, research instructor, Department of Pharmacology and Chemical Biology
- ▶▶▶ To develop a new class of small molecules for engaging potassium ion channels with potential therapeutic benefit for epilepsy, diabetes, tinnitus, neurodegeneration, and pain—Peter Wipf, Distinguished University Professor, Department of Chemistry

PROTOTYPING "XPROJECTS"

- ▶▶▶ To develop a new spinal cord stimulation device for controlling chronic pain that eliminates the need for a more invasive surgery to insert the stimulator leads—Gaurav Chauhan, assistant professor of anesthesiology and perioperative medicine; Trent Emerick, associate professor of anesthesiology and perioperative medicine
- ▶▶▶ To advance a reliable model system with physiological and anatomical resemblance to human skin that can be used to study skin-related pathologies and test therapeutics—Asim Ejaz, assistant professor of plastic surgery
- ▶▶▶ To develop vibration therapy to preoccupy nerve pathways for people with limb loss who suffer from phantom limb sensations or even phantom limb pain—Goeran Fiedler, associate professor of rehabilitation science and technology
- ▶▶▶ To develop a self-cleaning endoscope attachment for use during surgery—Rohit Mantena, student, Pitt School of Medicine; Kamil Nowicki, resident, Department of Neurological Surgery; Adi Mittal, student, Pitt School of Medicine; Michael McDowell, assistant professor of neurological surgery

COLLABORATIVE INNOVATION	 INVENTION DISCLOSURES	 LICENSING AND OPTIONS	 STARTUPS	 PATENTS
	ONE INVENTOR	73	23	0
TWO OR MORE INVENTORS	286	127	13	106
TOTAL	359	150	13	113

A GROWING CORPORATE PARTNER

Through Pitt's Office of Industry and Economic Partnerships (OIEP)—a one-stop shop for industry and venture capital firms seeking to partner with Pitt on sponsored research, technology licensing, and new venture creation—industry-sponsored research at Pitt grew by approximately 11% year over year, with more than 400 industry partners investing approximately \$56 million across a spectrum of research at Pitt. ■

- ▶▶▶▶ **Coeptis Therapeutics, Inc.**, a biopharmaceutical company developing innovative cell therapy platforms for cancer, entered into a sponsored research agreement to advance development of the platform.
- ▶▶▶▶ **Owkin**, a French technology company, partnered with Pitt and an industry/academic consortium called MOSAIC to revolutionize cancer research through a set of cutting-edge technologies that offer unprecedented information on the structure of tumors.
- ▶▶▶▶ **Genprex**, a clinical-stage gene therapy company focused on developing life-changing therapies for patients with cancer and diabetes, entered into an exclusive license agreement related to a gene therapy for type 2 diabetes.



AT BIG IDEA CENTER, PITT STUDENT INNOVATORS SOAR

The 15th annual Randall Family Big Idea Competition awarded nine student teams – with ideas ranging from social impact, education, and music, to medical devices, assistive technologies, clean energy, and consumer products and services. Prizes range from \$2,000 to \$25,000. Pitt's longest-running student innovation opportunity, the Randall competition, held each spring, has evolved into a culminating event for student-led teams working on a startup idea. The top winning teams include Underdog, Ember, ScOAP-E, CyberPunk Reality, NoVRel, and SpringE.

Four teams won at the Kuzneski Innovation Cup, an annual pitch competition sponsored by Andy and Laurie Kuzneski. The Kuzneskis chose four teams to win part of the \$25,000 prize pool: Underdog, CyberPunk Reality, ScOAP-E, and NoVRel. ■



FISCAL YEAR 2023 PITT STARTUPS

AiMiLight Sensors

Fiber optic-based sensors for chemical, mechanical, and temperature sensing in hazardous environments

Alenis Therapeutics

Gene replacement therapy using herpes simplex virus-based vectors to treat muscle diseases

BRG Innovations (dba PopSole™)

Customizable insole for use in pressure relief of primary foot discomfort or plantar fasciitis

Coloma Therapeutics

Small molecules that function as molecular degraders, inducing protein degradation of high-value therapeutic targets

GNOMX Inc.

Epigenetic diagnostics for infectious diseases and other exposures

Kaleibe Therapeutics

Gene replacement therapy using herpes simplex virus-based vectors to treat brain diseases

Pipeline Innervations

Greenfield and retrofit installation of fiber optic sensors into pipelines using robotics for real-time monitoring enabled by artificial intelligence

Respair Inc.

Novel endotracheal tube that seals the airway more consistently and for longer periods of time than current tubes without requiring constant monitoring by health care professionals

Sensible Photonics

Engineered optical fiber sensor technology platforms to eliminate predictable asset failures

Sirina Therapeutics

Gene replacement therapy using herpes simplex virus-based vectors to treat diseases of the skin

SirNaMed Therapeutics

Cationic amphiphilic polymers for co-delivery of therapeutic genes and hydrophobic drugs

Surface Design Solutions Inc.

Physics-informed machine learning delivers cost savings in manufacturing that increase over time

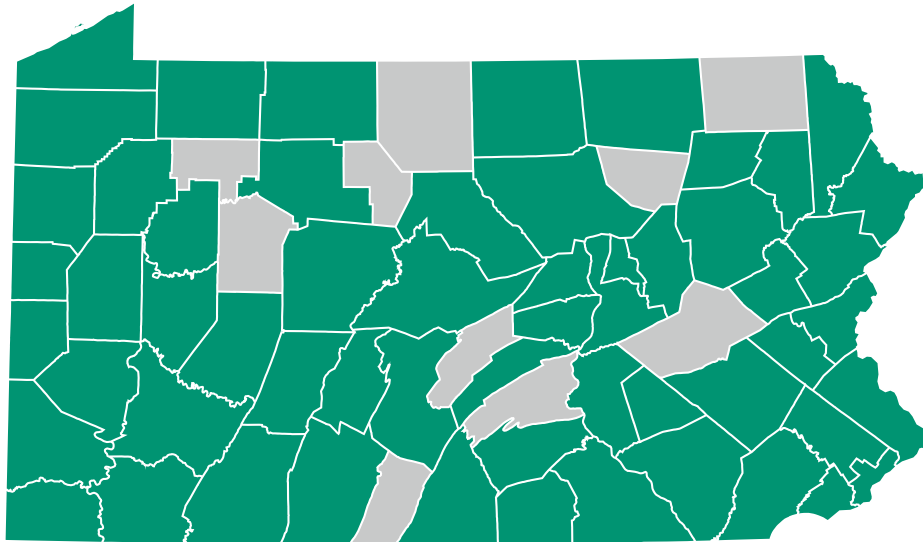


PITT SPENT RESEARCH FUNDING IN

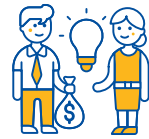
85% OF THE STATE'S COUNTIES IN FY2023

Map shows the impact of Pitt research on the state through research funding spending in counties in the state of Pennsylvania during fiscal year 2023. Vendors are located in counties highlighted in green. Spending is not uniform across counties. Allegheny is the county receiving the largest amount of Pitt research funding dollars.

Source: Research Spending and Vendors for FY 2023. Office of the Chief Financial Officer



\$41.9M SPENT IN PENNSYLVANIA



\$10.6M SPENT IN SMALL BUSINESSES IN PENNSYLVANIA



\$1.9M SPENT IN UNDER REPRESENTED MINORITY-OWNED BUSINESSES IN PENNSYLVANIA



CLIENTS 1,435



CONSULTING HOURS 10,564



CAPITAL \$18.24 million



TRAINING EVENTS HELD 71



BUSINESSES STARTED 58



JOBS SUPPORTED/CREATED 10,564

LENDING A HAND TO THE REGION'S SMALL BUSINESS OWNERS

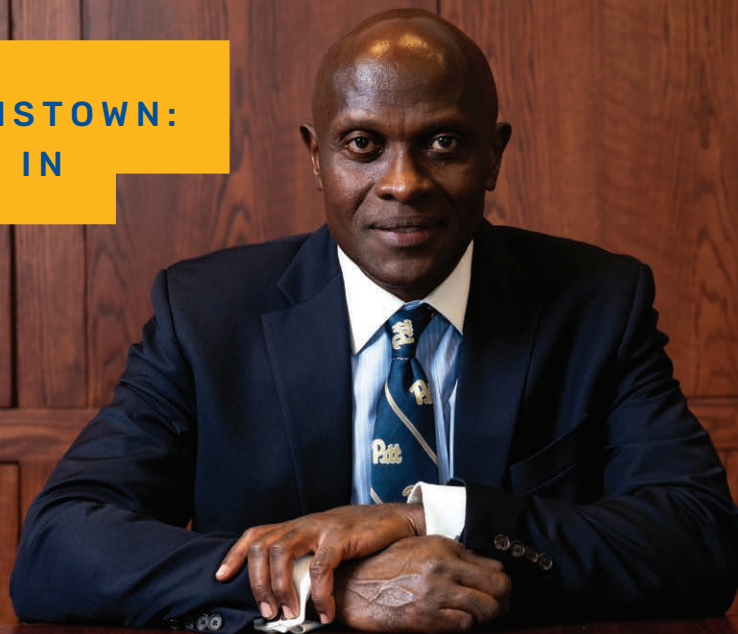
In fiscal year 2023, Pitt's Institute for Entrepreneurial Excellence (IEE) continued to support entrepreneurs and small business owners, providing assistance to more than 1,400 businesses in southwestern Pennsylvania, and helping launch nearly 60 new businesses.

The IEE and its Small Business Development Center (SBDC) held several specialized events to connect underrepresented-, women-, and veteran-owned businesses to regional contracting opportunities, and hosted more than 70 events for small business leaders, from start-up education to advanced topics. IEE's Entrepreneurial Fellows Class, which provides CEOs, founders, and the next

generation of family business leaders training to enhance their knowledge and expertise in managing and growing their businesses, also graduated more than 30 participants in December 2022. Additionally, its Urban & Community Entrepreneurship Program had nearly 30 underrepresented small business owners complete its six-month training program.

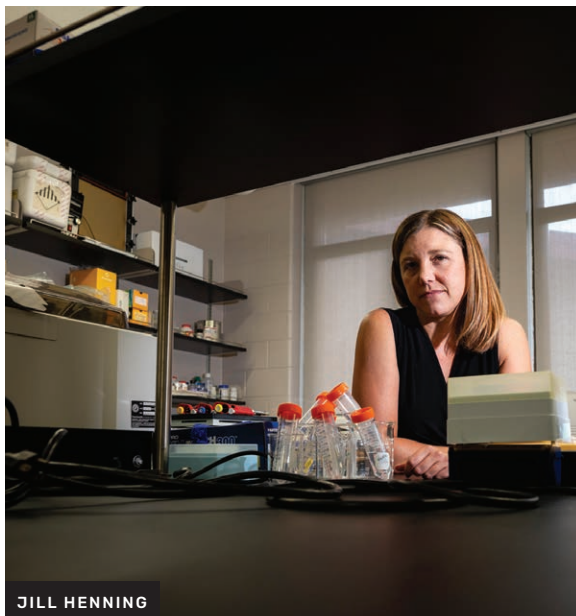
In recognition of IEE's mission to provide small business owners and entrepreneurs with the education and tools necessary to thrive, SBDC was honored as the Export-Import Bank of the United States Regional Export Promotion Program Member of the Year. ■

PITT-JOHNSTOWN: RESEARCH IN MOTION



JEM SPECTAR

**“THE FACULTY
ARE EXCELLENT
TEACHER-
SCHOLARS,
COMMITTED TO
SCHOLARLY
ENGAGEMENT,
RESEARCH, AND
PUBLICATION.”**



JILL HENNING

The University of Pittsburgh at Johnstown sits on a rural campus high above the Conemaugh Valley 70 miles east of Pittsburgh; the campus is a hub of research uniquely entwined with its community.

The multidisciplinary field of medical communications thrived during the COVID-19 pandemic when the school became the center of efforts promoting public health measures. Professor of Biology Jill Henning collaborated with medical communication researcher Susan Wiczorek, associate professor of communication, to take a critical public role in translating the new science emerging from COVID research into public health actions. Henning became the area’s go-to media source, writing a column in the Johnstown Tribune Democrat and hosting regular public meetings.

“Henning took her research to the community in a way I’ve never seen,” says Jem Spectar, president of Pitt-Johnstown. “She found a way to make the science accessible to people who may not have taken

precautions or the vaccine, and those people did not feel alienated or talked down to. Without question, the work she did saved lives.

“The faculty are excellent teacher-scholars, committed to scholarly engagement, research, and publication,” Spectar says.

Chemistry and chemical engineering are standouts, with an emphasis on the “green chemistry” movement and projects turning biomass into fuel. The school is one of a handful in the state certified by the green chemistry advocacy group, Beyond Benign. Other researchers are focusing on topics such as the sustainability of the local environment and reclaiming brownfield sites in the former industrial and mining region.

“Our community is our lab,” Spectar says. “Our research engages with the quality of life here. We are facing the human condition and trying to make it better. Pitt-Johnstown is research in motion and application.” ■





PITT FACULTY HONORS AND AWARDS

253 AAAS FELLOWS

53 NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE MEMBERS

22 AMERICAN ACADEMY OF ARTS & SCIENCES MEMBERS

12 NAI FELLOWS

320 FULBRIGHT GRANTEES

9 NATIONAL BOOK AWARD FINALISTS/WINNERS

46 GUGGENHEIM FELLOWS

105 NSF CAREER AWARDS

2 MACARTHUR FELLOWS

2 PRESIDENTIAL NATIONAL MEDALS OF SCIENCE/TECHNOLOGY AND INNOVATION

39 SLOAN FELLOWS

INITIALISMS:

AAAS: American Association for the Advancement of Science

NSF: National Science Foundation

NAI: National Academy of Inventors

Honorific recognitions awarded to Pitt individuals throughout the history of the university. This list includes all awards announced before the date of publication.

Source: Official websites of awarding organizations

NATIONAL ACADEMY OF INVENTORS FELLOWS

Joseph Glorioso, Distinguished Professor of microbiology and molecular genetics and pioneer in gene therapy – 23 issued patents; startup companies raised more than \$200 million to bring his therapies for cancer and pain to market.

Ronald Montelaro, professor emeritus in the Department of Microbiology and Molecular Genetics – focus on challenges presented by mutating viruses that complicate vaccine development; Peptilignics in clinical trial to treat and prevent prosthetic joint infections.

NATIONAL INVENTORS HALL OF FAME

Rory Cooper, founding director of the Human Engineering Research Laboratories and Distinguished Professor in Pitt's School of Health and Rehabilitation Sciences – focus on inventions in mobility technology.

CHANCELLOR'S DISTINGUISHED RESEARCH AWARDS

Annually recognizes outstanding scholarly accomplishments of members of the University of Pittsburgh's faculty.

SENIOR SCHOLARS

Peter Brusilovsky,
School of Computing and Information

Jeanne Marie Laskas, Kenneth P. Dietrich
School of Arts and Sciences

Anuradha Ray, School of Medicine

JUNIOR SCHOLARS

Salah Al-Zaiti, School of Nursing

Greer Donley, School of Law

Aidan G.C. Wright, Kenneth P. Dietrich
School of Arts and Sciences



**BLUE RIDGE RANKINGS
BY CATEGORY**

Psychiatry	1
Physical Medicine	2
Otolaryngology	2
Neurosciences	3
Anesthesiology	5
Surgery	6
Schools of Medicine	6
Schools of Public Health	6
Internal Medicine	7
Dermatology	7
Ophthalmology	8
Schools of Allied Health Sciences	8
Anatomy/Cell Biology	9
Pharmacology	10

University of Pittsburgh's rank in different categories as defined by the Blue Ridge Institute for Medical Research. Rankings are based on NIH funding data for federal fiscal year 2022.

Source: Blue Ridge Institute for Medical Research (BRIMR)

PITT ACADEMIC RANKINGS

SCHOOL	RANKING ORGANIZATION	RANKING TYPE	FIELD	YEAR	RANK
Dietrich School of Arts and Sciences	Quacquarelli Symonds	World University Rankings by Subject - National	Philosophy	2023	3
Graduate School of Public and International Affairs	U.S. News & World Report	Best Graduate Professional Schools	International/Global Policy and Administration	2023	8
Joseph M. Katz Graduate School of Business	U.S. News & World Report	Best Online Programs	Online MBA Program	2023	27
School of Computing and Information	Quacquarelli Symonds	World University Rankings by Subject - National	Library and Information Management	2023	11
School of Dental Medicine	University Ranking by Academic Performance	Field Ranking	Dentistry	2023	25
School of Education	U.S. News & World Report	Best Graduate Professional Schools	Education Psychology	2023	17
School of Health and Rehabilitation Sciences	U.S. News & World Report	Best Graduate Professional Schools	Physical Therapy	2021*	1
School of Law	U.S. News & World Report	Best Global Universities Subject Ranking	Tax Law	2023	28
School of Medicine	U.S. News & World Report	Best Graduate Professional Schools	Medical Schools - Research	2023	14
School of Nursing	U.S. News & World Report	Best Graduate Professional Schools	Doctor of Nursing Practice	2023	7
School of Pharmacy	U.S. News & World Report	Best Graduate Professional Schools	Pharmacy	2021*	13
School of Public Health	U.S. News & World Report	Best Graduate Professional Schools	Public Health	2023	15
School of Social Work	U.S. News & World Report	Best Graduate Professional Schools	Social Work	2023	21
Swanson School of Engineering	U.S. News & World Report	Best Graduate Professional Schools	Biomedical Engineering/Bioengineering	2023	18

Academic rankings by subject and field for 2023.

* Not all fields are ranked every year. The latest ranking has been included when data for 2023 has not been available.

Source: Office of the Provost





CONVE



#3 RANKED
IN NIH FUNDING

2022 PITT RESEARCH
NATIONAL INSTITUTES OF HEALTH (NIH)



16TH IN UTILITY
PATENTS GRANTED

2022 U.S. UNIVERSITY RANKINGS
NATIONAL ACADEMY OF INVENTORS



\$1B RESEARCH
BARRIER BROKEN

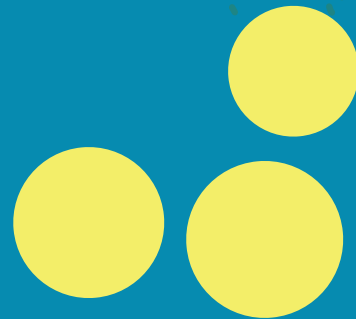
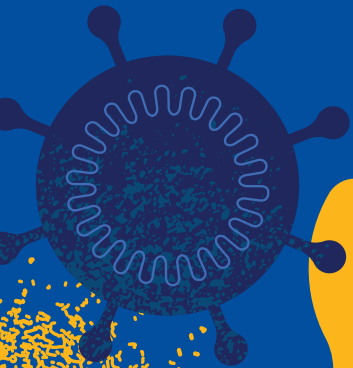
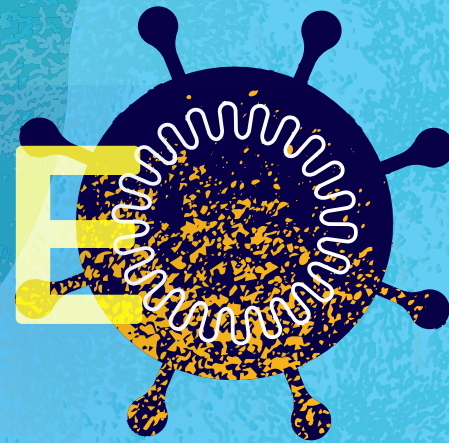
2022 RESEARCH EXPENDITURES



LEARN MORE

[RESEARCH.PITT.EDU](https://research.pitt.edu)

URGENCE





University of
Pittsburgh

Office of the Senior Vice
Chancellor for Research

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research.pitt.edu