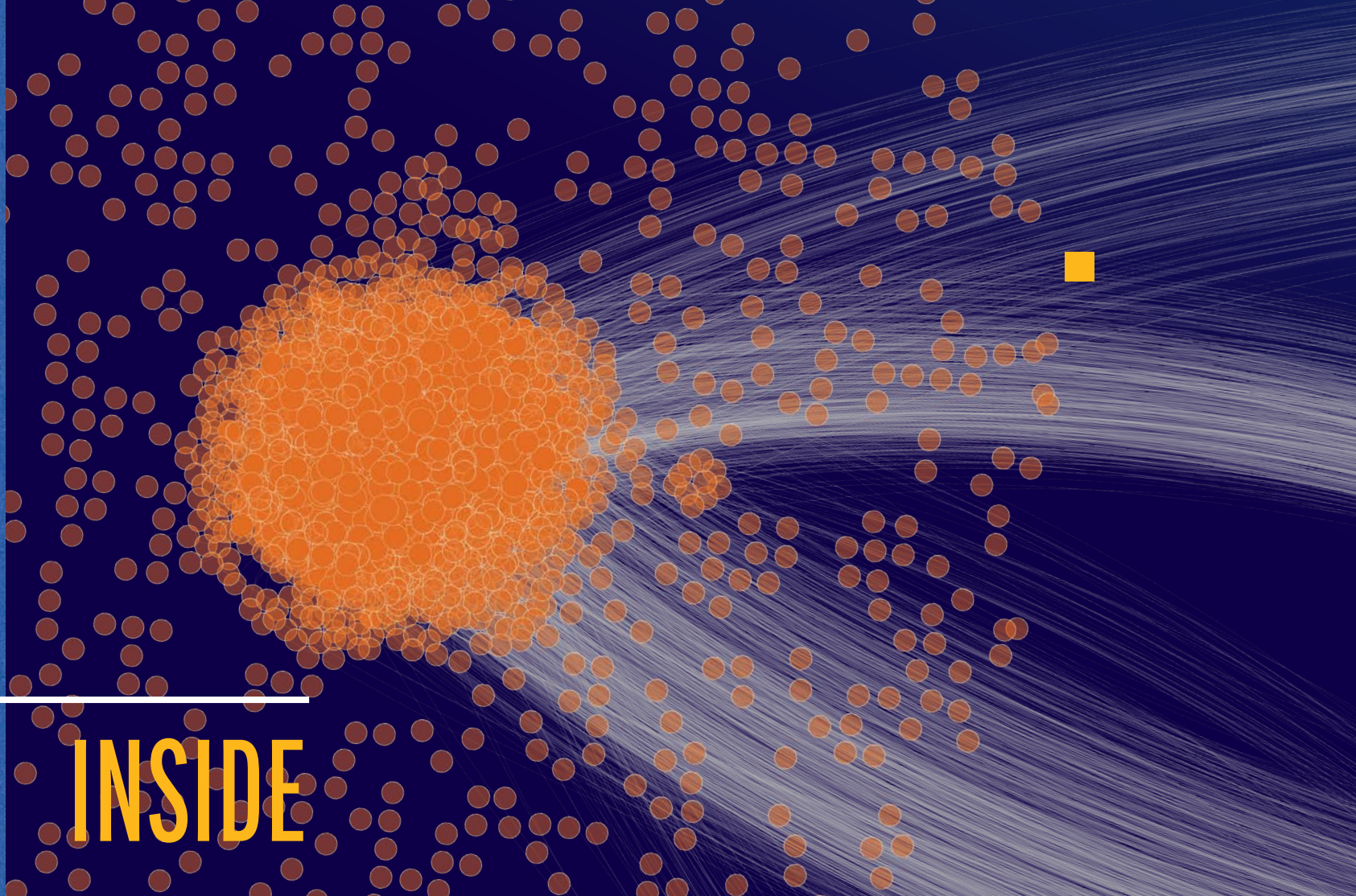
OFFICE OF THE SENIOR VICE CHANCELLOR FOR RESEARCH

ANNUAL REPORT 2023-24

University of Pittsburgh®

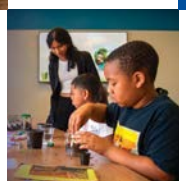


INSIDE

ON THE COVER

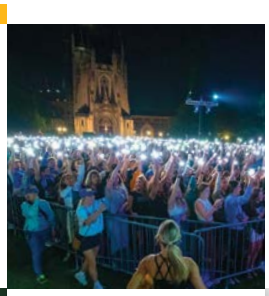
Our research collaboration network shows how Pitt researchers from different fields combine their knowledge to pursue grand research projects. Each node represents a Pitt individual who has submitted a proposal for research funding during FY 2024.

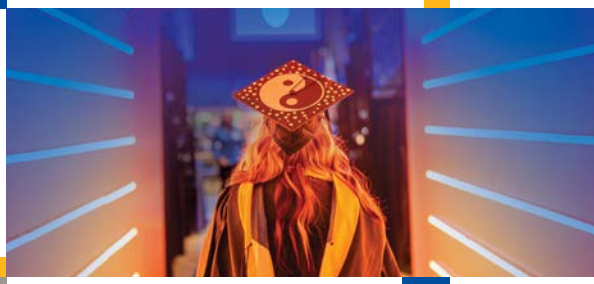
You can read more about the Pitt Research Social Network and *super connected* researchers on the foldout page between pages 32-33.

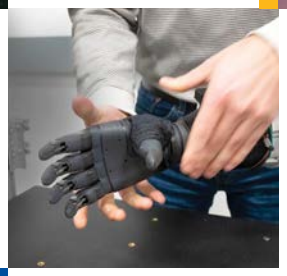


PLAN FOR PITT 2028

The University of Pittsburgh's strategic plan is grounded in values, defined by excellence and focused on elevating our community's aspirations. Forged through consultation with students, faculty, staff, alumni, supporters and partners, this plan reflects our core values and offers actionable and measurable initiatives and outcomes that invest in people and ideas, accelerate our momentum and ensure Pitt's best days lie ahead. **The Plan for Pitt 2028 outlines our strategic growth areas for research and scholarship, including: Life Sciences; Sustainability, Thriving Communities and the Future of Energy; Assistive Technologies; and Digital Futures**.







PITT CLIMBS TWO SPOTS IN NATIONAL R&D SURVEY

Every fiscal year, the Higher Education Research and Development (HERD) Survey collects data on research and development (R&D) spending at U.S. colleges and universities that have expended at least $150,000 in separately accounted-for R&D.[1] The survey is conducted by the National Center for Science and Engineering Statistics within the National Science Foundation. For the 2022 fiscal year, Pitt climbed two spots in the overall ranking thanks to a 10.3% increase in research expenditures from the previous fiscal year, as reported in the survey. Pitt now sits at #16 (out of 900 institutions) and is part of a prestigious cohort that includes institutions such as Johns Hopkins University; the University of California, San Francisco; the University of Pennsylvania; the University of Michigan; Duke University; Stanford University; Harvard University; and Cornell University.Pitt ranked 12th in expenditures from federal sources and 27th in expenditures from non-federal sources. Within the federal realm, Pitt ranked fifth in spending from the Department of Health and Human Services funding and 23rd in spending from the U.S. Department of Defense funding. Pitt ranked in the top 10 in three life sciences categories: life sciences, all (#7); life sciences, biological and biomedical sciences (#10); and life sciences, health sciences (#9).

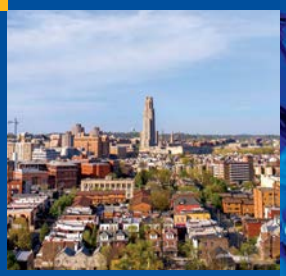
#16 OUT OF **900** INSTITUTIONS

FOR RESEARCH AND DEVELOPMENT EXPENDITURES

TOP 10

IN THREE LIFE SCIENCES CATEGORIES

1 Separately accounted-for R&D refers to spending that is tracked in separate R&D accounts. This spending cannot be part of general expenditure accounts that include teaching salaries, other direct costs, etc.



From left:
Senior Vice Chancellor for Research Rob A. Rutenbar, Chancellor Joan Gabel

A MESSAGE FROM THE SENIOR VICE CHANCELLOR FOR RESEARCH

For more information about research at the University of Pittsburgh, visit us online.

pittresearchannualreport.com

research.pitt.edu

x.com/pittresearch

linkedin.com/showcase/pitt-research

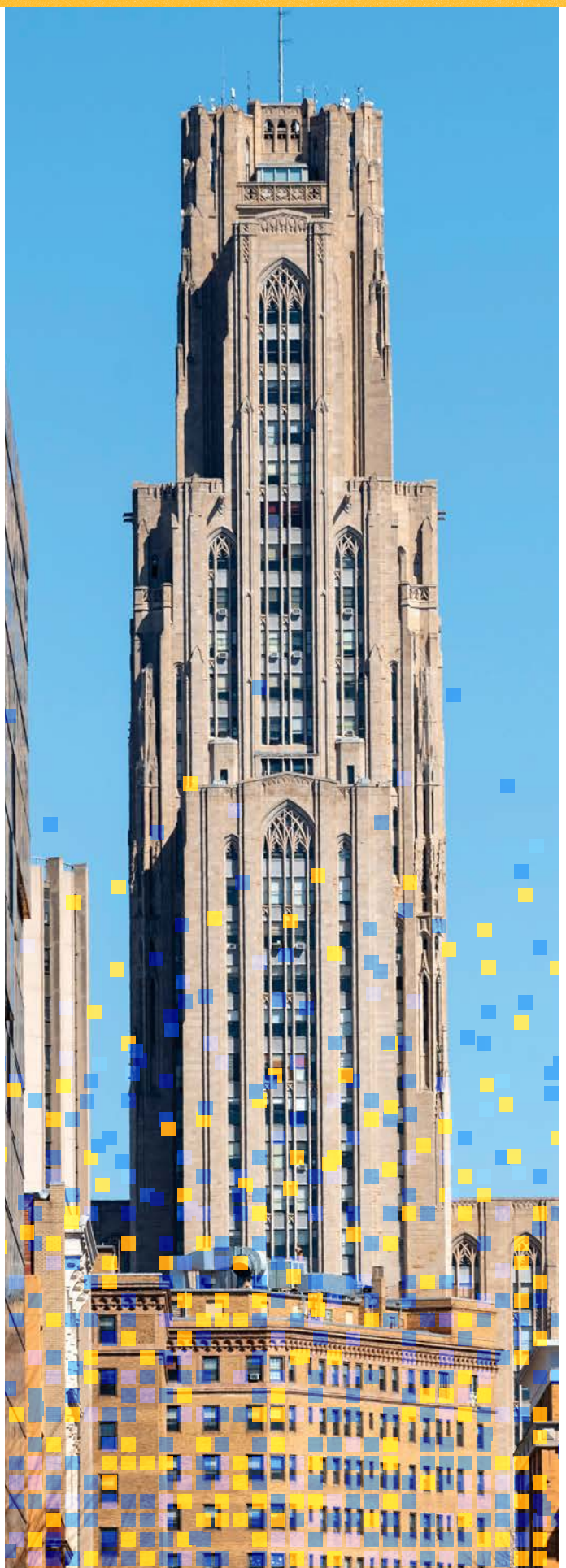
One of the best things about being in a top-tier, comprehensive research university like Pitt is the amazing breadth of scholarship happening. On one end of campus, artists are using their creativity to highlight environmental issues, and across the street, engineers are building new nanostructures, and up the hill, there's a clinical team advancing the fight against cancer. Every time I think that two different kinds of research cannot possibly be connected or overlap, I'm proven wrong—and even I learn something.

But our research programs are not just broad and diverse, there's a common thread running through everything: a desire for impactful discoveries and change that matter, that improve both knowledge and practice. In this year's annual report on research, you will see how seemingly distinct fields like genomics, anthropology, cyber law, space engineering and sustainability intertwine and enhance one another at Pitt, blending creativity and expertise to imagine exciting new possibilities. This year's report has lots of examples of the many paths from discovery to action—public art to cultivate environmental justice; training police to help keep juveniles out of the justice system; and preventing domestic terrorism by supporting military veterans.

As part of the 2024 Plan for Pitt, we are working with Chancellor Joan Gabel and Senior Vice Chancellor for the Health Sciences Anantha Shekhar to amplify the innovation ecosystem in Pittsburgh. We are working with academic and industry partners to help researchers bring their most creative ideas to national and international markets, where they can make the greatest impact on the greatest number of people. This burgeoning research ecosystem will be a positive force in the life of all of our communities—not limited to University researchers and entrepreneurs.

I welcome you to browse our 2024 Annual Report for more examples of discovery, action and impact. You'll see stories of accomplishment—impressive numbers, eye-opening innovations, distinguished legacies. Above all, you will meet a few of the remarkable people who make up our community of learning, teaching and building. I hope you enjoy reading their stories and exploring research at the University of Pittsburgh.

Rob A. Rutenbar
Senior Vice Chancellor for Research




Anantha Shekhar

A DECADE OF DELIVERY

Once again in 2024, the University of Pittsburgh finds itself among the most generously funded institutions by the National Institutes of Health (NIH), the world's largest public funder of biomedical research. Driven by the University's schools of the health sciences, Pitt has averaged a top seven ranking in NIH funding for a quarter century.

Our goal is to radically improve health for the region and for the world. Given our robust research engine, our focus this decade is to increase pathways for translating our scientific breakthroughs into products and solutions for patients. Along the way, we're transforming Pittsburgh into a globally recognized hub for life sciences innovation.

Not only is there collaboration among our health sciences researchers, but our scientists partner with colleagues across the University to reach shared goals. Pitt is a launchpad for possibilities, a place where everything and everyone is within reach. We're committed to bringing scientific possibilities to life.

Anantha Shekhar
Senior Vice Chancellor for the Health Sciences
John and Gertrude Petersen Dean, School of Medicine

RESEARCH BY THE NUMBERS

SPONSORED RESEARCH

4,545
PROPOSALS SUBMITTED

1,714
NEW GRANTS AWARDED

$1.20B
RESEARCH EXPENDITURES

6,109
ACTIVE AWARDS

1,361
UNIQUE, DIRECT RESEARCH SPONSORS

Sponsored research activity at Pitt during FY 2024, represented by the number of research proposals submitted, newly awarded and active grants, total research spending and organizations sponsoring research.

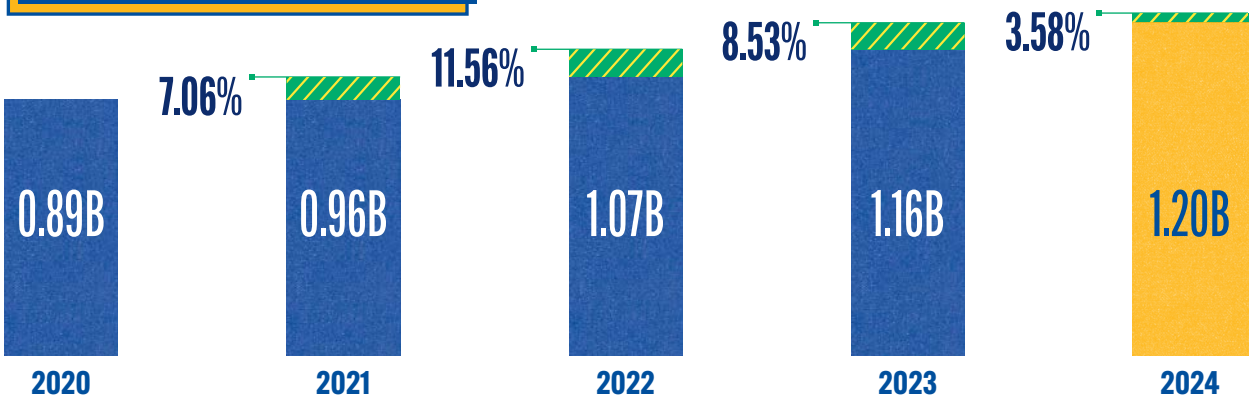
Proposal and award totals include new grants only; hence continuation grants have been excluded from this count. The count of unique, direct research sponsors includes entities funding currently active awards.

Data current as of 07/10/2024.

Source: Pitt Electronic Research Information System PERIS™ MyFunding for proposal, award, and sponsor data

Office of the Chief Financial Officer (expenditure data)

EXPENDITURES BY FISCAL YEAR



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 07/10/2024. Financial data reports finalized as of October 2024.

Source: Office of the Chief Financial Officer

Local and state funding takes us to the top of "Cathy."

Industry sponsorship takes us to 525.4 feet high, to the 40th floor.

507.18 feet high, thanks to our **other/nonprofit** sponsors. Only three floors to go.

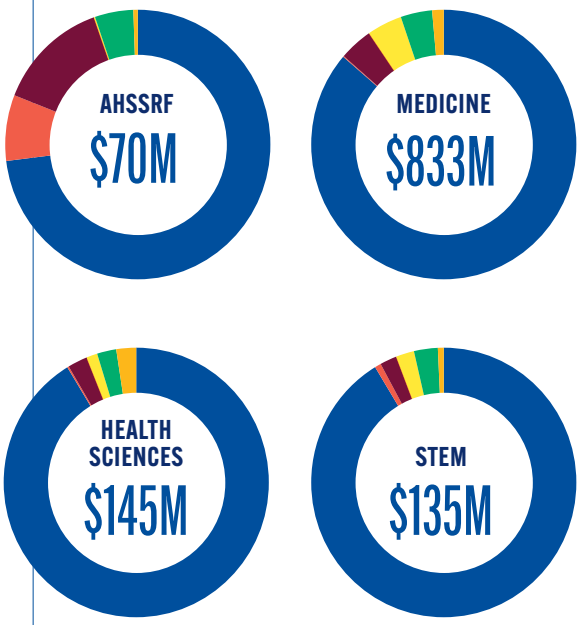
Our support from **foundations and nonprofits** brings us 487.9 feet high, close to the 38th floor.

Adding our **federal incoming sub-awards** takes us almost 465 feet high to the 36th floor, where the David C. Frederick Honors College resides.

Our spending from **federal funding** takes us to 379.15 feet high, to the 29th floor of the Cathedral of Learning. This is 70.9% of our total research spending.

IF OUR RESEARCH EXPENDITURES WERE AS HIGH AS THE CATHEDRAL OF LEARNING (535 feet)

EXPENDITURES BY FUNDING SPONSOR AND RESEARCH FIELD



Research spending in FY 2024 categorized by the type of organization sponsoring research.

The field called AHSSRF represents arts, humanities, social sciences and related fields.

Federal includes federal pass-through, which corresponds to grants where the prime sponsor is a federal agency, but Pitt has received direct funding from a different organization (e.g., university, company).

Data current as of 07/10/2024.

Source: Office of the Chief Financial Officer

CHAMPIONING ABILITIES OF PEOPLE WITH DISABILITIES

Dan Ding

When it comes to assistive technology, one size does not fit all. Just ask **Dan Ding**, associate professor and vice chair for research and translation, Department of Rehabilitation Science and Technology in the School of Health and Rehabilitation Sciences.

"People with disabilities want to participate in their community," notes Ding. "As rehabilitation scientists, we can help make that happen. We develop and evaluate tech-based solutions by assessing each individual's unique abilities, digital skills and other contextual factors such as home environment."

She says this comprehensive approach helps researchers better adapt and optimize tech solutions to improve a person's health, wellness and participation in various activities.

As director of Pitt's Wireless Rehabilitation Engineering Research Center (RERC), Ding leads an interdisciplinary team that empowers people with disabilities to embrace existing wireless technology to take control of their lives. "It's all about providing access," Ding says.

In a recent study, Ding's team identified 46 different tasks in the home that can be assisted by commercially available smart devices. Users with complex disabilities are taught to use their voices, eyes, hands or a joystick to make a selection on a personalized dashboard, and then complete tasks such as opening and closing blinds, locking doors, operating microwaves or taking inventory of their cupboards and closets.

Individuals with total paralysis can also enjoy more independence through Ding's latest endeavor, the SmartTech Implementation Hub for Paralysis Care. The hub, which leverages sensors, data analytics, connectivity, artificial intelligence and other smart technology features, will serve as a national resource center to support smart technology implementation for paralysis care.

To ensure the latest research finds its way into clinical practice, Ding also oversees a postdoctoral fellowship program called Career Advancement and Training for Assistive Technology Practice, Research and Policy (CAT-PReP).

According to Ding, the fellowship will improve clinicians' capacity to advance evidence-based practice and inform equitable policies for access to assistive technologies, with the goal of further empowering people with disabilities. ■

WHERE LIMITED SIGHT DOESN'T HAVE TO LIMIT LIFE

When people lose their vision, the risk of losing their independence is a major concern. **José-Alain Sahel**, Distinguished Professor and Eye and Ear Foundation Professor and Chair, Department of Ophthalmology, School of Medicine, is devoted to helping them keep or recover both. In the first year since the opening of the UPMC Vision Institute, which he directs, he and his team enrolled multiple patients in research studies, several of which rely on assistive technologies.

Sahel works with Clive D'Souza, assistant professor in the Department of Rehabilitation Science and Technology. "We use a driving simulator where we can really mimic, as close as possible to reality, the impact of low vision on driving," says Sahel, a global leader in vision restoration techniques who is known for his breakthrough work in optogenetics to partially restore sight to the blind.

"We are exploring the abilities of patients to direct their attention toward objects that are moving in the periphery. And then we have this driving simulator, which mimics the condition of driving in real life," says Sahel. "This project is integrated with our Center for Assistive Technology, where we have a real driving car where people can be monitored."

They plan to add eye-tracking technology "so we can monitor visual attention on a constant basis and try to reeducate patients," says Sahel. The team's goal is to make patients aware if they are ignoring important parts of the scene and alert them that this could be dangerous for them and for others.

His patients also use the StreetLab platform he developed in his previous role as founder and director of the Vision Institute in Paris, where they are able to mimic in a realistic environment what is happening for a patient. Researchers can control aspects such as the lighting, the temperature of color, the intensity and the noise to make the environment as realistic as possible. Together with Rakie Cham, a professor of bioengineering who holds secondary appointments in ophthalmology and physical therapy, and Galen Holland, a research engineer, they can also monitor, using infrared cameras, the movement of a body, gait, gaze and head movements.

The lab scores the impact of visual impairment on motor performance, measuring and quantifying the interactions between seeing and acting—between action and vision.

"Because there are only two platforms like that in the world, the one in Paris and one in Pittsburgh, and because we wanted to be able to apply that across many centers, we developed a virtual reality system, which will be available in dozens of settings," says Sahel.

The team is also developing a patient-centric platform for remote care, using technologies to monitor vision at home. Clinicians can provide clinical guidance and tell the patient whether to come in for treatment right away or to come back for follow-up a few months later. ■

From left: José-Alain Sahel, Clive D'Souza

MAKING THE IMPOSSIBLE POSSIBLE

Empowering people with disabilities to work, travel, engage with others and participate in a life that is free from barriers. This is the mission—and legacy—of **Rory Cooper**, Distinguished Professor of Rehabilitation Science and Technology and founder of the Human Engineering Research Laboratories (HERL), a joint effort of the University of Pittsburgh and the U.S. Department of Veterans Affairs.

For more than 30 years, Cooper and his researchers have harnessed the power of technology to transform the design, construction and utilization of power and manual wheelchairs and other mobility and manipulation devices. The result: 30 U.S. patents awarded or pending, two textbooks, more than 400 peer-reviewed articles and countless lives changed for the better.

A 2023 inductee into the National Inventors Hall of Fame and recipient of the National Medal of Technology and Innovation, Cooper was hailed by President Joe Biden for his seminal work "empowering the lives of millions of Americans."

"People often talk about the research for a cure for various disabilities," notes Cooper, who has been a wheelchair user since an accident in 1980 left him paralyzed from the waist down. "But for many of us, technology is really the cure."

Utilizing cloud computing, artificial intelligence, sensor fusion and other innovations, Cooper and his team at HERL have embarked on new ventures that will further support inclusivity.

Through a new Rehabilitation Engineering Research Center (RERC) on Physical Access and Transportation for People with Disabilities, they are developing ways to make electric vehicles and commercial airlines more accessible. During the next five years, Cooper will be investigating how people with disabilities can get in and out of vehicles and how their wheelchairs can safely be docked in commercial airplanes. "Within 10 years, we hope to see our recommendations implemented," says Cooper.

In addition, a separate RERC on the Power of Play strives to increase participation of people with disabilities in recreational exercise. Novel recreational technologies coupled with advanced training and strategies will make adaptive sports and recreation safe and affordable for all, especially those in underserved communities.

"Recreation helps maintain our spiritual, physical and emotional health," says Cooper. "Through this kind of research, recreation will be possible for everyone, especially people with disabilities." ▪

"People often talk about the research for a cure for various disabilities, but for many of us, technology is really the cure." —Rory Cooper

TRAUMA RESEARCH EXTENDS THE 'GOLDEN HOUR'


Ron Poropatich

When **Ron Poropatich** left the military in 2012, he wasted no time returning to his alma mater. "The day after I signed out of the Army, I signed in at Pitt," he says.

The University of Pittsburgh hired Poropatich to direct its Center for Military Medicine Research, which pursues medical advancements for wounded service members and their families. The position seemed almost tailor-made for him.

Poropatich, who earned a BS in biochemistry from Pitt in 1977, spent three years in active duty as a clinical microbiologist in the U.S. Army before taking time to earn his MD. He returned to the Army for another 27 years and rose to the rank of colonel while serving as a pulmonary critical care physician and leading large research programs at Walter Reed National Military Medical Center, at Fort Detrick and during deployments around the world.

"I started in July 2012, and I've been here ever since," says Poropatich, who is also a professor of medicine in the School of Medicine. Since then, the Center for Military Medicine Research and its investigators have been major contributors to the University's growing research expenditures from U.S. Department of Defense (DoD) funding, which has totaled more than $500 million since the center's launch.

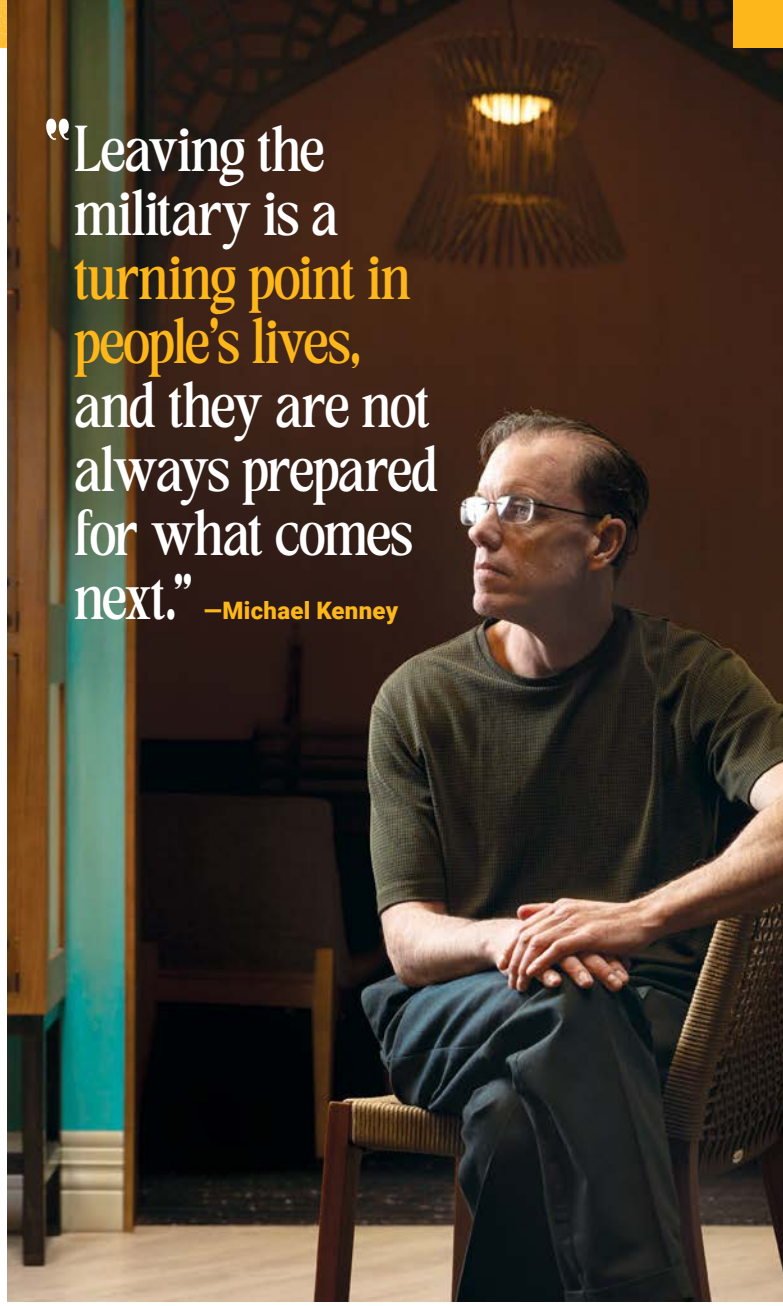
Today, Poropatich is most excited about a development that could save the lives of soldiers wounded in remote, hard-to-reach locations. In a project funded by the DoD, a team of researchers from Pitt and Carnegie Mellon University designed an autonomous system to continuously resuscitate patients with severe traumatic injuries. Trauma Care in a Rucksack (TRACIR) uses a computer algorithm to provide life-saving fluids and drugs without human intervention. It could make the difference between life and death during a patient's long transport to a medical center.

"You only have a short window in trauma care to really make a difference," says Poropatich, who was the overall principal investigator on the project. "They call that the 'golden hour.'"

In findings published in April, the team showed how TRACIR could extend that window. The algorithm (called Resuscitation Based on Functional Hemodynamic Monitoring, or ReFit) kept animals with lacerated livers alive for more than three hours as they were transported by helicopter and ground ambulance.

Poropatich envisions TRACIR being delivered by drone to wounded soldiers to get them care as soon as possible. The next step is to test it on human patients. Meanwhile, the team is working on incorporating artificial intelligence and machine learning into the system to make it more responsive to each person. ■

PREVENTING EXTREMISM AMONG VETERANS



In 1988, Pitt's Matthew B. Ridgway Center for International Security Studies was dedicated in honor of General Matthew Ridgway, a Pittsburgh native and war hero who jumped with his troops into Normandy on D-Day, became the commander of United Nations forces in the Korean War and is buried in Arlington National Cemetery.

Michael Kenney, Wesley W. Posvar Chair in International Security Studies, professor of international affairs in the Graduate School of Public & International Affairs, directs the Ridgway Center today, which is dedicated to understanding past and emerging security problems that face the United States and the international community. Kenney is currently studying the phenomenon of active duty personnel being recruited by domestic American extremist groups.

Kenney describes this as a low probability, high consequence problem—the probability of it happening is low, but when it happens, it can be devastating. He cites the case of Timothy McVeigh. A decorated soldier in the first Gulf War, McVeigh became radicalized in anti-government beliefs after leaving the military and in 1995 was responsible for bombing the Alfred P. Murrah Federal Building in Oklahoma City, killing 168 people, including 19 children.

"It's not something that we want to overstate," says Kenney. "Most American soldiers are perfectly fine. Even if some might have what seem like extreme beliefs, they are not violent extremists or terrorists. But militia movements have a strategy of recruiting veterans because they want people with military skills who know how to shoot and conduct military operations."

Kenney sees this primarily not as a problem with extremism, but first and foremost as a problem of a lack of support for veterans.

"Leaving the military is a turning point in people's lives, and they are not always prepared for what comes next," he explains. "Some struggle to acclimate to civilian society. They may be dealing with mental health issues, problems with employment or maintaining significant relationships. And mental health issues can develop decades after their service."

Beyond mental health and life issues, Kenney says that the Iraq War particularly left a legacy of drug addiction.

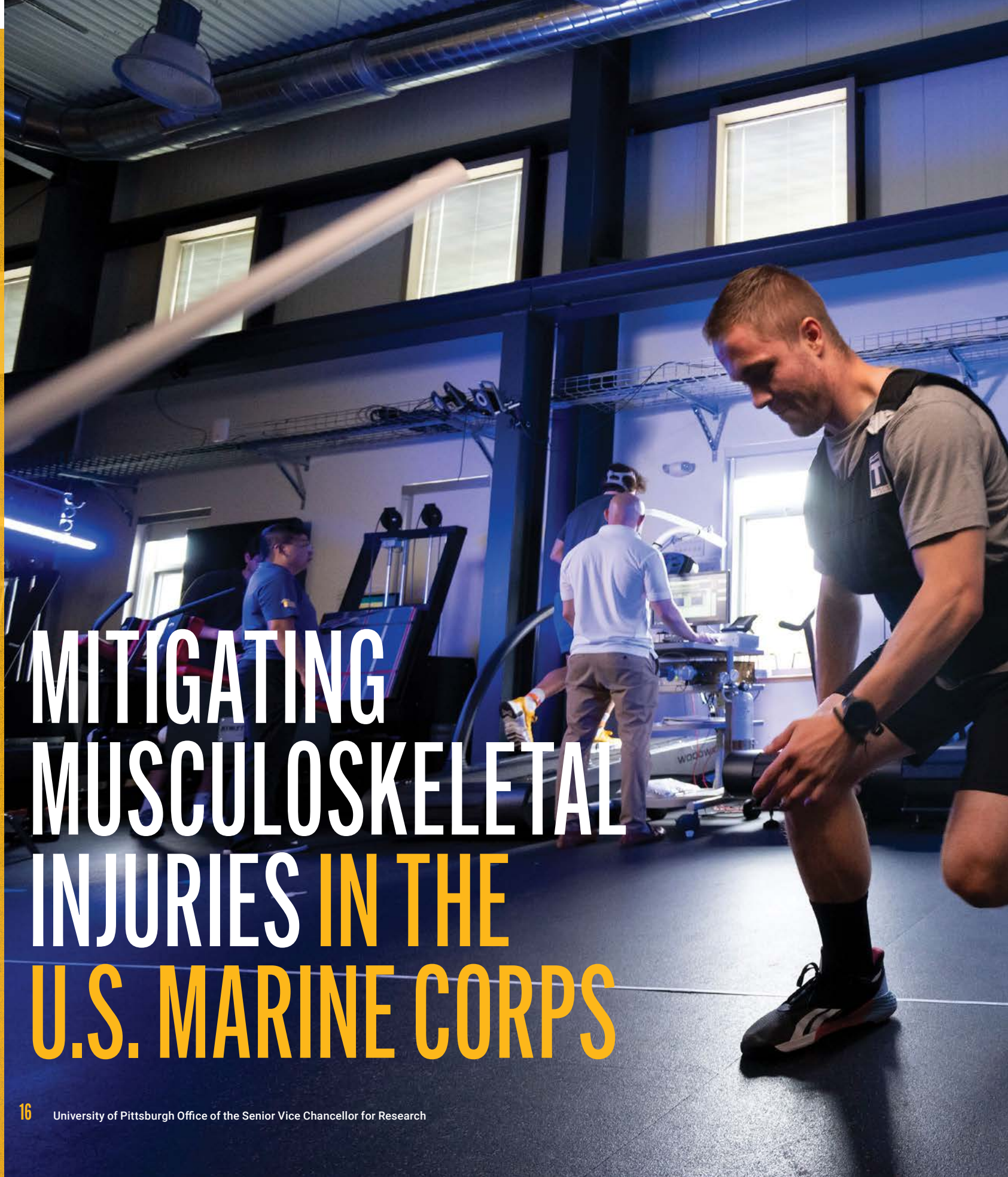
"Iraq had a devastating effect on drug use within the U.S. military, specifically among soldiers injured in combat, who were often prescribed powerful pain medication. A number of soldiers developed substance use problems that stayed with them after they left the military."

Kenney sees his research as providing evidence to encourage policy change in the U.S. Department of Defense.

"We need to do a better job of giving our veterans the support they need. It is not acceptable for these people to be struggling given the amount of money that we put into our military. There needs to be a more sustained attempt to develop programs that support the reintegration of veterans into civilian life."

Kenney says this multifaceted effort needs to include education and employment-based training and health care, particularly in mental health.

"We've got to invest more in mental health for our best and brightest veteran soldiers," he says. "We are not getting the job done." ■



MITIGATING MUSCULOSKELETAL INJURIES IN THE U.S. MARINE CORPS

Preventable musculoskeletal injuries pose a significant threat to military readiness. To understand why they happen, Pitt researchers have been working with U.S. Marines during officer candidate school training.

About one-third of the Marines who participated in a three-year study suffered some form of injury on an obstacle course, in a conditioning hike or during some other form of endurance training. In many cases, those injuries were severe enough to knock them out of officer training.

Bradley Nindl, director of the Neuromuscular Research Laboratory/ Warrior Human Performance Research Center, visited Marine Corps Base Quantico in May 2024 along with fellow researchers to brief Corps leadership on findings from their study.

"We looked at bone health, which is important because military personnel get a lot of stress fractures," says Nindl, professor and vice chair for research, Department of Sports Medicine and Nutrition in the School of Health and Rehabilitation Sciences. "We looked at psychosocial resilience, physical performance, the quality of their movement using technologies like markerless motion capture, and biochemical measures of bone turnover and immune function."

In addition to markerless motion technology, which captures movement without the need for body suits or other wearables, Nindl and team used peripheral quantitative computed tomography to study bone health, force plates and other clinical and rehabilitation tools.

Ultimately, the research will help the Marines identify ways to prevent injuries.

Additional research coming out of the Neuromuscular Research Laboratory/ Warrior Human Performance Research Center includes work with other branches of the U.S. military and internationally, including with militaries in Finland and Australia.

Nindl has a personal stake in the research. A former active-duty scientist for the U.S. Army, he studied warfighter physiology under stressful and arduous conditions with a focus on endocrine biomarker and neuromuscular adaptations. He still serves in the Army Reserve as a colonel and has had continuous military service since 1991. ▪

"We looked at psychosocial resilience, physical performance, the quality of their movement using technologies like markerless motion capture, and biochemical measures of bone turnover and immune function." —Bradley Nindl

MILITARY FRIENDLY '23-24 SCHOOL

DESIGNATED AS A MILITARY-FRIENDLY SCHOOL EVERY YEAR SINCE 2015, THE UNIVERSITY OF PITTSBURGH IS AMONG THE TOP 15% OF SCHOOLS IN THE U.S. FOR EXEMPLARY SERVICES IN SUPPORT OF MILITARY STUDENTS. **PITT'S COMMITMENT TO THE MILITARY DATES BACK MORE THAN 100 YEARS.**

TURNING DATA INTO KNOWLEDGE FOR PRECISION MEDICINE

From left: Rahil Sethi, Jiefei Wang, Vishal Soman, Paul Cantalupo, Uma Chandran

Genomics—an interdisciplinary field bringing together health sciences and data science to study the structures and functions of an organism's complete set of genetic material—is uniquely suited to the talents of researchers at Pitt. In studying the origins and course of breast cancer, blindness, dental deformities and dozens of other conditions, Pitt researchers are helping illuminate the ever-increasing complexity of the interplay of genes within humans, both traits that are shared and those that may be unique to one individual.

Built on the foundations of genetics and spurred by the achievement of the 2003 Human Genome Project, genomics is a field that has experienced frequent and ongoing revolutions.

Uma Chandran, research professor and director of the Pitt's Genomics Analysis Core, explains.

"In the past you would cut a tumor into little pieces and sequence it and figure out what genes were expressed, or which genes were higher or lower compared to normal tissue."

But a tumor consists of a mixture of cell types. As of early 2010, it was not possible to easily discover the variety of cells and microenvironment of a tumor, only whether it is expressing or not expressing particular genes.

Fast forward to 2020. A researcher could now infer cell types in that tumor using new bioinformatics algorithms. Fast forward again to 2023. It is now possible to map the spatial architecture of the tumor and to answer questions such as the locations of immune cells, which can alter the effectiveness of therapies.

"These advances are important because every person's cancer is different, even if it's the same type of cancer," says Chandran. "That's where personalized medicine comes in—we're able to characterize different tissues in three-dimensional detail. Using that map of the tumor, it may be possible to predict how a particular person would respond to therapy."

Incorporating machine learning and AI in the analysis tools makes these genomics tools even more powerful, and the demand for computing resources and trained workforce continues to grow exponentially. But the ability to create new data presents the conundrum familiar in data science—you now have more data than can be easily analyzed.

"I often say we're trying to turn data into knowledge," says **Adrian Lee**, director of the Institute for Precision Medicine (a joint effort between Pitt and UPMC), and professor of pharmacology and chemical biology in the School of Medicine.

As part of making that knowledge available to researchers across the country, Pitt is now the data coordinating center for a large national program sequencing metastatic breast cancer for the Global Data Hub, led by Jonathan Silverstein, associate director of research informatics in the Institute of Precision Medicine and a professor of bioinformatics in the School of Medicine. The project was created by the Breast Cancer Research Foundation, which cited Pitt as pioneers in data coordination and sharing, and the University's "vast experience coupling clinical and biological repositories with cutting-edge, secure high-performance computing." Reflecting the unique possibilities of collaboration at Pitt, the project will also be able to call on the resources of the Pittsburgh Supercomputing Center (a center shared by Pitt and Carnegie Mellon University).

Chandran explains Pitt's role in the Global Data Hub.

"We host terabytes of data (a terabyte is 1000 gigabytes), integrating data from many sources and linking researchers to de-identified clinical data on patients. A significant part of the job is cleaning up the data for sharing with other institutions."

The Global Data Hub creates larger sample sizes and more powerful studies. Pitt's expertise in genomics allows the teams to understand the inevitable challenges, mistakes and errors, as well as vital issues of annotation, data provenance, data sharing and data security.

Lee believes that genomics has the potential to make profound impacts on medicine. "Take a very simple example in pharmacogenomics. If we both take the same drug, we will respond differently because of our genetics. If I give you Tylenol and I take Tylenol, we will metabolize it differently. That's important for many drugs."

For highly toxic drugs like cancer drugs, metabolizing the drug more slowly can be dangerous. Lee cites the known property of the blood thinner clopidogrel—a drug that is inactive by itself but plays a role in metabolizing an active drug. But 30% of individuals cannot metabolize clopidogrel.

"So you are not helping them," Lee says. "If a drug is ineffective for an individual patient, or even dangerous, wouldn't you want to know that up front? That is the kind of goal we hope for in precision medicine." ■

WHAT GENES SHAPE A FACE?


Mary Marazita

Genomics holds immense potential for intervention and treatment of diseases like cancer and diabetes. Beyond that, genomics also provides insight into how genes influence the structures and appearance of parts of the body—known as morphology. As with other research based in genomics, studying morphology calls for massive data sets and advanced computation.

Mary Marazita studies the genomic markers associated with malformations of the human face and head. Marazita is co-director of the Center for Craniofacial and Dental Genetics (CCDG), as well as Distinguished Professor of Oral Biology in the School of Dental Medicine, and professor of human genetics in the School of Public Health.

"The CCDG primarily studies craniofacial birth defects—such as cleft lip, cleft palate and craniosynostosis, in which the bones of a baby's skull fuse together before the brain has stopped growing," Marazita explains. "Complementing that, we study genomic markers associated with normal facial development, and dental and oral diseases such as cavities and periodontal disease. Our mission really is to identify genetic causes of complex human conditions and traits that affect normal development of the craniofacial and oral complexes."

Having studied the genetic basis of these conditions for more than 40 years in very large population-based studies worldwide, Marazita has seen the capabilities of genomic technology grow exponentially.

"I was trained in human genetics—remember, there was genetics and molecular biology before genomics. It was a largely computational science even though we didn't have very good computers in those days," she says.

At that time, the limit of human genetic technology was studying tissues and blood and conducting genetic analyses of the molecules in the samples. Researchers could identify and examine a specific gene found in an animal model and compare it to genes found in human data. Current advanced genomic tools combined with bioinformatics create the possibility of linking genetic information to craniofacial traits, oral disorders and 3D mapping of faces.

Seth Weinberg is co-director of the CCDG, as well as professor in the Departments of Oral Biology, Human Genetics and Anthropology. He led a multiyear, NIH-funded study with John Shaffer, assistant professor of human genetics, which scanned roughly seven million genetic markers in the DNA of more than 8,000 healthy people. The study focused on statistical relationships between shape measurements based on 3D facial images and genetic markers that are known to play roles in creating human physical variation.

"This was the opportunity to build a big data resource," Weinberg explains. "This resource enabled us to replace old ways of measurement with a repository of three-dimensional facial images with exquisite, detailed measurements linked with DNA samples." The study was conducted across multiple sites in the United States and United Kingdom, and much of the data lives in usable repositories, from where it is frequently downloaded and used in clinical and other research.

A basic concept underlying this research is that the genes driving human facial shape are the same as those involved in malformations like cleft palate. Therefore, studies of typical facial features can reveal important insights into the biology of related health conditions. Among the surprising insights of the project: the facial feature most influenced by your genes is your nose.

"It's hard to imagine that data like this has not been around for a long time," says Weinberg. "The first genetic mapping study of human facial morphology was only in 2012. We have seen a lot of firsts coming in a short time." ■

ALBINISM AND LOW VISION: EXPLORING THE POSSIBILITIES OF GENE THERAPY

Leah Byrne

"We're investigating which routes of administration and which gene therapies are the most efficient and beneficial." —Leah Byrne

Albinism is in many ways a hidden condition, although roughly one in every 18,000 to 20,000 people in the United States live with some type of albinism, which can manifest in a range of conditions. While albinism affects people of all races and backgrounds, in sub-Saharan Africa the incidence of albinism has been estimated by researchers to be one in every 1,000 to 2,000 people.

The outward manifestations of albinism are obvious—lacking melanin, a person's skin and hair appear white. But one consequence of living with albinism that is not commonly known is blindness. Or more commonly, vision low enough to qualify as legal blindness.

The little-studied aspects of albinism's effects on vision drew scientist **Leah Byrne** into studying the genetic origins of the condition.

"People don't often think of albinism as an eye disease or a disease affecting vision, but it's actually one of the most challenging diseases," explains Byrne, assistant professor of ophthalmology in the School of Medicine. "Patients suffer from severe photophobia—light sensitivity—and they also have poor visual acuity. I became interested in albinism because I think it's an underserved disease and also an underserved area of research."

Albinism is caused by mutations in a handful of genes that are important in the production of melanin, most commonly in the tyrosinase gene (OCA1). Byrne's team is exploring how those genetic mutations affect eyesight.

"Normally, a certain proportion of retinal ganglion cells cross over from one to the other hemisphere of the brain, but in albinism, the number of cells that cross is not the same. We think that is why patients with albinism have poor depth perception," says Byrne. "Lack of pigment also results in severe photophobia. Those things can affect their quality of life."

Gene therapy research for the condition is rare. Byrne's lab specializes in developing nonpathogenic viruses that can efficiently deliver genes to the retina. "We think that perhaps we have a better and different approach for gene therapy for albinism," Byrne says.

Graduate student **Alessandra Larimer-Picciani** leads the project in her lab. "We're investigating which routes of administration and which gene therapies are the most efficient and beneficial," she says.

The lab now works with animal models, but Byrne believes the research will lead to clinical applications in humans.

"We want to narrow down the gene therapies and try to understand how much benefit patients could expect to have if they were to receive the gene therapy in childhood or in adulthood," says Byrne. "When would it make the most impact? What would the impact be?" ■

SEARCHING FOR KEYS TO HEALTHY AGING

From left: Anne Newman, Toren Finkel

University of Pittsburgh researchers **Anne Newman** and **Toren Finkel** want us all to live long and prosper.

"Most people will have a period of poor health at the end of their lives no matter how long they live," says Newman, Distinguished Professor of Epidemiology, School of Public Health, and clinical director of the joint Pitt-UPMC Aging Institute. "But the goal of what we call 'healthspan' is to optimize health for as long as possible."

Newman is principal investigator of a WoodNext Foundation-funded clinical trial to determine whether treatment to reduce inflammation can improve physical function in older adults.

"Aging is one of the least understood biological processes," adds Finkel, director of the Aging Institute. "It's something—if we're lucky—we all do, yet we don't understand why or how."

Finkel and Newman are longtime colleagues and collaborators whose aging research focuses on the intersection of biological systems and populations.

Newman's study targets persistent low-level immune system activity, which increases as we get older for reasons that are unclear. The RIGHT Study (Reducing Inflammation for Greater Health Trial) is a randomized trial using an anti-inflammatory monoclonal antibody, clazakizumab.

The goal is to see whether it is possible to block abnormal immune activation without affecting people's ability to fight off infections or disease. Measurements of physical function like walking speed will be taken, as well as cognitive tests to determine baseline and potential improvements at the conclusion of the study period.

"At the Aging Institute, we're also trying to develop new drugs to block inflammation," adds Finkel, professor of medicine, School of Medicine. "If we find people do better with these very targeted biological therapies, we could potentially use this strategy for older adults who are beginning to become frail, and potentially prevent many of the diseases of aging from ever occurring."

Newman and Finkel are heading up an American Heart Association-funded study of the role of inflammation and genetics common to brain and vascular health.

"Aging impacts everything, but much of aging research has focused on disease and illness," says Newman. "The focus of my work has been to try to understand health by doing studies in people who are out and about living their lives as they age." ■

UNDERSTANDING AND IMPROVING WOMEN'S HEALTH IN AGING

Launched in 1994, the Study of Women's Health Across the Nation (SWAN), was originally designed to better understand the menopause transition. It has since shifted beyond menopause to learn how mid-life experiences affect health and quality of life during aging overall. SWAN follows more than 3,300 women in the United States at seven research centers, including the University of Pittsburgh.

"We're trying to understand whether there are ways we could start earlier to improve later life health outcomes," says **Maria Mori Brooks**, principal investigator of the SWAN coordinating center. "It's not only length of life but also quality of life."

Brooks is a professor of epidemiology and of biostatistics in the School of Public Health who plays an integral role in designing the visit protocols, how each site collects data and the statistical analysis of those data. Each visit focuses on general themes of aging and the role of menopause, but the data collection varies.

"From each visit, we may get information from questionnaires about vasomotor symptoms, bone density scans or daily hormone levels," says Brooks. "We've had challenges and fun working with all the data and trying to make sense out of what happens as women age."

As a longitudinal cohort study, researchers are not assessing one specific intervention like they would in a clinical trial. Instead, they use all the data collected to depict the changes that happen in this transitional period in a woman's life and to evaluate the risk factors and consequences of specific health outcomes such as poor sleep patterns.

Though commonly seen in a negative light, there are both positive and negative aspects to the aging process. While physical function declines as you age, SWAN also found that depressive symptoms decrease and overall mental health increases. Knowing about these changes is key for women to understand what is happening to their bodies as they age.

From these results, SWAN aims to help women know what changes during menopause and aging are typical and what changes may benefit from interventions.

"In the 30 years since it began, SWAN has gone from a menopause study to an aging study," says Brooks. "But the overall goal has not changed, we want to better understand and improve women's health." ▪

Shaun Eack

BEYOND MEDICATION: COGNITIVE ENHANCEMENT THERAPY FOR SCHIZOPHRENIA

Schizophrenia is a mental illness that produces a significant amount of disability. While antipsychotic treatments and medications have proven to be extremely effective, for many people there is an important piece missing in their recovery. **Shaun Eack**, the James and Noel Browne Chair and professor of social work and of psychiatry, focuses his work on how we can support patients with schizophrenia beyond medication.

"People with schizophrenia are incredibly intelligent, but the way the condition affects the brain can cause a lot of challenges," says Eack. "If we can address some of these cognitive challenges, such as difficulty paying attention at work or school, which are unaddressed by current medications, we could help individuals go further in their recovery."

Eack is researching cognitive enhancement therapy—a treatment developed at Pitt by late professor of psychiatry Gerard Hogarty that utilizes the brain's neuroplasticity to learn new things. Cognitive enhancement focuses on improving social cognition and neurocognition with three main components: neurocognitive training exercises that focus on problem solving strategies, small group work to address social challenges and individual therapy sessions to best tailor the treatment to each person.

As shown by brain scans using structural magnetic resonance imaging, cognitive enhancement therapy protects against the loss of brain tissue that often happens in the early course of schizophrenia. The therapy also helps activate the prefrontal areas of the brain and allow for more effective neural communication, enhancing overall brain function. While this treatment has been proven to be effective, the question remains, why hasn't it been widely implemented into the standard of care?

"These treatments are only going to be helpful if they get implemented in practice," says Eack. "A lot of my work has turned from neuroscience to implementation science as I work with communities to make this treatment available."

Eack's team is currently working on a 20-site implementation trial with sites across the country. Through this work, they found that simplifying the treatments better accommodated health care providers in community spaces. Learning more about how to make these treatments both effective and practical makes Eack hopeful about achieving his goal of easily accessible clinics that offer cognitive enhancement therapy.

"For so long it was about proving that we could be doing more for patients with schizophrenia," says Eack. "Now that we know cognitive enhancement treatment works, the challenge becomes how we make it a reality." ▪

Mehret Birru Talabi

FAMILY PLANNING FOR THOSE WITH COMPLEX CHRONIC CONDITIONS

The United States has one of the highest rates of maternal mortality among comparable countries. This fact is influenced in part by people experiencing pregnancy who also have chronic medical conditions.

Mehret Birru Talabi, assistant professor of medicine in the School of Medicine, is working to ensure health care systems provide better anticipatory care and guidance to help those with rheumatic diseases have the healthiest and safest pregnancies possible.

"The diseases I treat as a rheumatologist are chronic and complex conditions, many of which are independently associated with severe maternal morbidity and mortality," says Birru Talabi. "Knowing that pregnancy can exacerbate disease conditions, how do we improve the rheumatology clinical environment so that family planning is part of the standard of care?"

Education, communication and collaboration between patients and providers leads to better outcomes in pregnancy and other facets of sexual and reproductive health. Health care providers cannot assume patients know which medications might detrimentally affect pregnancy or the safety or effectiveness of various contraception methods. To help patients make more informed reproductive decisions, Birru Talabi developed a novel, patient-facing decision aid called MyVoice:Rheum. The decision aid aims to enhance pregnancy decision-making and planning within the rheumatology clinical setting.

But rheumatology is not the only subspecialty that treats conditions that affect pregnancy. Luckily there are many researchers across Pitt that are looking for shared solutions and approaches to make a change.

One way Birru Talabi is promoting collaborative, cross-disciplinary work is through Optimizing Reproductive Health in People with Chronic Disease (ORCHID). Led by Birru Talabi and Traci Kazmerski in the Department of Pediatrics, ORCHID aims to develop innovative health care models to optimize reproductive health care among people with chronic conditions.

"I hope our team's research leaves a mark on how we approach people who are contemplating different family planning decisions in a way that's centered on their needs," says Birru Talabi. "At the end of the day, we want them to have the safest and healthiest outcomes possible, no matter what those goals are." ▪

> "I hope our team's research leaves a mark on how we approach people who are contemplating different family planning decisions in a way that's centered on their needs."
>
> —Mehret Birru Talabi

A "RADICAL" TO PARTICIPATE IN HEALTH RESEARCH

"Our health should not depend on who we are, our circumstances or the color of our skin." —Sirry Alang

WELCOME”

People with a history of substance use disorder, homelessness or incarceration, as well as minoritized populations, experience worse health outcomes than the general population. These inequities and the impact of social determinants of health are out of a person’s control.

Sirry Alang, associate dean of equity and justice and associate professor of health and human development, School of Education, explains that the problem is due, in part, to medical mistrust. This happens when individuals are wary of the medical system because of negative experiences at other institutions. It is also caused by a lack of similar voices in the creation of programs, policies and interventions.

“Our health should not depend on who we are, our circumstances or the color of our skin. But the people who make the policies and create interventions are usually the ones who are least affected by these factors,” Alang says. “In order to bring meaningful structural change, we have to ground our research and our practice in the lived experiences of those who have been harmed by structural injustices. This work requires a focus on their voices.”

Alang and colleagues have developed a first-of-its-kind tool to help facilitate community-based participatory research. The “Radical Welcome Engagement Restoration Model and Assessment Tool” can help researchers engage more effectively with community partners. The two-way tool allows them to assess their own roles in creating meaningful partnerships, and it helps community partners assess their own engagement.

THE TOOL FOCUSES ON SIX ESSENTIAL STEPS:

1. **The importance of how you invite community partners—the passionate invitation**
2. **How you respond to their interest—the radical welcome**
3. **How to create and maintain a sense of belonging to sustain interest in the project**
4. **Defining individual and collective roles**
5. **Prioritizing issues**
6. **Implementation**

Funded by the Patient-Centered Outcomes Research Institute, the tool is published in Health Promotion Practice. ■

SERIOUS GAMING IN SERIOUS ILLNESS

When **Teresa Hagan Thomas'** mother was diagnosed with cancer, Thomas saw firsthand the importance of her own research. Even though her mom was a self-sufficient woman, had already been a cancer caregiver twice, and had a daughter who is an expert in health care self-advocacy, she struggled to manage her own cancer journey.

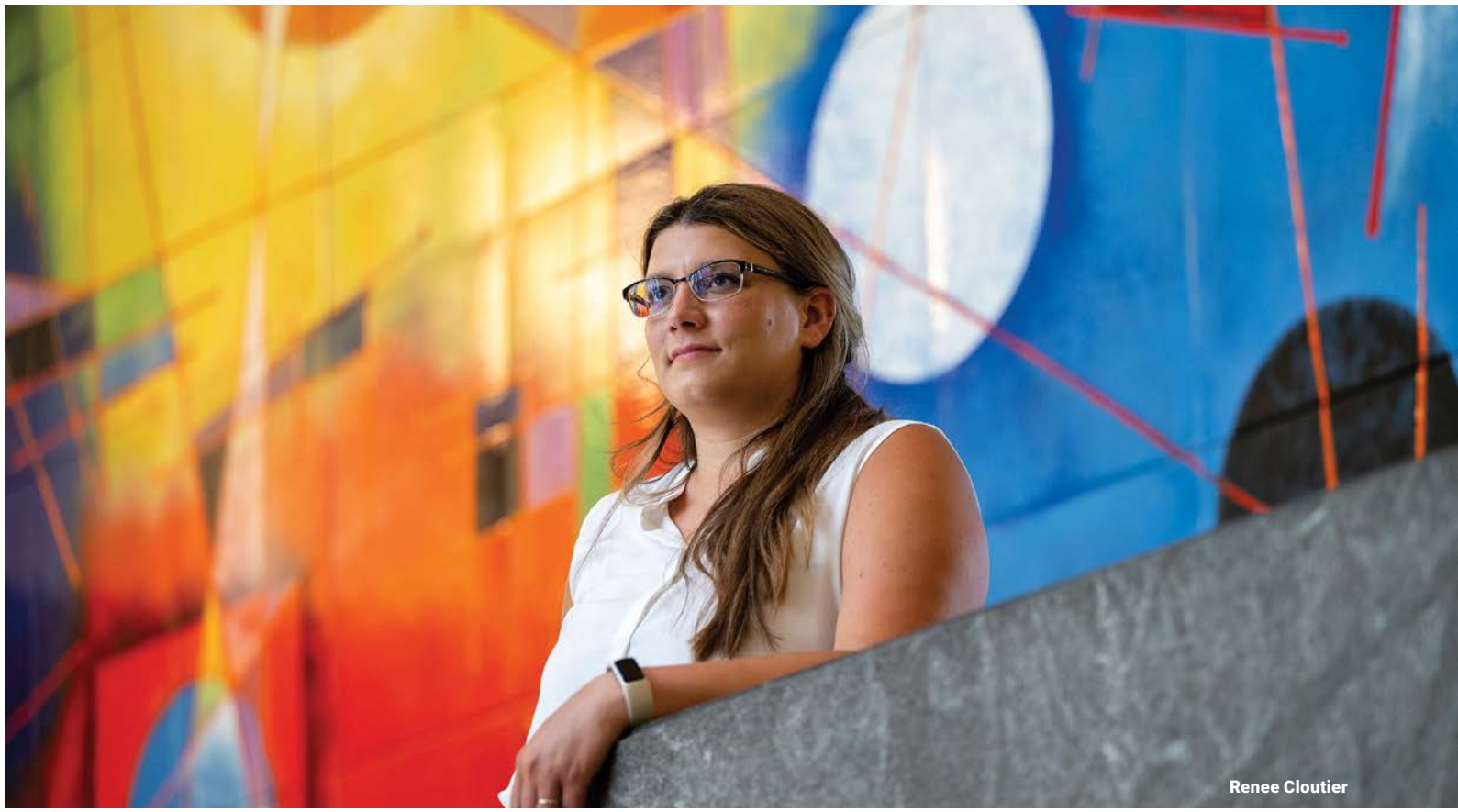
Even when patients come into a diagnosis as strong communicators who know how to take care of others, who can research information and take care of their own health—some of that dissipates with a personal diagnosis. The symptoms and side effects affect one's ability to make decisions, manage treatment and focus on quality of life.

"If that was the case for my mom, what happens to patients who are not trusting of the health care system, don't have a good relationship with the oncology team or don't have the needed resources or education?" asks Thomas, associate professor of health promotion and development in the School of Nursing.

With a $1.9 million grant from the National Cancer Institute, Thomas and colleagues are developing and testing an interactive video game to help women with breast cancer develop skills to advocate for themselves and better navigate the cancer journey. The program shows users characters with cancer through different challenges and decisions with the goal of keeping the characters healthy and strong. Clinicians can use the output for patient-centered education and shared decision-making.

The team is collecting broad evidence on which elements of "serious gaming" are most effective. Their findings will help researchers optimize gamified interventions in other patient populations. ■

Teresa Hagan Thomas



Renee Cloutier

LEVERAGING IMPLEMENTATION SCIENCE FOR OPIOID TREATMENT

On average, it takes between 17 and 20 years for evidence-based practice to be translated into everyday practice. To **Renee Cloutier**, that's way too long. Cloutier is an assistant professor in the School of Medicine whose work focuses on substance use and overdose prevention.

One arm of Cloutier's research applies implementation science to bring effective opioid treatment to patients more quickly. Her current five-year National Institute on Drug Abuse funded grant aims to use measurement-based care in 20 opioid treatment programs across Pennsylvania, including several sites in Pittsburgh.

Evidence from 20 years ago may not be relevant to some of today's issues. For example, research published in 2004 did not anticipate the past decade's explosion in fentanyl overdose deaths.

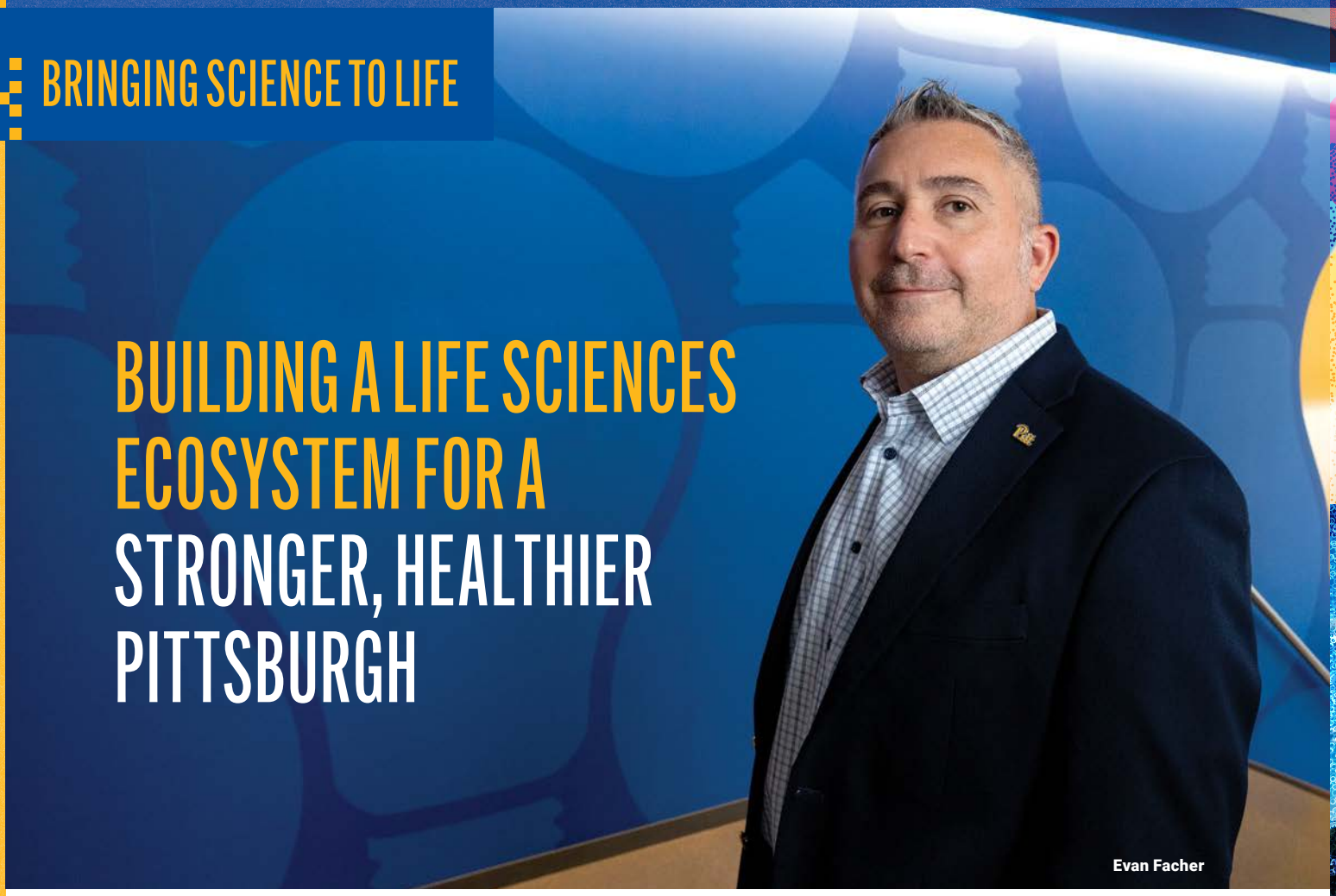
"There are a lot of major changes that that have occurred since COVID that are uniquely relevant to the opioid treatment program context," says Cloutier. "This includes flexibility around methadone, take-home doses and telehealth that makes implementation research in the opioid treatment program context especially important."

She and collaborators are working with Pennsylvania's Centers of Excellence for Opioid Use Disorder, which aim to engage and retain participants through care coordination and supporting various social determinants of health. The goal is to make treatment more immediately available and relevant to the patient's needs by "integrating and leveraging the existing infrastructure and support that already exist" says Cloutier.

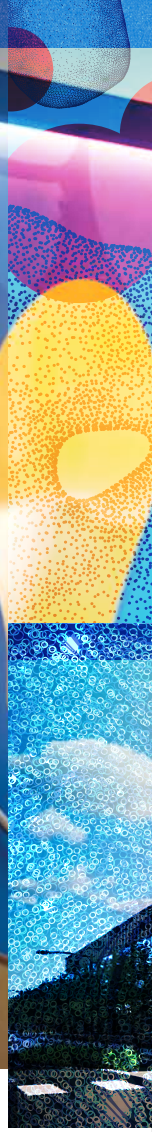
An additional objective of her work is reducing the paperwork and administrative burdens that drag down both patients and providers, such as lengthy or redundant assessments that patients feel are not used to guide their care.

"Everyone wants to see improved quality of care that does not only help keep people alive, but eventually thrive," explains Cloutier. "By centering data and resources around patient needs and how support provider teams meet those needs, we can achieve the common vision of improving the quality and impact of the patient care." ■

BUILDING A LIFE SCIENCES ECOSYSTEM FOR A STRONGER, HEALTHIER PITTSBURGH



Evan Facher



Evan Facher, vice chancellor for innovation and entrepreneurship, aims to make Pittsburgh the next big life sciences ecosystem, rivaling Boston and San Diego. To achieve this goal, the region needs to have all the essential pieces needed to nurture early-stage life sciences companies, enabling them to thrive and attract more industry partners and risk capital. In Facher's vision, the University of Pittsburgh will serve as the academic anchor for this scientific and economic growth.

"Pitt is extremely strong on the research side of the ecosystem," says Facher. "We make many groundbreaking discoveries, but much of this research is being done to understand new knowledge, and has not necessarily been designed to address a market gap."

Luckily, Pitt already has infrastructure and resources in place to help its innovators navigate the pathway from early-stage discovery through intellectual property protection and commercialization. ■

OFFICE OF INNOVATION AND ENTREPRENEURSHIP

Led by Facher, the Office of Innovation and Entrepreneurship (OIE) is made up of four units, each charged with achieving societal impact and economic development through commercialization.

Innovation Institute
Assists Pitt faculty with intellectual property protection and management, licensing and startup formation

Big Idea Center
An on-campus, outside the classroom, immersive innovation catalyst that develops the innovation and entrepreneurial skills of the Pitt student community

Office of Industry and Economic Partnerships
Aligns Pitt's research capabilities and world-class expertise with the needs of industry and venture capital, creating mutually beneficial partnerships that advance important science

Institute for Entrepreneurial Excellence
Offers a dynamic mix of consulting, education and networking opportunities for regional businesses throughout Southwestern PA while serving as an innovative leader in economic development

LIFEX

Established by Pitt in 2017, LifeX drives the development of life science companies through deep industry expertise and capital infusion. It focuses on therapeutic, device, diagnostic and digital health technologies poised to transform the future of health care. Its highest priority is expanding the opportunity for entrepreneurship in the life sciences ecosystem by developing strong life science companies capable of attracting parterships with industry and the financial community. In November 2023, LifeX received a $2 million grant through the Build to Scale program that administers funds annually through the U.S. Department of Commerce's Economic Development Administration. These funds will create new job opportunities and add new innovations to the local landscape that will make a lasting impact on entrepreneurs, the region and health care industry. ■

PITT BIOFORGE

While new research and technology are nearly always celebrated, we tend to focus less on how those technologies will be implemented or delivered. Pitt BioForge wants to ensure just as much thought goes into the manufacturing process as the initial discovery. What will soon be a 185,000 square foot state-of-the-art biomanufacturing facility, BioForge aims to spark novel cell and gene therapies from concept to market.

BioForge is anchored by the company ElevateBio—a technology-driven cell and gene therapy company that accelerates access to cutting-edge technologies and expertise to change the future of medicine.

Through BioForge, next-generation manufacturing and delivery can be scaled up, creating a more efficient and cost-effective process to benefit those receiving precision medicine therapies. The BioForge team strives to create inclusive economic growth opportunities for the region and enable equitable access to these life-changing medications.

"This is a big swing for ecosystem creation," says Facher. "If we can create a local environment where companies want to move here because of these new capabilities at BioForge, it could lead to bigger partnerships and a bench to bedside process that is completely local."

As Pittsburgh sets its sights on becoming a global life sciences ecosystem, the synergy between Pitt and its regional partners will be instrumental. With a strong research foundation and a passion for innovation in health care, Pittsburgh already attracts top-tier talent making pioneering discoveries. Translating those discoveries into real-word therapies and regional economic growth will shape the future of Pittsburgh and enhance the quality of life for patients locally and worldwide. ■

Pitt EI³

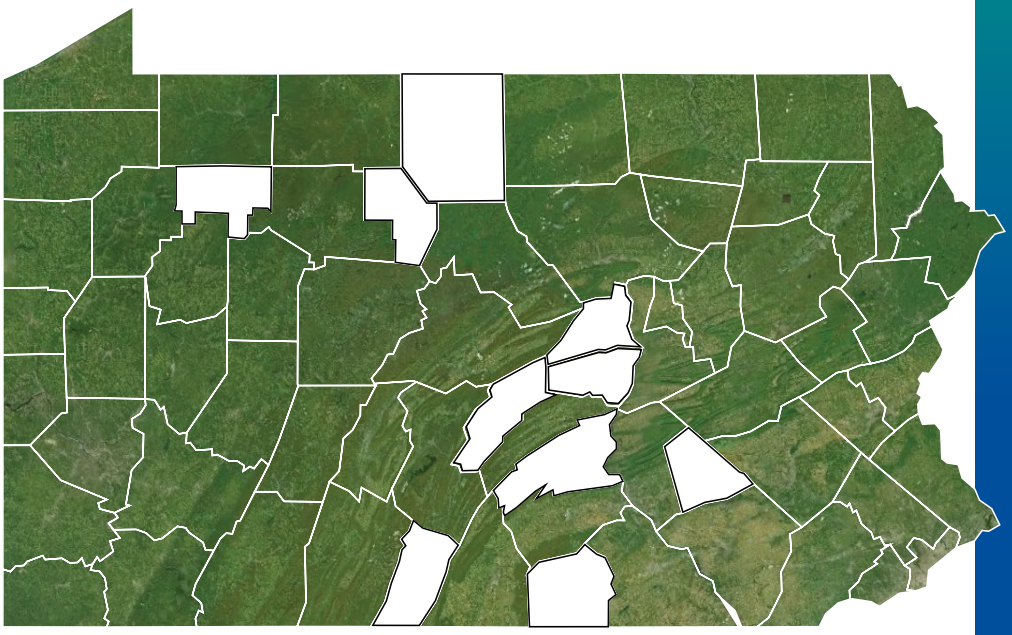
EI³ TACKLES INEQUALITY IN ENTREPRENEURSHIP

Pitt's Equitable, Inclusive, Innovation and Incubation Program, or PittEI³, aims to develop sustainable and equitable cultural change around innovation at the University of Pittsburgh to ensure women and other historically excluded people are participating in innovation and entrepreneurship at all levels.

Led by the Office of Innovation and Entrepreneurship in partnership with the Office of the Provost, Office of the Senior Vice Chancellor for Health Sciences and the Clinical and Translational Science Institute, PittEI³ is designed to address inequality in academic innovation and entrepreneurship through programming, mentoring and networking. Support includes up to 25% full-time professional effort to devote directly to innovation activities. PittEI³ programming allows fellows to engage in skills training with the opportunity to develop individual innovation planning and mapping. Participants also gain personalized one-on-one coaching and mentoring in addition to helping build the innovation community on campus. ■

IMPACT IN PENNSYLVANIA

SPENDING IN THE REGION



This map shows the impact of Pitt research through research spending in counties in the state of Pennsylvania during fiscal year 2024.

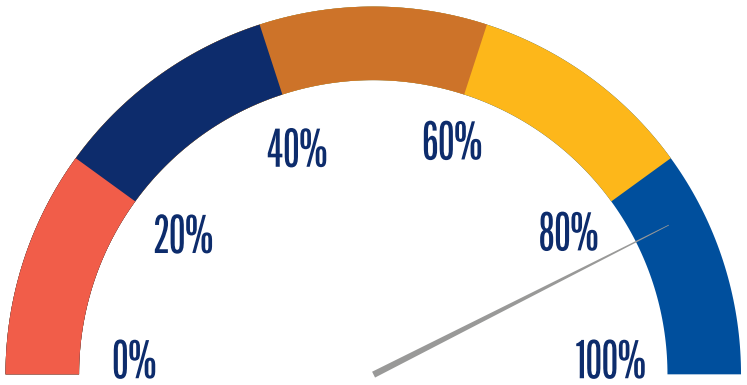
Vendors are located in counties highlighted in a satellite image of the county. Spending is not uniform across counties.

Allegheny County received the largest amount of Pitt research funding dollars.

Source: Research Spending and Vendors for FY 2024

Office of the Chief Financial Officer

PERCENT OF PA COUNTIES PITT SPENT IN RESEARCH FUNDING



This gauge illustrates the impact of Pitt research on Pennsylvania by showing spending on Pennsylvania-based businesses during fiscal year 2024. The percentage value indicates the counties in which Pitt has spent research funding. Spending is not uniform across counties. The largest spending occurs in Allegheny County.

Source: Research Spending and Vendors for FY 2024

Office of the Chief Financial Officer

PITT RESEARCH IMPACT ON THE STATE

$51.6M

SPENT IN PENNSYLVANIA

$13.4M

SPENT IN SMALL BUSINESSES IN PENNSYLVANIA

$3.1M

SPENT IN DIVERSE-OWNED BUSINESSES IN PENNSYLVANIA

Spending from sponsored research accounts during the academic fiscal year 2024. We measure Pitt's research impact on the state through transactions from sponsored research accounts with vendors located in PA. The period covered corresponds to fiscal year 2024; however, data is not finalized until late October 2024.

Diverse-owned categories include African American/Black, Caucasian women, Hispanic American/Latinx, Asian Indian American, Asian Pacific American and Native American (which includes Native American, and Aleut, Alaskan Native). Total Sponsored Projects spending is defined as Entity 05 spending on Pitt's Controller's Office website under the PRISM Account Structure & Attributes page.

Source: Office of the Chief Financial Officer

PITT MOMENTUM FUNDS

346	162	$7.6M
APPLICATIONS RECEIVED	GRANTS AWARDED	DOLLARS AWARDED

ARTS AND HUMANITIES MICROGRANTS

62	41	$125K
APPLICATIONS RECEIVED	GRANTS AWARDED	DOLLARS AWARDED

Pitt Momentum Funds and Microgrants activity since these programs were first launched in FY 2019 and FY 2023, respectively.

Source: Office of the Senior Vice Chancellor for Research

COLLABORATIVE INNOVATION

	Invention Disclosures	Licensing and Options	Startups	Newly Issued U.S. Patents
ONE INVENTOR	80	24	2	12
TWO OR MORE INVENTORS	268	108	11	106
TOTAL	348	132	13	118

Innovation activity at the University of Pittsburgh during FY 2024.

Source: Office of Innovation and Entrepreneurship

INTERNATIONAL COLLABORATION

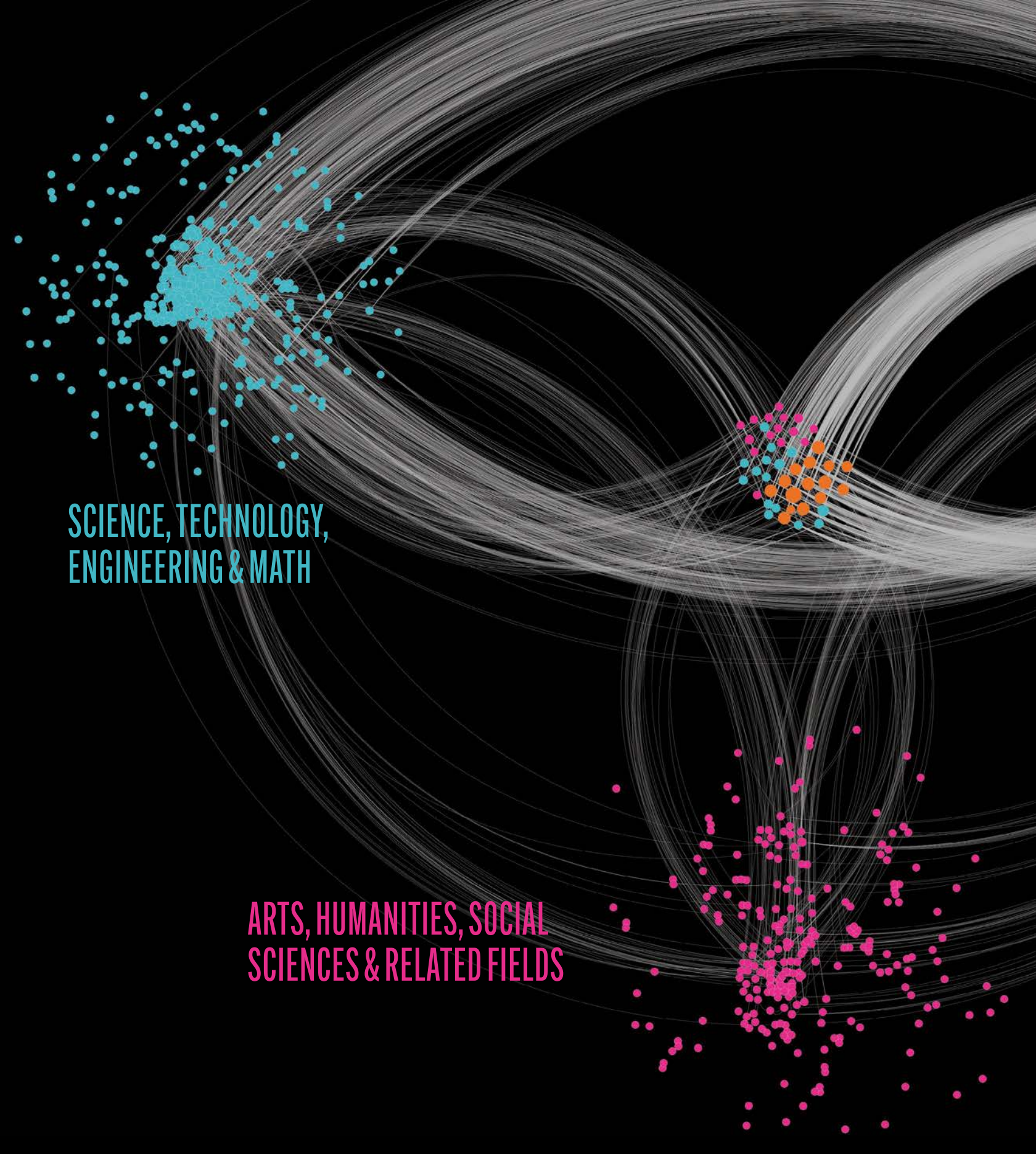
This map visualizes international research collaborations based on the number of Web of Science documents that involve the University of Pittsburgh and partners from other countries or regions.

The color scale indicates the total number of collaborative Web of Science documents with researchers from each highlighted country during the period from July 2023 to July 2024.

Source: Clarivate InCites

LOW HIGH

RANK	COUNTRY	NUMBER OF WEB OF SCIENCE DOCUMENTS
1	United Kindom	2,617
2	Canada	1,455
3	Germany	1,021
4	China	934
5	Italy	872
6	Australia	856
7	France	713
8	Spain	706
9	Netherlands	646
10	Japan	580


SCIENCE, TECHNOLOGY,
ENGINEERING & MATH
ARTS, HUMANITIES, SOCIAL
SCIENCES & RELATED FIELDS

HEALTH SCIENCES

PITT RESEARCH SOCIAL NETWORK

Our research collaboration network shows how Pitt researchers from different fields combine their knowledge to pursue grand research projects. Each node represents a Pitt individual who has submitted a proposal for research funding during FY 2024. The links between the nodes indicate that the connected individuals are co-investigators in a proposal. At the core of the graph, we find *super connected* individuals, who have partnered with an impressive number of collaborators across disciplines.

Source: Pitt Electronic Research Information System PERIS™ MyFunding

Data is current as of 07/08/2024.

RESEARCH SUPER CONNECTORS

SIMON WATKINS

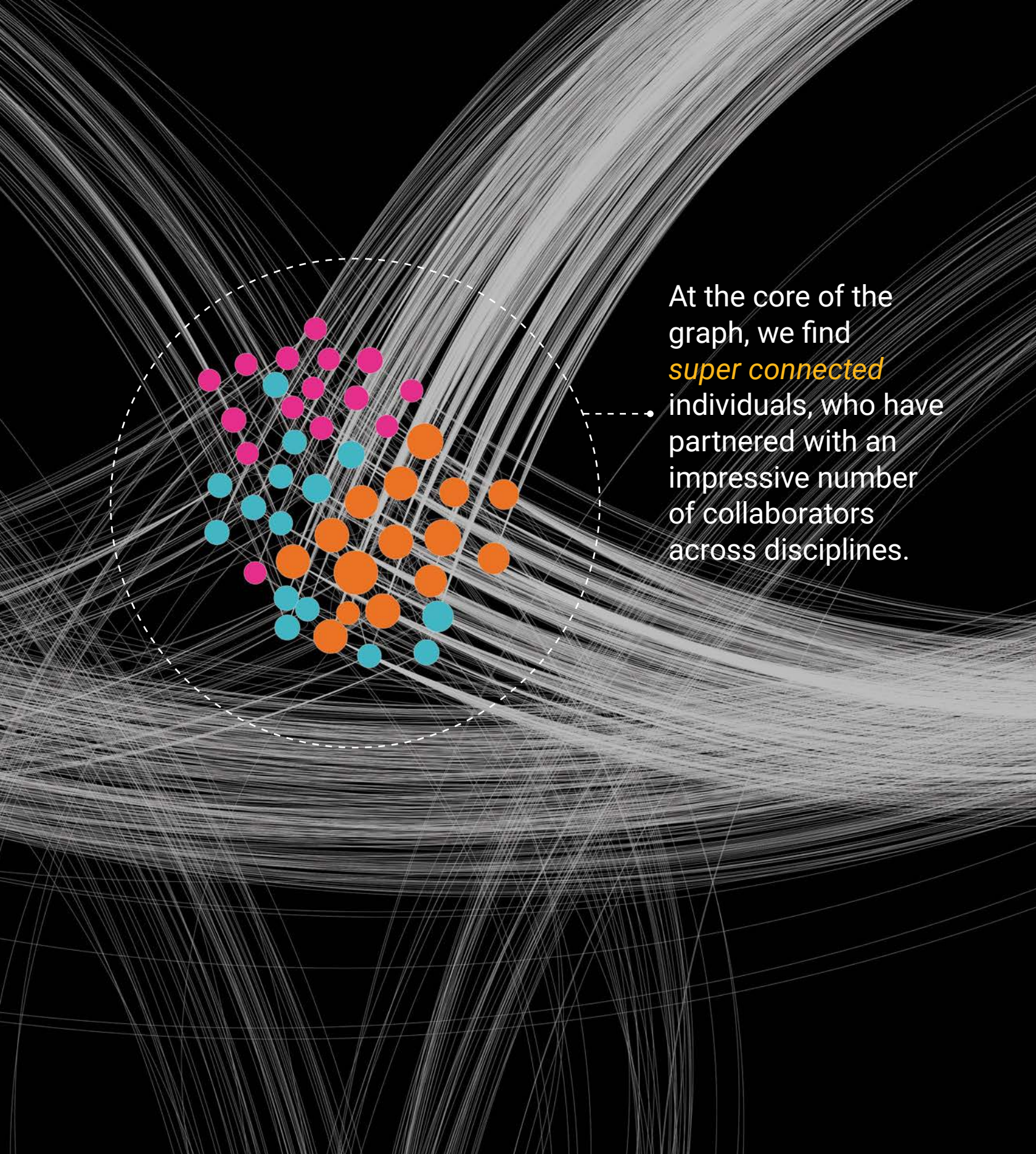
Simon Watkins is a distinguished professor in the Department of Cell Biology in the School of Medicine. He is the founder and director of the Center for Biologic Imaging—one of the largest optical imaging centers in the country. Through his work in the Center for Biologic Imaging, he provides integrated, elite access to microscopy, biophotonics and imaging used for research, education and collaboration across the University.

JULIE FIEZ

Julie Fiez is a professor in the Department of Psychology in the Kenneth P. Dietrich School of Arts and Sciences. She uses an interdisciplinary neuroscience approach for her research on the neural basis of language processing and basic systems in the human brain. Her research group is specifically focused on how cognition can be optimized with reinforcement learning and error-correction signals from the basal ganglia and cerebellum.

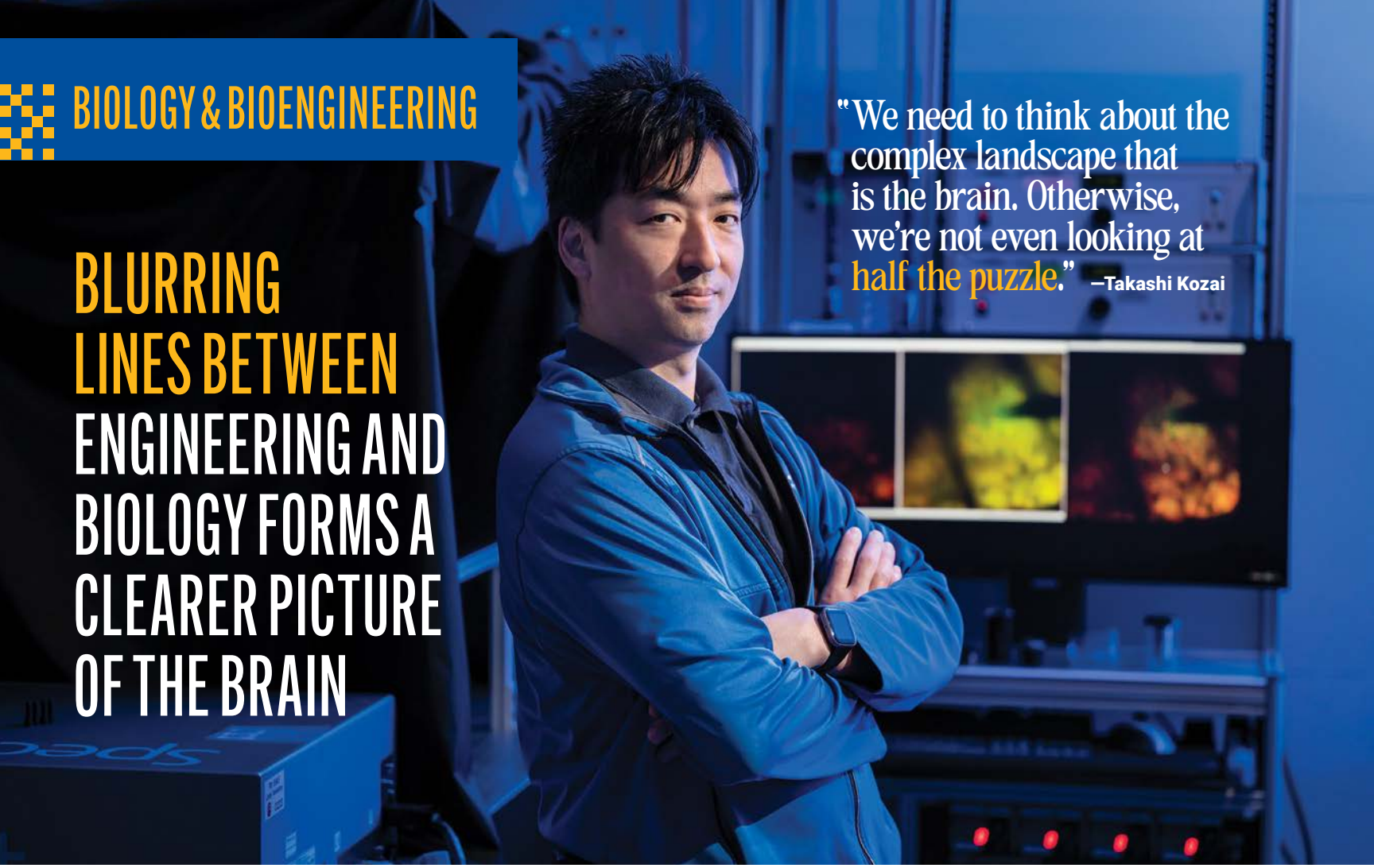
JAMES HUGULEY

James Huguley is an associate professor in the School of Social Work and chair of the Race and Youth Development Research Group at the Center on Race and Social Problems. His work revolves around culturally distinct socialization practices in Black families and their impact on outcomes of Black youth in addition to improving the educational and mental health outcomes of young people in oppressed educational contexts.



At the core of the graph, we find *super connected* individuals, who have partnered with an impressive number of collaborators across disciplines.

BLURRING LINES BETWEEN ENGINEERING AND BIOLOGY FORMS A CLEARER PICTURE OF THE BRAIN



"We need to think about the complex landscape that is the brain. Otherwise, we're not even looking at half the puzzle." —Takashi Kozai

Takashi Kozai, associate professor of bioengineering in the Swanson School of Engineering, wasn't always a fan of biology. He wanted to be an engineer.

Then he learned about ATP synthase, a motor-like enzyme. "It's like the smallest, most energy-efficient engineered system," he says. "That's when I became interested in bridging biology and engineering."

Kozai's research integrates the fields, bridging a gap separated by language, process and even thinking patterns to improve people's lives.

"I think contributing to my success is my ability to switch back and forth between the mindsets and jargon of science and engineering," he says. "To go from, 'Here is my hypothesis, here is my prediction,' to, 'If it doesn't perform at this minimum level, then it's a failure.'"

He got his start out of necessity: as a graduate student, he couldn't access the devices he needed, so he had to get creative. His lab developed brain implants, improving upon what was commercially available.

Then he became interested in how the brain works, particularly the role of so-called silent cells in neurodegenerative diseases. This work, coupled with his skills designing brain implants, led to a blending of the two fields.

"We're trying to stimulate activity," Kozai says, "And ultimately allow people to do specific tasks that they've lost the capacity for because of disease or injury."

Kozai is part of a team that received 2023 Pitt Momentum Award funding, part of an internal funding program operated by the Office of the Senior Vice Chancellor for Research and the Office of the Provost. The award allows Kozai and his team to create an ecosystem to restore a sense of touch to people with prosthetic limbs using sensors that relay information to the somatosensory cortex.

"The human subjects are able to get a sensation of touch in that robotic hand," he says. But Kozai's intentions go beyond restoring a sense of touch to people who have lost limbs, or even curing neurodegenerative diseases.

"I would like to get more people to see the world, not as engineering versus science, not as neurons versus non-neuronal cells, but in a blended way," he says. "We need to think about the complex landscape that is the brain. Otherwise, we're not even looking at half the puzzle." ■

Xinyan Tracy Cui

AT THE INTERFACE OF THE NERVOUS SYSTEM AND IMPLANTABLE DEVICES

As director of the Neural Tissue Electrode Interface and Neural Tissue Engineering Lab and William Kepler Whiteford Professor of Bioengineering, **Xinyan Tracy Cui** works at the interface between artificially made implantable devices and the nervous system. She has dedicated her career to studying how biological responses affect neural interface function, with the end goal of ensuring that the implant and brain tissue work together seamlessly.

Implantable devices in the brain are used for anything from recording electrical impulses to restoring motor function in paralyzed patients. While there are obvious benefits to these devices, issues involving mechanical damage to the brain and the host tissue's response to a foreign object still pose a large problem.

To overcome these hurdles, Cui and her lab developed an ultra-thin, flexible implant. The size and shape solve some of the mechanical issues and allow the device to move with the brain rather than irritate it with an immovable object. They also developed different types of coatings that reduce the inflammatory response and attract neurons to the device to get a stronger signal.

"Neurotechnology has become such a hot topic and I'm thrilled to be a part of it," says Cui. "The field is exploding, but there's still plenty to learn and ways to improve the devices."

In April 2024, Cui received a $2.6 million R01 grant in collaboration with Amy Wagner in the School of Medicine to investigate the cognitive and affective deficits after a traumatic brain injury (TBI) using multimodal flexible neural probes. There are few treatments for TBI, so the team aims to use these devices to better understand the neurochemical and biological origin of the symptoms and identify an effective therapy.

"The multimodal probe we develop for this study can be customized for studying varieties of neurological and psychiatric disorders and provide clinical impact even if we aren't implanting the devices in humans," says Cui. "The work we do will help move the field forward and benefit people in the long run." ■

Alexander Deiters

FROM BREAKING TO MAKING COVALENT BONDS FOR NEW CHEMISTRY

Alexander Deiters, professor of chemistry in the Kenneth P. Dietrich School of Arts and Sciences, focuses his work on creating synthetic organic molecules with new architectures and new biological functions.

His lab is well known for engineering "optical switches," which are molecular probes used for understanding protein interactions. They start by expanding the genetic code of cells to create light-responsive amino acids. When these amino acids are incorporated into proteins, the proteins' functions are blocked until they are exposed to light. The light breaks covalent bonds and activates the proteins.

"By engineering the genetic code from 20 to 21 amino acids, we enable fundamentally new chemistry to proteins inside that cell," says Deiters. "This allows us to investigate the protein to find disease relevance or the discovery of new biological mechanisms in a way that has never been done before."

More recently, his lab is transitioning from the science behind breaking covalent bonds in biological systems, to making them. Using aptamers, the research group can transfer things like fluorescent labels or drugs onto a target protein through covalent bond formation. This method shows promise for the development of new diagnostics and targeted therapeutics.

From another bond-forming project in 2023, Deiters and collaborators in the School of Medicine and Swanson School of Engineering published their groundbreaking work in Nature Communications that devised a solution to broaden the versatility of engineered CAR T-cells through covalent modification. The team engineered CAR T-cells that carry SNAPtag, a DNA repair enzyme engineered to label proteins. SNAPtag covalently bonds with benzylguanine, which is attached to an antibody. This universal approach allows the programming of CAR T-cells to recognize multiple tumor targets in a tunable fashion, which opens the door for safer and more effective CAR T treatment.

"We really try to utilize covalent bond formation to provide enhanced treatment modalities for diseases," says Deiters. "But at the same time, we're also looking to provide new research approaches to move the whole field forward." ■

PARSING PARROT DIALECTS AT PITT JOHNSTOWN

The University of Pittsburgh at Johnstown campus sits high above Pennsylvania's Conemaugh Valley on more than 600 acres of a certified Audubon Cooperative Sanctuary, full of birds and the occasional bear. Biology students, many of them first-generation college students from rural communities, create research projects studying the area's biodiversity. But the most striking bird research at UPJ doesn't involve native birds—it involves parrots.

Christine Dahlin, professor of biology at Pitt-Johnstown, has a lifelong interest in vocal learning in birds, specifically yellow-naped amazon parrots. Known for imitating human speech when kept as pets, their vocals in the wild are equally complex.

"I have a team of research students working on a long-running project studying the dialects of yellow amazon parrots. We use vocal recordings to study the spectrograms of the parrots—visual graphs of the sounds—and use specialized programs to develop a lexicon of the sounds," says Dahlin. "We're looking at what rules the parrots follow. We use vocal recordings to organize the duets between the males and females."

Dahlin's team aims to learn if the birds use rules in a manner similar to human language to structure the long, complex sequences of the duets.

She also studies regional parrot dialects, traveling to Costa Rica every 11 years to document the evolution of variants. Simultaneously, she studies the health and biodiversity of the bird population. In the course of the dialect research, her team documented a steep decline in the population of yellow-naped amazon parrots in Costa Rica, which led to the International Union for Conservation of Nature listing the birds as critically endangered.

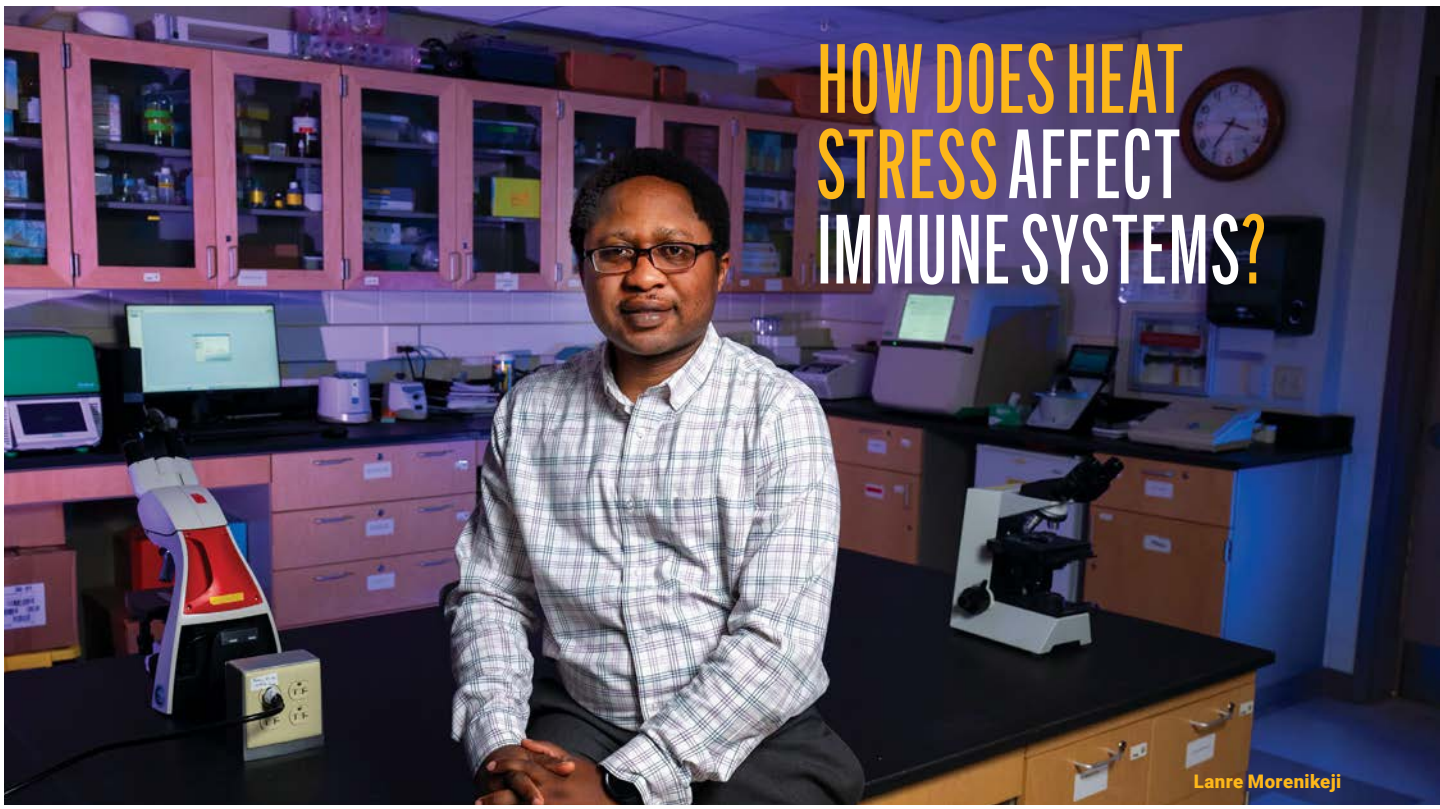
Collecting data on wild parrots is difficult, so Dahlin collaborates on a project relying primarily on citizen scientists reporting on their pet parrots.

"Essentially, we are building an enormous database of information on the repertoire of mimicry for pet parrots. We ask people to complete a survey with data on what they know about their own pets. That way, we can collect data about a whole array of varied species that we really can't do in the wild," says Dahlin. "With this information, we can better understand the capacity for vocal learning across parrots, for example, African grey parrots are particularly good at mimicking human speech. Cockatiels are not good at mimicking words—but they are *really* good whistlers."

If you have a companion parrot and want to participate in ongoing research, see www.manyparrots.org. ■

Christine Dahlin

HOW DOES HEAT STRESS AFFECT IMMUNE SYSTEMS?



Lanre Morenikeji

Located in a small city near the Allegheny National Forest a few miles from the New York border, the University of Pittsburgh at Bradford, with an enrollment of 1,300 students, boasts rankings in value, alumni placement and earnings—as well as social mobility—that would be the envy of many larger institutions. Perhaps surprising to some for a small school deep in the Pennsylvania woods, Pitt-Bradford has the highest percentage of Black students in the Pitt system. The University has been recognized in several college rankings for equity and inclusion.

Pitt-Bradford emphasizes faculty-student research collaborations that lead to publishable results. Immunologist **Lanre Morenikeji** and students conduct research that could not be more of the moment—the effects of heat stress on the immune systems of plants and animals. Morenikeji, assistant professor of biology, received a 2022 Pitt Momentum Fund Award for research on the effect of small molecules such as non-coding RNA on immune responses.

Morenikeji began by studying animal health in his native Nigeria. That work led to research in the United States on immunity in both experimental and computational genomics. His background studying human and animal vectors in malaria and SARS viruses put him in a unique position with the outbreak of COVID-19, caused by a SARS virus conventionally thought to be zoonotic—having passed from animals to humans.

"COVID-19 was a unique opportunity," says Morenikeji. "I had students who were curious to know the relationship between the virus that infects humans and animals."

They looked at pathways that are common in the SARS CoV-2 infections and thought there might be a cross infection between animals that created a kind of a recombinant virus—a chimeric virus, containing genetic material from more than one virus. They did computational analysis and their results were published.

Morenikeji's lab is now working on the effect of heat stress on immune responses in plants. Students in his lab grow maize plants and subject them to heat stress, measuring the respiration and growth rates along with changes in the plants' physical parameters. The team extracts RNA at stages and compares the gene expression under varying conditions.

"Heat stress is not related to climate change alone, but climate change could be a major driver of increasing stress," says Morenikeji. He cites heat stroke as one possible condition in humans that can be related to an increasingly hot environment.

"Climate change is affecting all life—human, plant and animal," Morenikeji emphasizes. "The ultimate goal is to create a pathway to mitigate the stress response in the future, no matter what form of life." ■

ODYSSEYNOW: MORE THAN A GAME

> "To understand ourselves as a culture, we have to understand our stories, the media we use to tell them and how those things have changed over time."
>
> —Zachary Horton

Gaming's popularity has surpassed all other forms of narrative media, including books and movies. **Zachary Horton** wants everyone to understand that video games are more than just diversions.

"To understand ourselves as a culture, we have to understand our stories, the media we use to tell them and how those things have changed over time," says the associate professor of film and media studies in the Kenneth P. Dietrich School of Arts and Sciences.

As part of that effort, Horton is writing a book about the first 30 years of computing, the 1940s through early 1970s. His research unearthed schematics for the Magnavox Odyssey, the first video game console people could play at home. It debuted in 1972 but has not garnered much attention or been properly documented.

That discovery led to OdysseyNow, the first definitive archive of this important part of early computer history. The project now includes a YouTube channel and website, where people can watch game-play videos and collectors can connect. When the project revealed an Odyssey game that was never released, Horton's team recreated the lost video game "Ski Festival" and held gaming tournaments.

While Horton lacks the free time to play games as often as he would prefer, he believes that hands-on experience with early computers and games reveals the genealogy of our current media, the origins of artificial intelligence and our culture's "media potentials" for the future.

Horton also founded and runs Pitt's Vibrant Media Lab, a "quirky, messy space" that's part science lab, part design studio and part humanities gathering space. The space is equipped with various equipment and designed so people can play, create and cross-pollinate ideas in unique ways. ▪

TRANSFORMING LIVES IN AN UNCERTAIN WORLD

Most predictions are wrong because the future is unpredictable. That is the bedrock of **Sharon Alvarez**'s research on entrepreneurship and business formation.

"Technically, the term in economics is 'Knightian uncertainty,'" explains Alvarez, Thomas W. Olofson Chair in Entrepreneurial Studies in the Joseph M. Katz Graduate School of Business. "Named after economist Frank Knight, it is based on the idea that simple human interactions trigger changes on a massive scale, and those changes are unpredictable. The COVID-19 pandemic is a great example. In 2020, it was impossible to predict what would happen in a year."

The uncertainty principle flies in the face of risk-based probabilities, the model for most business school education. Managing risk inherently involves anticipating problems within existing frameworks.

Uncertainty is not a bleak concept.

"My work talks about agency in times of uncertainty and deviates from the notion that we just react to the world," she describes. "The world is uncertain, and we human beings are the ones who create things in the world and make them available. Entrepreneurship is human in nature. It's about the agency of the human being, not about the world acting on us."

Alvarez believes that business schools try to predict the future by teaching risk management. For her, the importance of entrepreneurship lies not in predicting the market, but in getting products into the market, an inherently uncertain process.

Alvarez works to impart that sense of agency and entrepreneurship to her students.

"At universities, we have a lot of privileges, so we also have obligations to transform the lives of students," she says. "We don't get to just transform the lives of those who come in perfectly prepared from the perfect background, but we oftentimes get to transform the lives of students who don't come from backgrounds that make it easy for them—such as first-generation college students and students from marginalized groups."

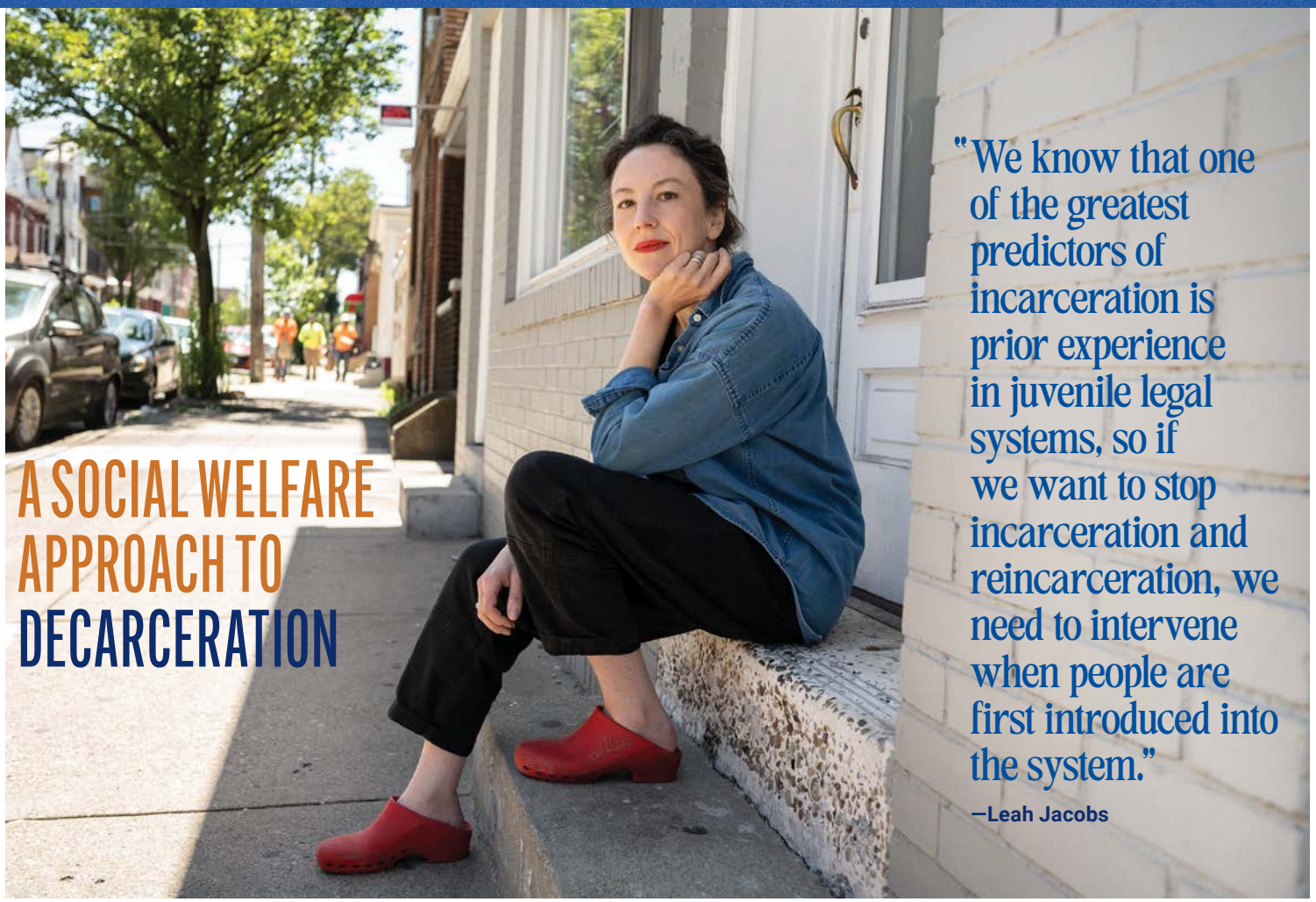
Along with other groups, Alvarez points out, women entrepreneurs continue to face barriers, receiving roughly 3% of the investment from banks or venture capital firms.

"If you think about the investor investing in the person and not necessarily the product, perhaps the investor feels men are better at handling uncertainty than women," she explains. "That's not explicitly expressed, but when you probe deeper you find interesting assumptions."

Beyond her work at Pitt, Alvarez is president of the 20,000-member Academy of Management, made up of academic researchers around the world. With such a large platform, Alvarez hopes to affect the teaching of entrepreneurship.

"The academy has been primarily research oriented but there are now more professors of practice who are teaching oriented. I'm really proud that under my term we are able to bring in more teaching faculty," says Alvarez. "Teaching is where we transform lives. We've chosen that responsibility, and transforming lives involves far more than learning technical skills." ▪

Sharon Alvarez



A SOCIAL WELFARE APPROACH TO DECARCERATION

> "We know that one of the greatest predictors of incarceration is prior experience in juvenile legal systems, so if we want to stop incarceration and reincarceration, we need to intervene when people are first introduced into the system."
>
> —Leah Jacobs

The U.S. prison population has grown 500% since 1973, and recent policy discussions have explored ways to control and reduce this trend. A Pitt social work scholar is working to understand how and why the country turned to hyperincarceration to address social problems—and how we can use social interventions to reduce incarceration and enhance public safety.

Her recent work focuses on the ways law enforcement interacts with the public, especially young people.

"We know that one of the greatest predictors of incarceration is prior experience in juvenile legal systems, so if we want to stop incarceration and reincarceration, we need to intervene when people are first introduced into the system," says **Leah Jacobs**, associate professor in the School of Social Work.

She collaborates with Strategies for Youth, a nonprofit organization based in Cambridge, Massachusetts, to test a program to teach law enforcement personnel about typical adolescent behaviors that may be mistaken for criminality or disrespect to police, such as displaying autonomy, impressing peers and being impulsive. The intervention team wants police to learn how to recognize these normal aspects of adolescent development and how they influence interactions.

The project offers train-the-trainer education to help police build skills to divert and de-escalate, such as allowing youth to save face, using humor selectively and building relationships in the community. Training includes five modules with didactic training, role playing and teach-back led by mental health experts, former police and legal experts. Trainers then return to their departments to train their peers.

The team aims to implement the program across 21 police departments. The project is funded by the National Institute of Justice and conducted in conjunction with Community Partners in the Contra Costa County, California, Department of Probation.

Although the issue of hyperincarceration requires collaboration among many disciplines, Jacobs believes social welfare scholars are essential to these efforts because they see issues through a unique lens, both the individual's and society's role. ■

Peggy Liu

UNDERSTANDING PEOPLE'S DECISIONS: THE INTERSECTION OF PSYCHOLOGY, PUBLIC HEALTH AND MARKETING

Peggy Liu's research seeks to understand what drives the many decisions people make. What made you buy that particular product for your child? What happens when you reach out to that old friend? Why do we make certain healthy or unhealthy choices?

The Ben L. Fryrear Chair in Marketing and an associate professor of business administration in the School of Business examines how people's consumption decisions and actions affect their social connections—and vice versa—and how to motivate people to make healthier decisions. She uses expertise in psychology, public health and marketing to better understand and influence various aspects of consumer behavior.

One of her recent studies, published in the Journal of Personality and Social Psychology, garnered high levels of international media coverage. The work found that people significantly underestimate how much others appreciate it when we reach out to them. The more unexpected that phone call, text or email—the more people underestimate the appreciation. The research was covered by The New York Times, The Guardian and other major media outlets.

In another recent project, Liu and a colleague from the School of Dental Medicine developed a family activity box to aid parents in their efforts to develop good eating, drinking and brushing habits in their young children. An embedded video in the box's lid features a mom talking about how she cares for her children's dental health, and the box contains a children's activity, a book and toothbrushing supplies. Winners of the Pitt Innovation Challenge, the team is examining families' reactions to the box.

Liu has received numerous awards for her research from major international societies in the psychology, public policy and marketing disciplines. Most recently this year, she won the 2024 Award for Transformative Early Career Contributions from the Association for Psychological Science and the 2024 Pitt Chancellor's Distinguished Research Award in the Junior Scholar Category. ■

PUSHING BOUNDARIES IN SPACE TO IMPROVE LIFE ON EARTH

If someone said they could reprogram a person's cells and then transplant them back on the skin's surface to create excitable neural cells for the brain to help heal after injury, what would you think? For **Chandan Sen**, director of the McGowan Institute for Regenerative Medicine, this is a reality and only takes 100 milliseconds of contact with a tiny silicone chip.

The technology is called tissue nanotransfection, or TNT. It achieves reprogramming of the tissue in the live body—no sophisticated laboratory infrastructure required. That means TNT is cost efficient, scalable and does not rely on access to specialized resources. Fourteen peer-reviewed papers later, Sen truly sees the impact of his work. "We presented data after data after data to win the confidence of our peers that indeed skin can be reprogramed using a silicon chip to make functioning blood vessels," says Sen.

Research in Sen's lab takes advantage of the body's own resilience to help regenerate tissue that has been injured in a traumatic injury or is losing function due to age. "This is not looking for the fountain of youth," says Sen. "This is looking for a way to maximize functionality for as long as we live."

There are two major approaches to obtain specialized tissue with desired functionality. The first is tissue engineering, which relies on a scaffold where building-block cells are placed in the right order. The second is to recapitulate some aspects of developmental biology—known to generate tissues in the mother's womb—in the adult body. TNT relies on the latter.

Someday, part of maximizing tissue functionality may include a trip to space.

"Muscle atrophy, brittle bones, puffy heads, eye disease—enough people are looking at what does not work when we go to space," says Sen. "We want to understand how the body adapts in response to exposure to this new natural environment."

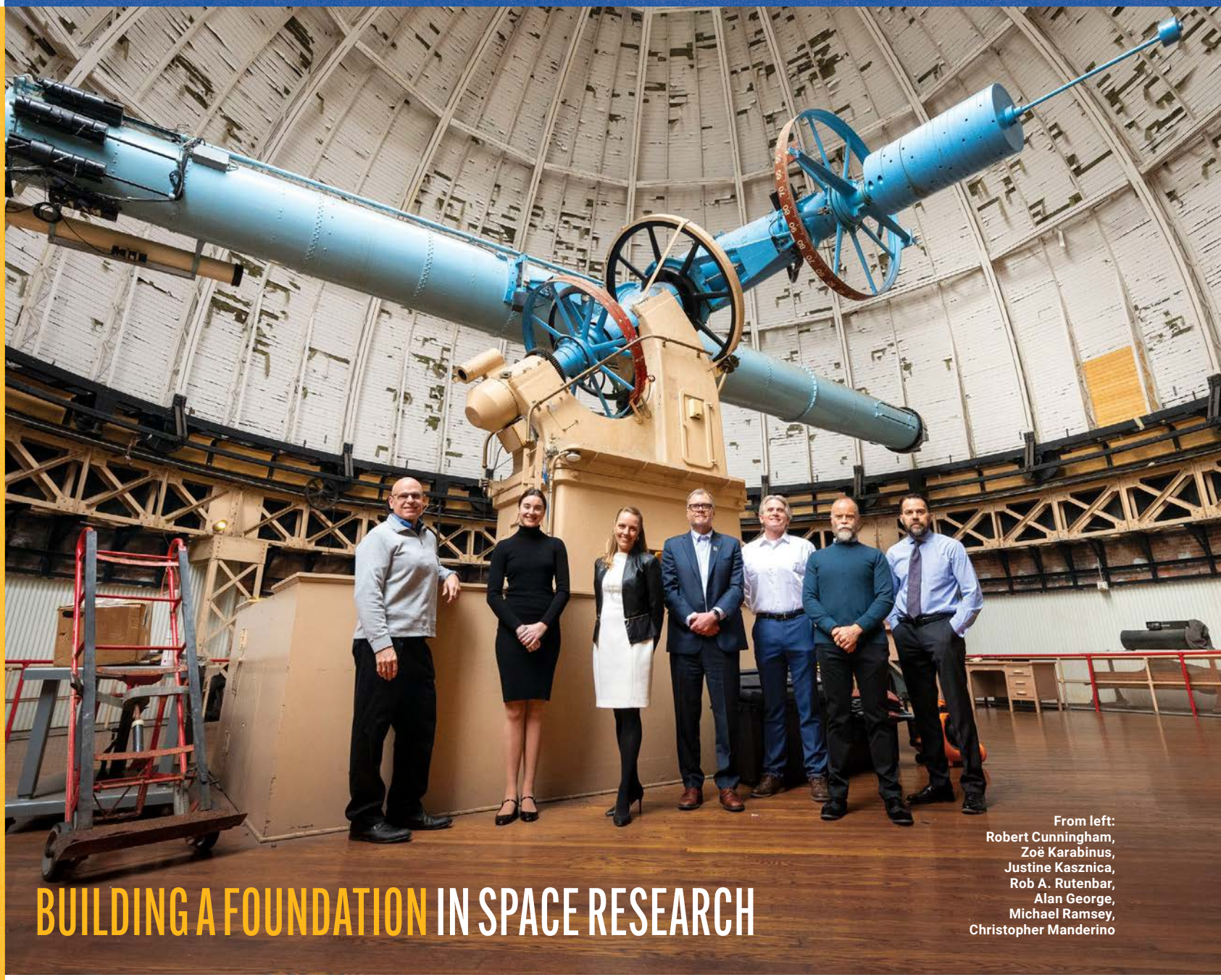
Everything we know today about the limits of the human body is conditional; we only know those limits are true when we are on Earth. "We learned them as if they are absolute limits," says Sen, but they are not. The limits of the human body and the way it functions may shift off-Earth.

"The power of human resilience is amazing. Once we know the constraints are not so absolute, perhaps we can bring someone to space and leverage the adaptive forces in the body for therapeutic purposes," says Sen, who oversees the creation of a proposed Center for Space Biomedicine in the McGowan Institute. He imagines a day when people go to space for medical procedures that are only possible when our bodies change in response to being in that environment.

Sen already has seen some of the differences by studying mice. After 42 days on the International Space Station, genomic plasticity went up in about a third of the mice, which is indicative of functional adaptations. What factors exactly cause those changes, Sen doesn't yet know. "Space biomedicine represents a lucrative frontier with tremendous opportunities to gain insight into new therapeutic opportunities on Earth," adds Sen.

"Sometimes ignorance is bliss, especially in space medicine. It makes room for unbiased exploration," says Sen. "It's important to come in with a fertile mind, curiosity and humility, acknowledging the vastness of the unknown compared to the little known." ■

"It's important to come in with a fertile mind, curiosity and humility, acknowledging the vastness of the unknown compared to the little known." –Chandan Sen



From left: Robert Cunningham, Zoë Karabinus, Justine Kasznica, Rob A. Rutenbar, Alan George, Michael Ramsey, Christopher Manderino

BUILDING A FOUNDATION IN SPACE RESEARCH

Pitt has a long history of cutting-edge space science. Pitt researchers were among the first to analyze moon rocks brought back by the Apollo 11 crew, and more recently, they were among the first to use the most powerful telescope in history. They're already working on its successor.

But the complexities of doing anything in space require collaboration with Pitt colleagues as well as researchers, engineers and scientists at other institutions.

Ultimately, it will also require working with local entrepreneurs and other residents of the Pittsburgh region as research gets put into practice.

Pitt recently made a move to forge those collaborations by joining the Keystone Space Collaborative with a sponsorship of $20,000. The nonprofit organization supports the growing space industries in Ohio, Pennsylvania and West Virginia, bringing together representatives from academia, industry, investing and government to meet challenges together.

"We're excited to join Keystone Space and excited to help this ecosystem grow," says **Robert Cunningham**, vice chancellor for research infrastructure and a leader of Pitt's space initiative.

Pitt's recently launched space initiative focuses on three areas: basic science, engineering and space medicine and

biomanufacturing. Partnering with Keystone, which connects more than 700 participants, can help make the connections needed for truly cutting-edge science.

Christopher Manderino graduated from the Swanson School of Engineering in 2020 with a master's degree in electrical and computer engineering. He's now a systems engineer at Pittsburgh-based Astrobotic, a company that designs and builds a variety of space-based robotics.

At Pitt, Manderino worked with **Alan George**, R&H Mickle Professor and Chair, Department of Electrical and Computer Engineering in Swanson. George also directs the National Science Foundation Center for Space, High-performance and Resilient Computing (SHREC), where Manderino worked on hardware that would make its way to the International Space Station.

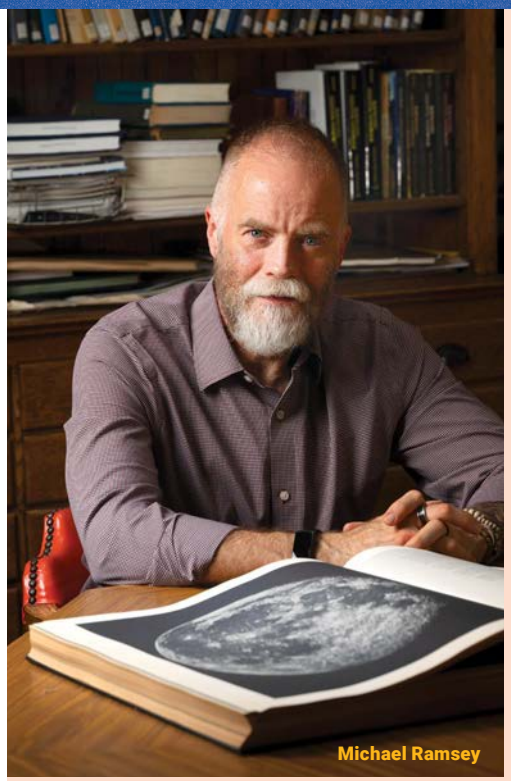
"Thanks to my studies with Pitt and the SHREC lab, within months from graduation I was already in a position to take on the role of technical lead for a new space computer design from the ground up," Manderino says.

According to **Zoë Karabinus**, program director of Keystone, the region's thriving space ecosystem, if nurtured properly, could compete with longstanding champions of space industry like Texas and Florida. Manderino believes Pitt can play an outsized role within this ecosystem.

"Pitt is in a unique position to plant and foster this vibrant culture in Western Pennsylvania," he says. "I can see the potential for space engineering at Pitt to be an indispensable bridge to the growing space community, and to bring a new energy to Pittsburgh and Pennsylvania with unparalleled impact."

The Keystone Space Collaborative is a foundational part of that bridge—and Karabinus hopes membership in the group will spark meaningful partnerships across the region.

"Partnerships with universities like Pitt are invaluable when it comes to growing the region's skilled talent pool, as well as tapping into the amazing things Pitt is doing in the areas of space," Karabinus says. ■



Michael Ramsey

SPACE-BASED MONITORING UNCOVERS VOLCANO ACTIVITY ON EARTH AND BEYOND

As a geologist, **Michael Ramsey**, professor of volcanology and planetary science in the Kenneth P. Dietrich School of Arts and Sciences, studies volcanoes to understand their behavior and minimize risks for people living nearby. Using his background as an engineer, he has developed unique instruments that allow him to gather data in the field, in the lab and from about 400 miles above ground, on satellites in low-Earth orbit.

"My work has involved space since my days as a first-year graduate student," Ramsey says. His very first grant as a principal investigator was funded by NASA, and nearly 30 years later, so are his four most recent research projects.

The importance of space across disciplines as different as geology, astronomy, manufacturing or medicine, was a motivation for Ramsey to join with researchers from other disciplines in an effort to bolster Pitt's commitment to space-based research.

Ramsey has gathered data using satellites pointing away from Earth, too. He has analyzed images of Mars, the Moon and, as part of a recent project, is using computer modeling to review historical data of lava flows from Venus. The results should help illuminate how long eruptions take if Venus is in fact still volcanically active.

NASA has two missions to Venus, sometimes called "Earth's twin," planned by 2030. "We're trying to give them a feel for what's actually going on there," Ramsey says. "For planetary science, satellite data are typically the only data we get."

Space-based observation is also important for learning about volcanoes on Earth. From orbital data, Ramsey can get a large-scale view of an entire system. Most volcanoes are not monitored on the ground 24/7, so data from space can provide people living nearby with the first hint that something is stirring.

Still, Ramsey also collects data from the ground. He and his team have developed specialty thermal infrared cameras, the latest of which will collect data from volcanoes emitting different amounts of ash and gases. The data will be used as ground truth against which upcoming NASA satellite observations can be tested and refined and to better understand the ongoing eruptive processes at these active volcanoes.

"Space-based data are safer than going into the field, are usually free and are repetitive," Ramsey says. "The marriage of both ground and space data is ideal." ■

WHERE SILICON HITS THE SIDEWALK: RESPONSIBLE DATA SCIENCE AT PITT

Creating and analyzing data—data science—should not be isolated in a computational silo. Anticipating a world of data applications across the University community, Pitt's Responsible Data Science Initiative is bringing data science to every field across Pitt, including those that have not typically used computation but are now generating and influenced by data on an unprecedented scale.

Data science is about people, explains **Michael Colaresi**, associate vice provost for data science and leader of the Responsible Data Science Initiative.

"We don't simply focus on computation in and of itself. We focus on the decisions that the models and the algorithm help to guide," he says. "The aim is decision making that is data driven but human steered."

Beyond areas like health sciences and engineering, Pitt's data initiative brings in business, social sciences, policy and the humanities. Applied data science in social sciences is familiar to Colaresi, whose background is political science. He also is the William S. Dietrich II Professor of Political Science, served on Pitt's data science task force and co-founded a major in computational and social science in the School of Computing and Information.

"Pitt can be uniquely impactful on the applications of data science. We are where silicon hits the sidewalk," says Colaresi. "We apply broad expertise in foundational data science and computation, biostatistics and artificial intelligence to solve societal-level problems from addiction to sustainability to equity and access."

Even further, Pitt is connected to organizations in banking and finance, retail, operations, government and the nonprofit sector.

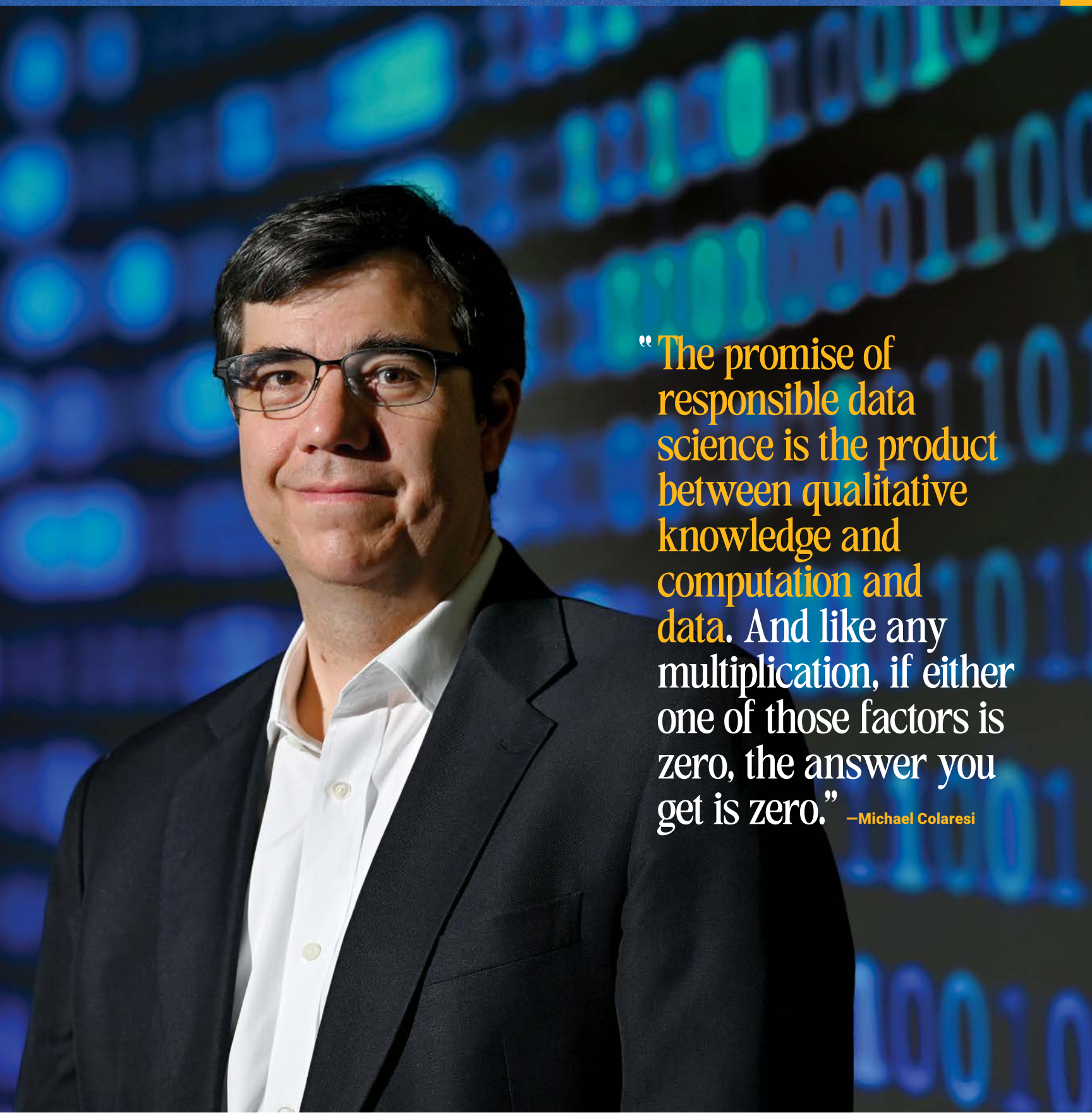
"Sometimes our image of data and computation is glowing blue bits of abstract ones and zeros. Pitt's perspective allows us to see past this illusion. Our view focuses on how data science can help people and organizations gain agency over computation," says Colaresi. "It's wonderful to speed up an algorithm, but we value that speed because of what it unlocks practically."

Pitt's Responsible Data Science Initiative is named to intentionally highlight "responsibility" as the core of data science.

"Data and models are important pieces of almost all decision-making puzzles in our current age, but we cannot forget that people are not only the edge and corner pieces but the puzzle makers and players without which there are no solutions," Colaresi says. "The amazing ability to compute and measure means we need people at the table to help us fit together trust and oversight, surveillance and privacy, as well as convenience with value."

Pitt is well placed to help resolve these conflicts. Colaresi's team won't stop trying to innovate algorithms, but they think about collecting data responsibly and protecting privacy in applied settings. Responsible data science means being thoughtful and intentional about the context in which data could be used as opposed to assuming a one-sized-fits-all solution designed without industry or community input.

"The promise of responsible data science is the product between qualitative knowledge, and computation and data," says Colaresi. "And like any multiplication, if either one of those factors is zero, the answer you get is zero." ■



"The promise of responsible data science is the product between qualitative knowledge and computation and data. And like any multiplication, if either one of those factors is zero, the answer you get is zero." —Michael Colaresi


Sera Linardi

BUILDING INCLUSIVE INFRASTRUCTURE FOR ALGORITHMIC SYSTEMS

To effectively promote equity and improve opportunities for marginalized communities, the world needs all hands on deck, including technologists. Historically, the nature of academic work and the identities of those who undertake mathematical and computational research have resulted in algorithmic and resource allocation systems that do not integrate the perspectives of people who experience them. **Sera Linardi** is leading efforts to break down silos and integrate lived experience and grassroots voices into mathematics and computer science for social issues.

Linardi, associate professor of economics in the Graduate School of Public and International Affairs, was recently named the first executive director of Equity and Access in Algorithms, Mechanisms, and Optimization (EAAMO), an association that brings together researchers in computer science, mechanism design and operations research to tackle societal challenges. The organization, which includes more than 2,000 participants from 130 institutions in 50 countries, hosts an annual conference and runs year-long working groups, called EAAMO Bridges.

"Academic-driven social impact projects often don't work because they are not sustainable or do not address what communities actually need. Researchers are rewarded for discipline-specific contributions, but communities need them to work across disciplines toward practical applications," Linardi says. "Therefore, we need to build infrastructure to reconcile these different incentive systems. Centering the research questions on community voices and deployment considerations from the start would produce research that is more useful in practice and truly innovative."

The organization offers tutorials, faculty support networks, doctoral consortiums and outreach programs, such as pairing Indigenous students and EAAMO researchers. EAAMO also communicates with larger agencies about how to connect academia and community programs, including funding. ■

HELPING LAW KEEP PACE WITH TECHNOLOGY

Technology moves fast, **David Hickton** says—but the law moves slowly.

Hickton describes this as the driving principle behind his work. As a United States attorney in 2014, he led a first-of-its-kind cybercrime prosecution for theft of U.S. intellectual property against a unit of the People's Liberation Army of the People's Republic of China. In 2017, he became the founder of the Pitt Cyber Institute for Cyber Law, Policy, and Security.

"Applying law to digital space is what I've been a missionary about for many years," explains Hickton. "We're trying to make sure that law and policy catch up to technology in the digital world by being a trusted, informed, nonpartisan source of data to drive policy."

One focus of Pitt Cyber is election security. In 2018, Hickton led a commission to review Pennsylvania's outdated election infrastructure, in part given its status as a battleground state in national elections. Hickton describes this as a bipartisan effort with members reflecting the state's political, geographic and demographic diversity.

"We looked at antiquated and exposed election machinery that would allow any malign actor to subvert our democracy," Hickton says. "We are proud of the report, and our recommendations were taken up. It's a feather in Pitt's cap."

In the 2020 presidential and subsequent elections, Pennsylvania's updated voting systems functioned without any significant hitches.

Although language like "election security" has since become politicized, Hickton says the motivation in 2018 was driven by clear evidence that Russia was interfering in elections as a matter of strategy, not only in the United States but throughout Eastern and Western Europe.

Pitt Cyber is also concerned with protecting against attacks on infrastructure. Last November, the water authority in the small Pennsylvania city of Aliquippa outside of Pittsburgh was the target of a malware attack.

Why attack such a small population center? Hickton believes the attack was a dry run.

"Every incident I have investigated had two components: the present crime and the probing component. The probing is designed to measure our response."

Hackers, Hickton says, go to vulnerability. A system is in danger if it does not have robust security, like a smaller utility or hospital. These vulnerabilities can also create a larger danger because of the many digital linkages within and between U.S. industry, government and research institutions. He describes the tension as one between security and interoperability. Modern efficiency and communication call for systems to be able to communicate and for users to have wide access to information. Cybersecurity requires that systems be as separate as possible.

Fully digital systems, Hickton says, require full digital protection.

"We only have two choices for security in a digital world. We can neglect security and suffer the pain. Or we can prepare and prevent attacks." ■

"COMPUTERS ARE HUMAN

Alison Langmead wants the world to think differently about artificial intelligence (AI). She doesn't even like the phrase "artificial intelligence." She'd prefer people to focus instead on the *humanity* in AI so that they better understand the term and quell concerns that these technologies could run amok.

"Computers are human all the way down," says Langmead, clinical professor in the Department of History of Art and Architecture in the Kenneth P. Dietrich School of Arts and Sciences with a joint appointment in the School of Computing and Information. "Digital computing was our idea, starting from the original thought about how to model arithmetic through electricity and logic. Year after year, we have layered new forms of abstraction on that original idea, modeling more than just arithmetic and building up to what's now known as AI. There is a deep, layered history of human decision making."

Langmead believes that current hype, misunderstandings and even panic regarding AI are worthy of deep, multidisciplinary investigation. The problem is socio-technical and political in nature, she adds, not just a computer science issue.

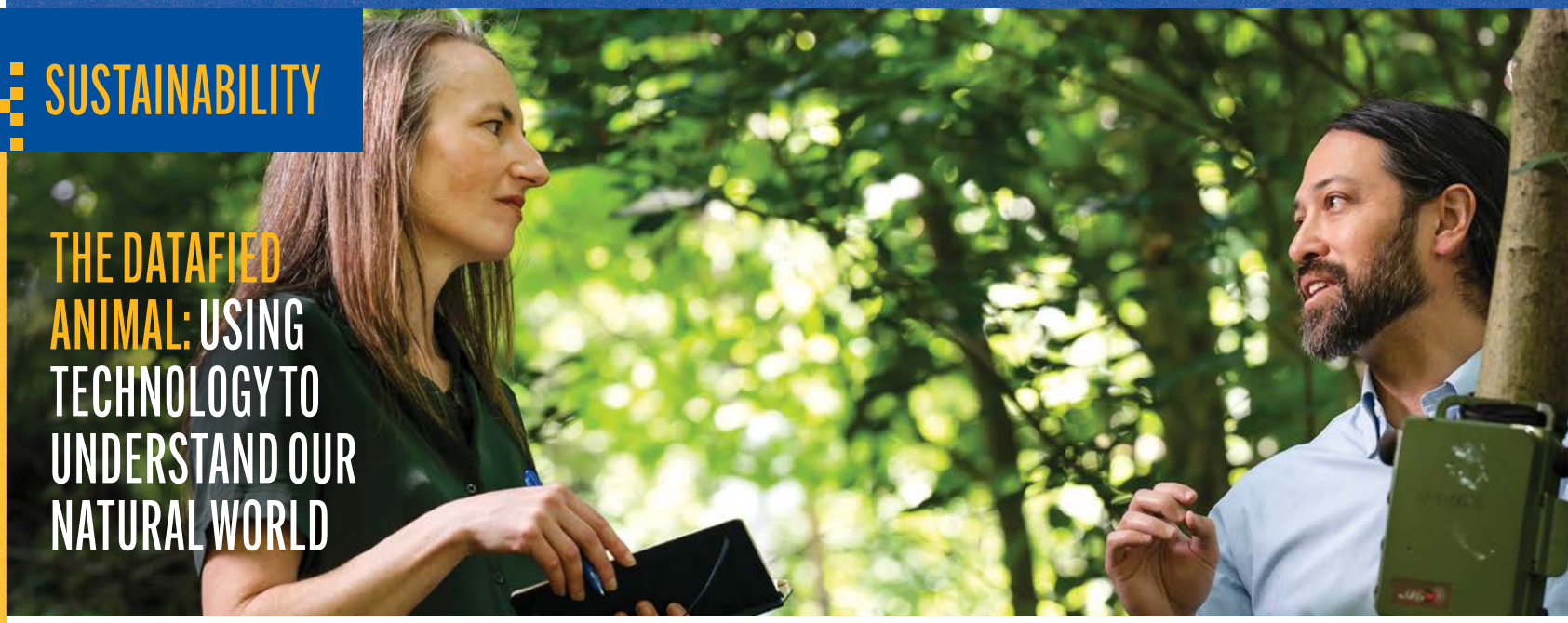
With a grant from the National Endowment for the Humanities, she developed a workshop titled "Teaching Art History with AI" to help college educators understand and teach students about image-generation technologies—computer programs that use deep learning algorithms to produce digital images from patterns found in millions of pre-existing digital images. The response was overwhelming, with three times the number of applications than spots, so Langmead is developing open-access resources. The educators can now spread that knowledge to students on an exponential scale.

Langmead also leads the DHRX: Digital Humanities Research at Pitt, an initiative that highlights innovative, digitally focused academic work across disciplines and Pitt campuses. The network supports the creative use of digital technologies in humanities and social science research. ■

"Digital computing was our idea, starting from the original thought about how to model arithmetic through electricity and logic. Year after year, we have layered new forms of abstraction on that original idea, modeling more than just arithmetic and building up to what's now known as AI. There is a deep, layered history of human decision making." —Alison Langmead

ALL THE WAY DOWN”

THE DATAFIED ANIMAL: USING TECHNOLOGY TO UNDERSTAND OUR NATURAL WORLD



Humans are part of nature and have always affected the natural world. That reality is behind the concept of the anthropocene, the proposed name of a geological epoch in which human activity—more than any other force on Earth—is the main driver of change from the micro to the planetary level. The term was rejected as an official designation by the International Union of Geological Sciences but has entered common usage, especially among environmental scientists.

If humans inevitably affect the natural world, the question becomes—in what ways *should* humans affect the natural world?

Emily Wanderer is an associate professor in the Department of Anthropology, Kenneth P. Dietrich School of Arts and Sciences, and author of an influential book "The Life of a Pest," a study of the politics of nature in Mexico. She recently received an award from the National Science Foundation for her study, "The Datafied Animal: Biologging, Machine Learning and Wildlife Conservation."

There have been many studies on the effects of datafication on human lives. However, what happens when these technologies are used to study animals? Wanderer calls this "the datafied animal." The study of datafied animals is at the intersection of animal life and technology but also takes into account the humans who develop and use this technology. "The questions become what kind of data we are gathering," says Wanderer. "What are some of the things that get left out?"

"It's interesting to collaborate with scientists using these new technologies and to understand what things don't make it into the data collection. As an anthropologist, I argue that data is made by people," says Wanderer. "It is important to think about the cultural, social and technological aspects of producing data. As a cultural anthropologist, I am also interested in the symbolic and cultural meanings of animals."

Wanderer describes a project accompanying scientists in Sicily in which dogs and goats wore collars to study if the animals could help predict when the volcano Mt. Etna would erupt. The researchers could track the animals on their phones, but the tracking apps do not record the interactions that humans traditionally have with dogs and goats.

"Only certain kinds of information are useful to science," Wanderer explains. "The embodied and affective connections people have with animals are not translated into the datafied animal."

Associate professor of biological sciences in the Dietrich School **Justin Kitzes** works to expand the possibilities and value of data about wildlife, specifically using acoustic recorders and AI to identify, in ever greater detail, lives of birds, frogs and other animals by identifying the sounds they make. In the course of seven years of recording and refining the algorithm that analyzes the recordings, Kitzes and his team have recorded more than one million hours of audio.

"Our audio analysis software, OpenSoundscape, is now published and out in use," Kitzes says. And we have got big collaborations and long-term relationships with funders and partners."

Part of the funding for the research came from the National Science Foundation and other foundations, including the National Fish and Wildlife Foundation. Kitzes' team is looking at the success of large-scale forest restoration across Pennsylvania by searching their recordings for the presence of three bird species—goldwing warbler, cerulean warbler and wood thrush—using them as indicators of healthy forest habitat.

Kitzes describes the acoustic recording as akin to museum specimens.

"They are permanent records of a particular time and place, and we can go back to that record years later. Let's say, hypothetically, there was an insect apocalypse-type event or a major change in the community—we can go back and ask what did this place look like five years ago, 10 years ago, 20 years ago? When did we stop hearing these species?"
In the past, he points out, biologists jarring specimens in ethanol and collecting skins filling up natural history museums did not

From left: Emily Wanderer, Justin Kitzes

know that DNA existed. The research value of the specimens could not have been imagined when naturalists originally collected them.

"I like to think that we're doing something similar," says Kitzes. "We're building this corpus of data showing how the world looks right now, in part so that future scientists can come up with ideas and answer questions that we're not even thinking about."

Kitzes says there are ongoing challenges to creating a full picture of the life and health of a habitat. A bird song is usually a male advertising for a mate or defending a territory. The song says nothing about the presence of females or successful nesting. He hopes to learn more from other sounds, such as the sound of a juvenile bird begging for food.

A perennial challenge is finding rare species and sounds.

"If there aren't many of the species, there aren't many sounds from them," Kitzes explains. "We are sifting through an enormous haystack, looking for tiny needles like the juvenile begging sound. That juvenile may have only passed by the recorder for one minute in an entire season. It's with those rare events where the technology really shines."

As an anthropologist, Wanderer is enthusiastic about the possibilities of the datafied animal that the audio data and AI methods produce.

"I get to do the cultural and social analysis of the work that Justin does in his lab to think about what it means for people and their relationship to wildlife," she says. "It is exciting—and complementary work." ■

Paul Ohodnicki

SEEING INNOVATION THROUGH, FROM SUBATOMIC TO TANGIBLE MATERIALS

A project is rarely "one-and-done" in the lab of **Paul Ohodnicki**, associate professor of mechanical engineering and materials science in the Swanson School of Engineering. His research results are often two-fold, resulting in the primary scientific findings as well as novel engineering applications.

"I'm always excited about new materials engineering and new physics concepts," he says, but he has observed a disconnect between the research materials scientists are performing and the needs of electrical engineers. Ohodnicki's research bridges that gap.

"I'm excited when new materials can be used in a device or a system that people actually use," he says.

A typical project may start on a subatomic scale, probing materials to understand why they have certain properties. But Ohodnicki's work can also begin at the end, so to speak, with requests for materials with specific properties.

"It could be an electrical engineer saying, 'I don't have a material that allows me to shrink the size of my system,'" he says. At that point, Ohodnicki's work becomes less exploratory and more problem solving.

The two ways of working complement each other and engage his students. Whether they are trying to develop something for a specific application, or they discover something they are working on happens to have sought-out properties, "that's what gets them excited," Ohodnicki says.

His work benefits the greater Western Pennsylvania area as the power landscape evolves. The Advanced Magnetics for Power and Energy Development (AMPED) Consortium at the Swanson School of Engineering was awarded a $1.2 million grant from the Henry L. Hillman Foundation to expand its capabilities. The consortium, of which Ohodnicki is director, is working to prepare the region to provide new materials for our increasingly electrified future.

In 2023, he also spun off a company, Sensible Photonics, which develops sensors reliant on light to detect and measure qualities of the physical environment. In this case, the sensors would keep tabs on power grid equipment and energy storage systems.

Ohodnicki is preparing both the grid and his students for the future. He teaches undergraduate classes in the materials science program, but he also mentors students and teaches graduate classes in mechanical engineering and electrical engineering. "The students I mentor are usually thinking about a few disciplines," he says. "If you can bridge those gaps between disciplines, there are a lot of innovations and advances to be made." ■

READING ARISTOTLE: ANCIENT THOUGHT FOR THE HERE AND NOW

Jennifer Whiting, Distinguished Professor of Philosophy in the Kenneth P. Dietrich School of Arts and Sciences, is recognized as one of the most influential voices in the field of ancient philosophy. She stands out for the way she links current debates about the nature of friendship and personal identity to scholarly readings of Plato and Aristotle.

Much of Whiting's work is inspired by Aristotle's conception of the ideal friend as an "other self." Many scholars, influenced by their readings of Aristotle as a rational egoist, read this concept as fundamentally egocentric: one's friend is an extension of oneself. But Whiting resists this notion, both in itself and as a reading of Aristotle, because it involves a kind of "colonizing ego."

In her view, Aristotle thinks that a person should love himself not because of who he is but on account of his virtuous character. Therefore, a virtuous person will love their "other self" in the same way, on account of her virtuous character. This idea yields what Whiting calls an ethocentric—or character-centered—view.

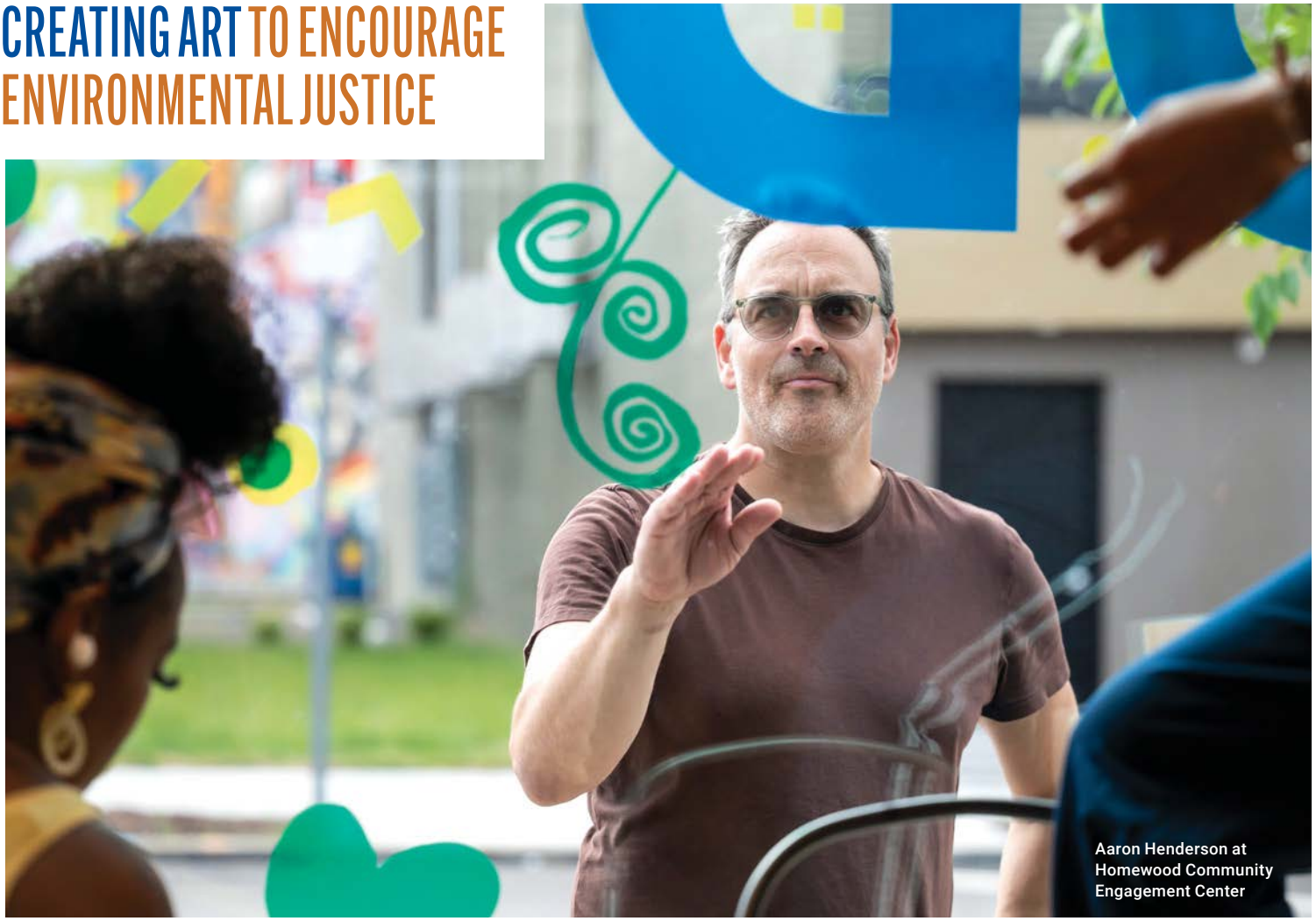
This view is not simply an academic debate—it also is relevant to our own daily lives. "The ethocentric ideal may help human beings overcome ethnocentric and other egocentric forms of bias that lead to various forms of injustice," Whiting says.

Whiting's interest in connecting ancient philosophy to modern issues is also evident in her department's Open Doors Philosophy Academy, which provides support to students from groups underrepresented in academic philosophy who want to pursue a PhD in the field.

She also has worked—and seeks support to resume working—on Rhyme and Reason, a program aimed at helping high school students in underserved communities view the humanities and similar fields (such as law) as viable paths in higher education and their careers. This short-lived program's capstone event was featured in the Pittsburgh Courier.

For 40 years, Whiting has been prodding students from all walks of life to engage in dialogue both with each other and with influential thinkers of the past. Her goal is to teach students to think outside of the boxes in which they were raised. This, she thinks, is the only hope we have for dealing with the problems we face today. ▪

CREATING ART TO ENCOURAGE ENVIRONMENTAL JUSTICE



Aaron Henderson at Homewood Community Engagement Center

Western Pennsylvania and the surrounding region still struggle to clear the air from decades of pollution, and environmental disasters and irresponsible commercial activities continue to affect our communities.

A professor from the University of Pittsburgh is using creativity to highlight environmental justice issues. **Aaron Henderson**, associate professor in the Department of Studio Arts, Kenneth P. Dietrich School of Arts and Sciences, has launched Future Studio, an initiative that collaborates with communities to envision a better future. The goal is to listen to the lived experiences of communities and then create projects that encourage dialogue and change. The work is funded in part through a Pitt Arts and Humanities Microgrant and an award from the Mascaro Center for Sustainable Innovation.

The microgrant funds a series of workshops and events between Future Studio and residents of Beaver County, Pennsylvania and East Palestine, Ohio. Future Studio is a project that plans and implements art and design collaborations with local communities in the region. These workshops and events will focus on creative opportunities to build community and raise awareness about the environmental justice issues they are undergoing. One effort, "Make It Right," projects images and text onto buildings in East Palestine raising awareness about the humanitarian crisis created by the toxic train derailment. "The Watchers" is a sculpture created in collaboration with Pitt students that is designed to capture the attention of lawmakers. Future Studio also used projection to call attention to struggles among people who live in the shadow of U.S. Steel facilities. The team is beginning a project in Beaver County, which is grappling with a new ethane cracker plant.

"All of us deserve clean air to breathe and clean water to drink," Henderson says. "I hope more people will pay attention to these critical—and remarkably local—issues. We need to consider the consequences of our choices, support companies that prioritize community well-being, think about how plastic fits into our world and vote thoughtfully to create meaningful change." ■

UNIVERSITY ART GALLERY CELEBRATES SCIENTIFIC INQUIRY

The University Art Gallery (UAG) is the largest repository of art at the University, with a permanent collection of more than 3,000 works of art. The UAG is an open, flexible and immersive laboratory for studying and displaying how art and visual objects generate knowledge and understanding of the world. Since the late 1960s, the UAG has displayed more than 150 exhibitions, ranging from ancient to contemporary art.

The gallery continues to develop exhibitions that incorporate research expertise from the arts and sciences to more fully and broadly understand how art plays a role in humanistic, scientific and technical inquiry. ■

MENTORING SUPPORTS FIRST-GENERATION STEM STUDENTS

> It is not always easy explaining to families unfamiliar with higher education that their student can achieve great success, just like anyone else in college." –Olivia Long

Olivia Long works to help students like she once was—a first-generation, financially disadvantaged student from a rural background who was interested in science.

Long is passionate about demonstrating to those students the value of college and the value of science—and helping them stay in school and stay in science. An associate professor of biochemistry at the University of Pittsburgh at Greensburg, she received a U.S. National Science Foundation (NSF) grant to research the impact of educational resources on improving STEM students' sense of belonging, retention and graduation rates.

The grant was awarded as part of an initiative to enhance diversity in STEM at Pitt-Greensburg, a school of about 1,500 students 35 miles east of Pittsburgh. The initiative aims to create a more inclusive and supportive environment that fosters innovation and academic success among STEM students. A significant number of these students are first-generation college students from rural, former industrial and mining areas.

One of the strongest ways to support STEM students, Long's team found, was mentoring.

"We took a new approach to support mentoring," Long says. "Rather than having a general one-semester first-year seminar for new students, we put together a full-year, credit-earning seminar specific to science students."

Previous first-year seminars at Pitt-Greensburg were mostly taught by staff. The Science Cornerstone courses now recruit faculty throughout the STEM disciplines to work for a year with students interested in STEM.

Before the program, the attrition rate for students between the first and second year was about 50% for science students, and specifically biology students. After the first two years of the program, the attrition of STEM students dropped dramatically, and the retention rate increased from about 50% to almost 90% for students who completed the year-long course.

Long is now on leave working for the NSF in the Directorate for STEM Education as a program officer in the Division for Undergraduate Education.

"Rural and first-generation students face various challenges, but one significant hurdle is demonstrating the value of a science education," Long explains. "It is not always easy explaining to families unfamiliar with higher education that their student can achieve great success, just like anyone else in college. However, by helping them feel they belong in science and showing the power of education, we can open new doors to success for these students." ■

TRAINING RESEARCHERS TO THINK ABOUT TEAM SCIENCE

Jennifer Iriti

As assistant vice chancellor for research inclusion and outreach strategy and a research scientist in the Learning Research and Development Center, **Jennifer Iriti** aims to build a community at Pitt that can foster new, convergent research training opportunities. Iriti wants to focus on building an architecture that can support researchers who are experts in one area to find areas of convergence with experts from other disciplines.

"Researchers who have intersectional and interdisciplinary mindsets are really valuable because they can think about and engage in research in ways that allow them to address some of our society's most intractable problems," says Iriti.

In the past, multidisciplinary researchers came to be because of their own interests, but what if we could train them from the start in this way? Rather than putting the onus on individual faculty to think about these possibilities, Iriti and Pitt leadership have started to build the infrastructure and the culture of bringing leaders together to engage more strategically to identify areas ripe for convergence research training at Pitt.

"We're creating an incubator space where these ideas can flourish," says Iriti. "Doing this will help increase our collaboration across schools and departments and create more linkages between people interested in this type of traineeship."

A goal of this project is for Pitt to successfully obtain a National Science Foundation Research Traineeship (NRT) grant. The NRTs support interdisciplinary work that helps advance the training of graduate students in research-based programs. An NRT grant would allow for further development and enhancement of the interdisciplinary training Pitt aims to make the standard.

Given the amount of money received versus the amount of work required for an NRT, Pitt is trying to change how the grants are approached at an institutional level by providing financial and intellectual support for faculty and school or department leaders with promising ideas. Additionally, leadership is working together to identify faculty who would best be equipped to apply for this funding. By coming at it from a more strategic and coordinated way than in the past, Iriti hopes to set Pitt apart in its capacity to leverage institutional strengths for innovative and convergent areas of research and training. ■

DEVELOPING JOB SKILLS WHERE PEOPLE LIVE

More than 100 miles north of Pittsburgh in Crawford County, the University of Pittsburgh at Titusville offers education and training for students living within an often-struggling economy. Some of that training is also part of a research and workforce development project using a model first developed by the Swanson School of Engineering known as the Manufacturing Assistance Center (MAC) Initiative. Model programs are also being developed globally in Nigeria and India. The model is based using experiential and intensive training in skills that meet the needs of local economies, in part to battle the phenomenon of economic depression and depopulation in agricultural and old industrial areas.

In Titusville, that skill is machining—a fundamental industrial process for shaping metal. Students train in an intensive six- or 15-week course, attending daytime or evening classes, some while working for local manufacturers.

Bopaya Bidanda is the original principal investigator on the project, funded by grants from the U.S. Chamber of Commerce, R.K. Mellon Foundation, The Heinz Endowments and Pitt internal funds. In August, Bidanda, Ernest Roth Professor in the Swanson School, traveled to India to help establish a MAC program in the small town of Pauri in the Garhwal foothills of the Himalayas.

The Indian MAC program is based on growing herbs used in the ancient Indian medicine system of Ayurveda.

"We encourage local people to grow medicinal herbs, a high-value crop, collaborating with a team of Indian medicine doctors," Bidanda explains. "We hope this helps stem the urban migration that leads to overcrowded cities and empty countryside."

"It is about workforce development for skills that can be used where people live," Bidanda says. "Whether it is in India; Nigeria, where the focus is on 3D printing; or in Titusville."

Students in the Titusville MAC can learn progressive levels of skills through three separate courses: basic machining, programming computerized machines, and computer-aided design and manufacturing (CAD/CAM).

Stephanie Fiely is executive director of the Education and Training Center at Pitt-Titusville. She explains that the northwestern region of Pennsylvania, while facing the economic challenges of a post-industrial economy, is still home to manufacturing, with many tool and die manufacturing jobs in small-scale shops and big industrial facilities. The summer 2024 MAC cohort included high school students who were starting an entrepreneurial program to make custom items for local businesses.

Similar to the program in India, the Pitt-Titusville MAC program hopes to help stop population loss in the region.

"The mission of the MAC and other programs at the Education and Training Center at Pitt-Titusville is to meet the workforce needs of Northwestern Pennsylvania," Fiely explains. "All our programs are based on job opportunities that already exist here in our region. Students can get valuable training and education and not be forced to leave the area to find a job." ▪

BOOTCAMP PREPARES INVESTIGATORS FOR LARGE GRANT SUBMISSIONS

An 11-week program each spring, the Big Proposal Bootcamp introduces a small cohort of faculty to the skills necessary to complete large-scale, cross-disciplinary proposals. The program also connects faculty to diverse resources to assist them in those proposals.

Projects for the Big Proposal Bootcamp are typically strategic investments that involve multiple institutions and corporate or nonprofit partners. They additionally require a wide diversity of disciplinary expertise to be the most successful. Throughout the bootcamp, participants have the opportunity to develop an outline of their proposal and participate in a pitch competition. The winning pitch is rewarded with a small prize to jumpstart the project's development. ▪

ELEVATING MARGINALIZED VOICES IN TECHNOLOGY

Angela Stewart's love of technology was born in the classroom, specifically her middle school computer classroom where the teacher first introduced her to the basics of coding.

So, it's fitting that her work now focuses on the classroom, too. Stewart, an assistant professor in the School of Computing and Information and a researcher at the Learning Research and Development Center, conducts research at the intersection of education, artificial intelligence and human-computer interaction, using data and technology to study learning and to create more equitable and inclusive educational spaces.

Her work seeks to support the agency of classroom teachers and students, particularly the girls and people of color whose voices and perspectives have been marginalized in the tech world.

The most tangible example of this work is a summer camp hosted by Stewart and her collaborators from other universities, including Carnegie Mellon University, and the Manchester Youth Development Center in Pittsburgh. The goal of the camp is to study the ways in which participants—particularly Black girls—understand and interact with technology.

Using Hummingbird Robotics Kits and craft supplies, the students build personal robots with whatever materials they wish. Meanwhile, Stewart and her team observe and react to the students, both in real time and by tracking their choices, to better understand the multitude of ways they express engagement.

Sometimes, the way a student shows interest isn't obvious. For example, several students attending a recent online camp session appeared to be checked out, with their cameras off and microphones muted. But after looking at the data the team collected during the session, they found that those students were working in the software, experimenting with the very topic the teachers were discussing.

In traditional technology education, those students may have been dismissed as disinterested and their abilities never nurtured. But Stewart's program ensures that the students are recognized and their engagement is reinforced.

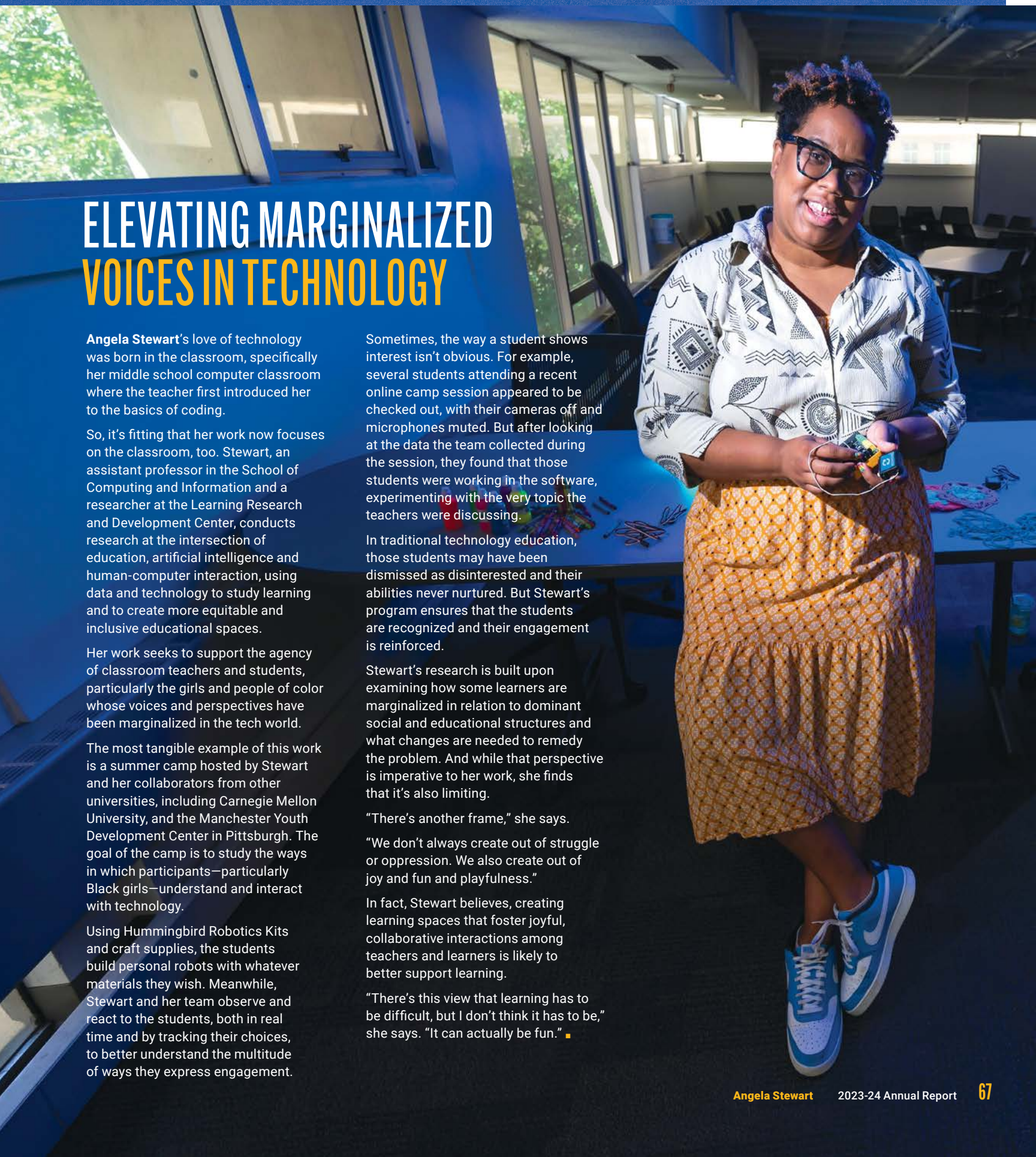
Stewart's research is built upon examining how some learners are marginalized in relation to dominant social and educational structures and what changes are needed to remedy the problem. And while that perspective is imperative to her work, she finds that it's also limiting.

"There's another frame," she says.

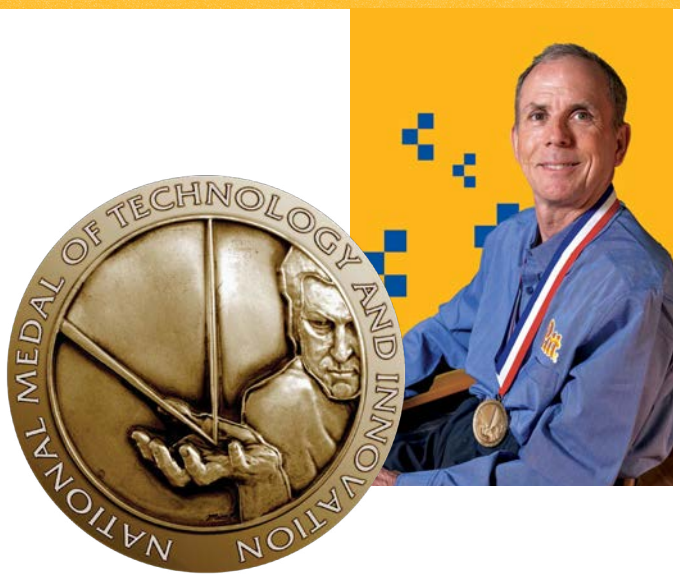
"We don't always create out of struggle or oppression. We also create out of joy and fun and playfulness."

In fact, Stewart believes, creating learning spaces that foster joyful, collaborative interactions among teachers and learners is likely to better support learning.

"There's this view that learning has to be difficult, but I don't think it has to be," she says. "It can actually be fun." ▪



AWARDS AND HIGHLIGHTS



A NATIONAL HONOR

Distinguished Professor of Rehabilitation Science and Technology and founder and director of the Human Engineering Research Laboratories (HERL), **Rory Cooper**, was awarded the National Medal of Technology and Innovation by U.S. President Joe Biden during the National Science and Technology Medals Foundation ceremony at the White House. The medal is the nation's highest honor for technological achievement. ■

By inventing and developing cutting-edge wheelchair technologies and mobility devices, cultivating the next generation of rehabilitation engineers and championing wounded veterans and students with disabilities, Cooper moves us closer to being a nation that is accessible for all.

AAAS NAMES NEW FELLOWS

Two University of Pittsburgh Health Sciences faculty members were elected 2023 fellows of the American Association for the Advancement of Science (AAAS), the world's largest scientific society.

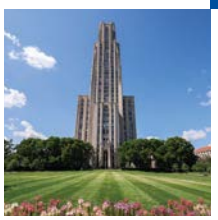
Deborah Polk, assistant professor of dental public health in the School of Dental Medicine, and **Bennett Van Houten**, Richard M. Cyert Professor of Molecular Oncology and professor of pharmacology and of chemical biology in the School of Medicine, were among the 502 scientists, engineers and innovators recognized by AAAS for their scientifically and socially distinguished achievements. ■

TRAILBLAZER R21 AWARD

Amir Alavi, Swanson School of Engineering, received a $557,000, three-year Trailblazer R21 Award from the National Institutes of Health, one of most prestigious awards given to young scientists. The grant allows him to investigate the use of metamaterial orthopaedic implants that his research previously developed.

Alavi, an associate professor of civil and environmental engineering, is perhaps better known for his work with bridges and infrastructure in partnership with the Pennsylvania Turnpike Commission. He also was among 23 University of Pittsburgh scientists included in the 2023 "Highly Cited Researchers" list from Clarivate. ■

CHANCELLOR'S DISTINGUISHED RESEARCH AWARDS



The Chancellor's Distinguished Research Awards annually recognize outstanding scholarly accomplishments of members of the University of Pittsburgh's faculty.

SENIOR CATEGORY

Alexander Deiters, professor of chemistry in the Kenneth P. Dietrich School of Arts and Sciences, was honored for his innovation and interdisciplinary research at the interface of chemistry and biology, which aims to discover new therapeutic approaches and improve human health, for example, by discovering inhibitors of the microRNA pathway and of enzymes involved in phase II metabolism. Deiters' peers described him as "one of the most productive research contributors in the field" whose research program "shows both breadth and depth."

Anne B. Newman, UPMC Chair in Geroscience and Distinguished Professor of Epidemiology in the School of Public Health, was awarded for her impactful work in the epidemiology of aging and interventions to promote healthy aging through strategies like cardiovascular disease prevention. Peers said the Center for Aging and Population Health director's research is an "exemplar of the best of scientific accomplishments, leading the development and answering of questions for the public good" and "truly a giant in clinical population research among older adults." Newman also is clinical director for the University of Pittsburgh/UPMC Aging Institute and a professor of medicine and clinical and translational science.

Jennifer Whiting, Distinguished Professor of Philosophy in the Dietrich School, was recognized for her depth and range of research in philosophy, which brings ancient philosophical thought into dialogue with modern debates on the nature of friendship and personal identity. Peers described Whiting as "one of the more influential and important voices in the field" and the most "sophisticated ancient philosopher of [her] generation," adding that she is "an extraordinary figure in the world of ancient Greek philosophy," especially regarding close readings of Plato and Aristotle.

JUNIOR CATEGORY

Peggy Liu, Ben L. Fryrear Professor of Marketing in the Joseph M. Katz Graduate School of Business and College of Business Administration, was honored for her theoretical and practical contributions to research on social and physical well-being and the intersection between the two. Considered a prominent scholar globally, Liu received recommendations from well-known authorities in the field and was described by peers as "one of the most productive junior scholars" in the discipline, with a research record that has been "staggeringly strong in quality and quantity."

Mehret Birru Talabi is an assistant professor in the School of Medicine. She was awarded for her contributions to the field of reproductive rheumatology, which led to the development of a new paradigm for addressing reproductive health within subspeciality medicine and in vulnerable and high-risk populations. Her peers cited her work as providing a "strong moral compass and attention to social determinants of health and reproductive justice in our field," and predict that it will continue to transform clinical practice and theoretical approaches in rheumatology and subspecialty medicine more broadly.

Christopher Wilmer, associate professor and William Kepler Whiteford Faculty Fellow in the Swanson School of Engineering, was recognized for his research on porous materials, which has advanced understanding of thermal transport in these materials and played a role in the design of innovative electronic nose technology. Peers described Wilmer as "a world-leading researcher in the use of molecular simulations to study porous materials" who is "ahead of the curve, innovative and creative."

AWARDS AND HIGHLIGHTS

NSF CAREER AWARDS

Eight faculty members at the University of Pittsburgh earned National Science Foundation (NSF) Faculty Early Career Development (CAREER) Awards, one of the foundation's most prestigious in support of early-career faculty.

Winners not only serve as principal investigator on a project but also integrate an education aspect into their research. NSF selects recipients who are role models and can lead advances in their department and at the University.

HERE ARE THIS YEAR'S RECIPIENTS FROM PITT:

Sarah Haig
Assistant Professor, Department of Civil and Environmental Engineering, Swanson School of Engineering

Rajkumar Kubendran
Assistant Professor, Department of Electrical and Computer Engineering, Swanson School of Engineering

Qihan Liu
Assistant Professor, Department of Mechanical Engineering and Materials Science, Swanson School of Engineering

Xu Qin
Associate Professor, Department of Health and Human Development, School of Education

Longfei Shangguan
Assistant Professor, Department of Computer Science, School of Computing and Information

Matthew Wohlever
Assistant Professor, Department of Cell Biology, School of Medicine

Nathan Youngblood
Assistant Professor, Department of Electrical and Computer Engineering, Swanson School of Engineering

Ioannis Zervantonakis
Assistant Professor, Department of Bioengineering, Swanson School of Engineering

MENTORING THE NEXT GENERATION

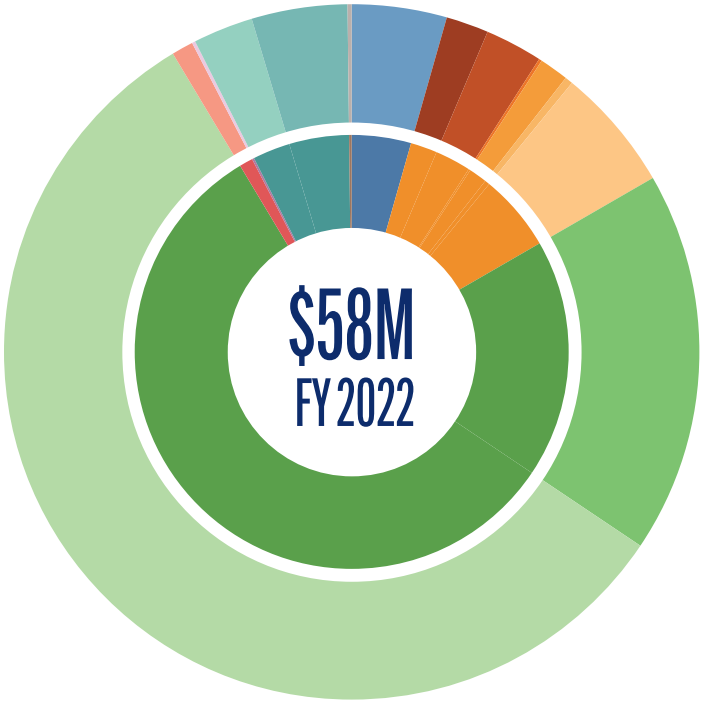
The Provost's Award for Excellence in Doctoral Mentoring recognizes outstanding mentors who substantially impact students seeking research doctoral degrees.

Each year, the office presents up to four awards, including a $2,500 prize for graduate faculty members. The prize is in its 19th year.

This year's awardees included:

- **Giannis Mpourmpakis, Swanson School of Engineering**
- **Caterina Rosano, School of Public Health**
- **Sunil Saxena, Kenneth P. Dietrich School of Arts and Sciences**
- **Elizabeth Skidmore, School of Health and Rehabilitation Sciences**

BREAKDOWN OF DoD EXPENDITURES BY FIELD



Using data from the most recent HERD Survey, FY 2022, the sunburst chart illustrates U.S. Department of Defense (DoD) expenditures categorized by field and subfield. At the center is the University of Pittsburgh's total DoD expenditures for FY 2022.

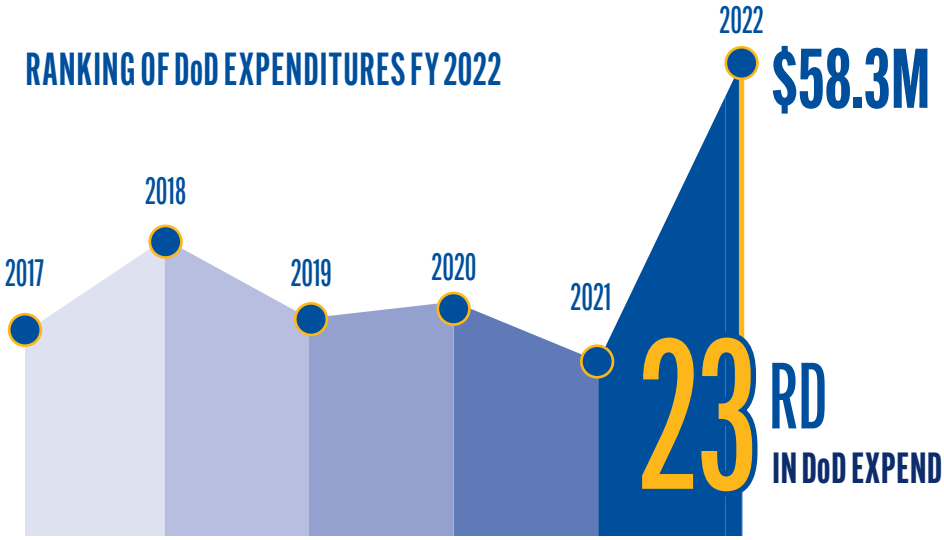
The inner ring segments represent the primary fields of expenditure, while the outer ring further divides these fields into subfields. The size of each segment corresponds to the percentage of total expenditures allocated to each field and subfield.

Source: National Center for Science and Engineering

Statistics: Higher Education Research and Development (HERD) survey

INNER RING LABELS	OUTER RING LABELS
Computer and Information Sciences	Computer and Information Sciences
Engineering	Bioengineering and Biomedical Engineering
	Chemical
	Civil
	Electrical, Electronics and Communications
	Industrial and Manufacturing
	Mechanical
Life Sciences	Biological and Biomedical Sciences
	Health Sciences
Mathematics and Statistics	Mathematics and Statistics
Non-Science and Engineering	Business Management and Business Administration
Physical Sciences	Chemistry
	Physics
Social Sciences	Economics

RANKING OF DoD EXPENDITURES FY 2022



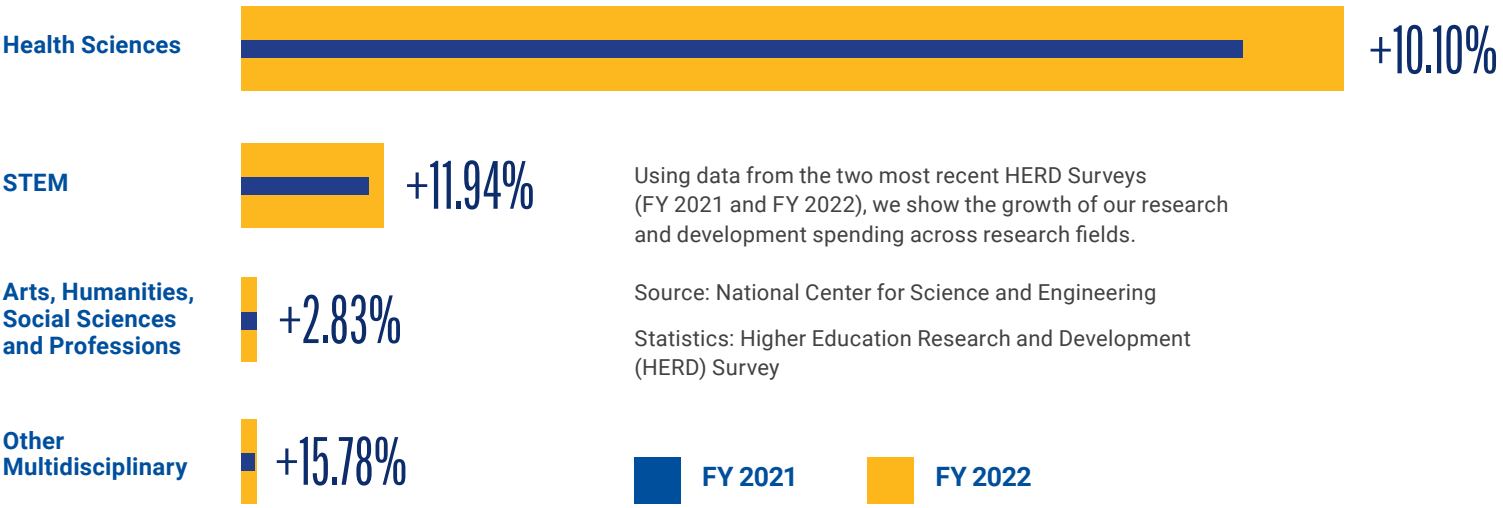
This area graph shows Pitt's spending from DoD funding over the past five years, based on data from HERD survey.

Notably, FY 2022 marked a record high for Pitt, with expenditures reaching $58.3 million and a Top 25 ranking.

Source: National Center for Science and Engineering

Statistics: Higher Education Research and Development (HERD) survey

HERD EXPENDITURES BY RESEARCH FIELD 2021 vs 2022



Using data from the two most recent HERD Surveys (FY 2021 and FY 2022), we show the growth of our research and development spending across research fields.

Source: National Center for Science and Engineering

Statistics: Higher Education Research and Development (HERD) Survey

HONORIFIC AWARDS

255 AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE FELLOWS	55 NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE MEMBERS
27 AMERICAN ACADEMY OF ARTS & SCIENCES MEMBERS	14 NATIONAL ACADEMY OF INVENTORS FELLOWS
231 FULBRIGHT GRANTEES	9 NATIONAL BOOK AWARD FINALISTS/WINNERS
46 GUGGENHEIM FELLOWS	113 NATIONAL SCIENCE FOUNDATION CAREER AWARDS
2 MACARTHUR FELLOWS	3 PRESIDENTIAL NATIONAL MEDALS OF SCIENCE/TECHNOLOGY AND INNOVATION
39 SLOAN FELLOWS	

Honorific recognitions awarded to Pitt individuals throughout the history of the University.

This list includes all awards announced before the date of publication. Fulbright grantees count only includes faculty members and professors.

Source: Official websites of awarding organizations

SELECT PITT ACADEMIC RANKINGS

SCHOOL	RANKING ORGANIZATION	RANKING TYPE	FIELD	YEAR	RANK
Kenneth P. Dietrich School of Arts and Sciences	Quacquarelli Symonds	World University Rankings by Subject - National	Philosophy	2024	3
Graduate School of Public and International Affairs	U.S. News & World Report	Best Graduate / Professional Schools	International/Global Policy and Administration	2024	9
Joseph M. Katz Graduate School of Business	U.S. News & World Report	Best Online Programs	Online MBA Program	2024	22
School of Computing and Information	Quacquarelli Symonds	World University Rankings by Subject - National	Library and Information Management	2024	10
School of Dental Medicine	Shanghai Ranking	Global Ranking by Subject	Dentistry and Oral Sciences	2023	18
School of Education	U.S. News & World Report	Best Graduate / Professional Schools	Educational Psychology	2024	22
School of Health and Rehabilitation Sciences	U.S. News & World Report	Best Graduate / Professional Schools	Occupational Therapy	2025	1
School of Law	U.S. News & World Report	Best Graduate / Professional Schools	Health Care Law	2025	28
School of Medicine	U.S. News & World Report	Best Medical Schools	Research	2024	13
School of Nursing	U.S. News & World Report	Best Graduate / Professional Schools	Nursing - Anesthesia	2025	2
School of Pharmacy	U.S. News & World Report	Best Graduate / Professional Schools	Pharmacy	2024	9
School of Public Health	U.S. News & World Report	Best Graduate / Professional Schools	Public Health	2025	16
School of Social Work	U.S. News & World Report	Best Graduate / Professional Schools	Social Work	2025	12
Swanson School of Engineering	U.S. News & World Report	Best Graduate / Professional Schools	Biomedical Engineering / Bioengineering	2024	21

Academic rankings by subject and field for schools across the University.
Not all fields are ranked every year, hence the latest available ranking has been included.

Source: Office of the Provost

NIH RANKINGS BY CATEGORY

Category	Rank	Category	Rank
Psychiatry	1	Internal Medicine	8
Anatomy/Cell Biology	2	Opthalmology	8
Microbiology	3	Schools of Medicine	8
Physical Medicine	3	Surgery	8
Otolaryngology	3	Schools of Public Health	8
Dermatology	5	Pharmacology	10
Neurosciences	6		

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 FY 2023.

Source: Blue Ridge Institute for Medical Research (BRIMR)

SELECT FUNDING AGENCIES AND SPONSORS

GOVERNMENT AGENCIES

FEDERAL

- Institute of Museum and Library Services
- National Aeronautics and Space Administration
- National Endowment for the Humanities
- National Science Foundation
- Patient-Centered Outcomes Research Institute
- U.S. Department of Agriculture
- U.S. Department of Defense
  - U.S. Army
    - U.S. Army Medical Research Acquisition Activity
    - U.S. Army Medical Research and Development Command
  - U.S. Navy
    - Office of Naval Research
  - U.S. Air Force
    - Air Force Office of Scientific Research
  - Strategic Environmental Research and Development Program
  - Defense Advanced Research Projects Agency
  - Defense Threat Reduction Agency
  - National Security Agency
- U.S. Department of Education
- U.S. Department of Energy
- U.S. Department of Health and Human Services
  - Biomedical Advanced Research and Development Authority
  - National Institutes of Health
    - National Heart, Lung, and Blood Institute
    - National Institute on Aging
    - National Institute of Mental Health
    - National Institute of Diabetes and Digestive and Kidney Diseases
    - National Institute of Allergy and Infectious Diseases
  - Administration for Children and Families
  - Centers for Disease Control and Prevention
  - Administration for Community Living
- U.S. Department of Justice
  - National Institute of Justice
- U.S. Department of Veteran Affairs
- U.S. Nuclear Regulatory Commission

STATE

- Commonwealth of Pennsylvania
- Pennsylvania Commission on Crime and Delinquency
- Pennsylvania Department of Health
- Pennsylvania Department of Human Services
- Pennsylvania Interest on Lawyers Trust Account Board

CITY AND COUNTY

- Allegheny County
- Allegheny County Department of Human Services
- Dallas Independent School District
- New Brunswick Public Schools
- Syracuse City School District

INDUSTRY PARTNERS

- bioMérieux
- Eli Lilly
- Icosavax
- Leidos
- Moderna
- Pfizer
- Shionogi

MAJOR INCOMING SUBAWARDS

- Carnegie Mellon University
- Duke University
- Harvard University
- Johns Hopkins University
- Leidos
- Magee-Womens Research Institute and Foundation
- Public Health Institute
- University of California, San Francisco
- University of Michigan
- University of Southern California

FOUNDATIONS

- American Heart Association
- Alzheimer's Association
- Bill & Melinda Gates Foundation
- Breast Cancer Research Foundation
- Burroughs Wellcome Fund
- Chuck Noll Foundation for Brain Injury Research
- Coalition for Epidemic Preparedness Innovations
- Cystic Fibrosis Foundation
- The Heinz Endowments
- Henry L. Hillman Foundation
- Hevolution Foundation
- Jewish Healthcare Foundation
- John Templeton Foundation
- Michael J. Fox Foundation
- National Fish and Wildlife Foundation
- The Pittsburgh Foundation
- Richard King Mellon Foundation
- Samuel and Emma Winters Foundation

OTHER/NONPROFIT

- Chan Zuckerberg Initiative
- Pennsylvania Turnpike Commission
- UPMC Enterprises

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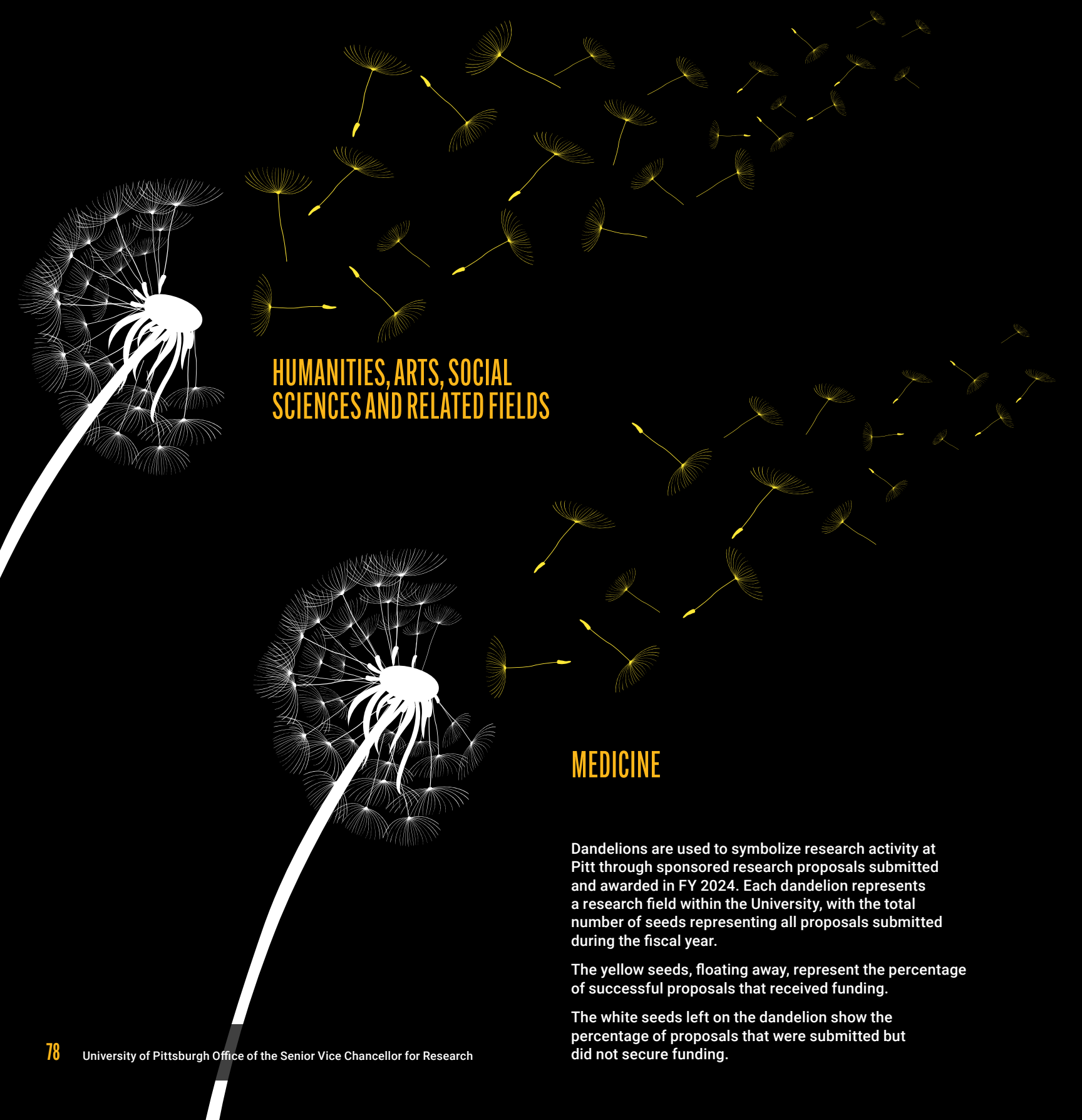


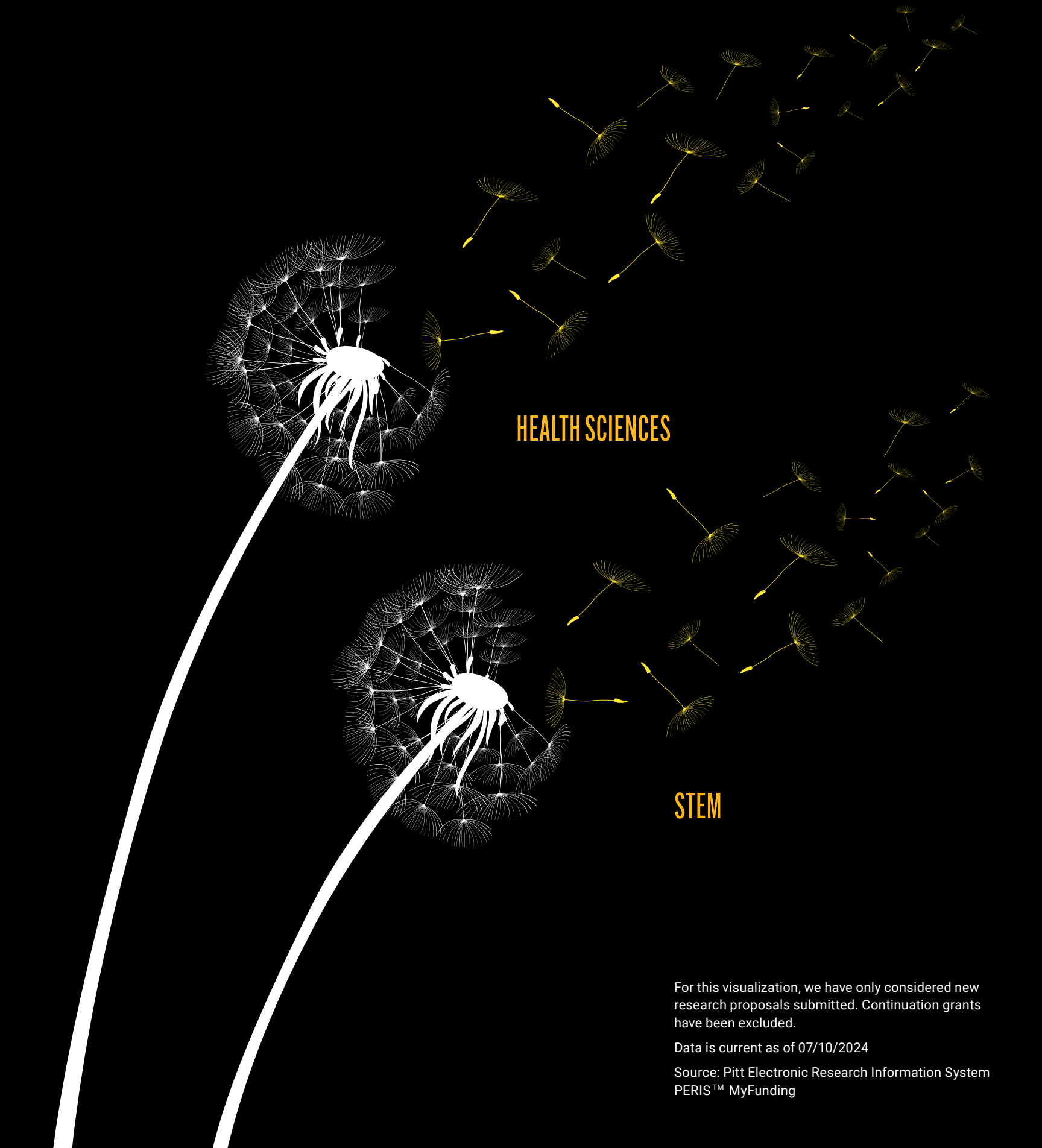
HUMANITIES, ARTS, SOCIAL SCIENCES AND RELATED FIELDS

MEDICINE

Dandelions are used to symbolize research activity at Pitt through sponsored research proposals submitted and awarded in FY 2024. Each dandelion represents a research field within the University, with the total number of seeds representing all proposals submitted during the fiscal year.

The yellow seeds, floating away, represent the percentage of successful proposals that received funding.

The white seeds left on the dandelion show the percentage of proposals that were submitted but did not secure funding.



For this visualization, we have only considered new research proposals submitted. Continuation grants have been excluded.

Data is current as of 07/10/2024

Source: Pitt Electronic Research Information System PERIS™ MyFunding

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