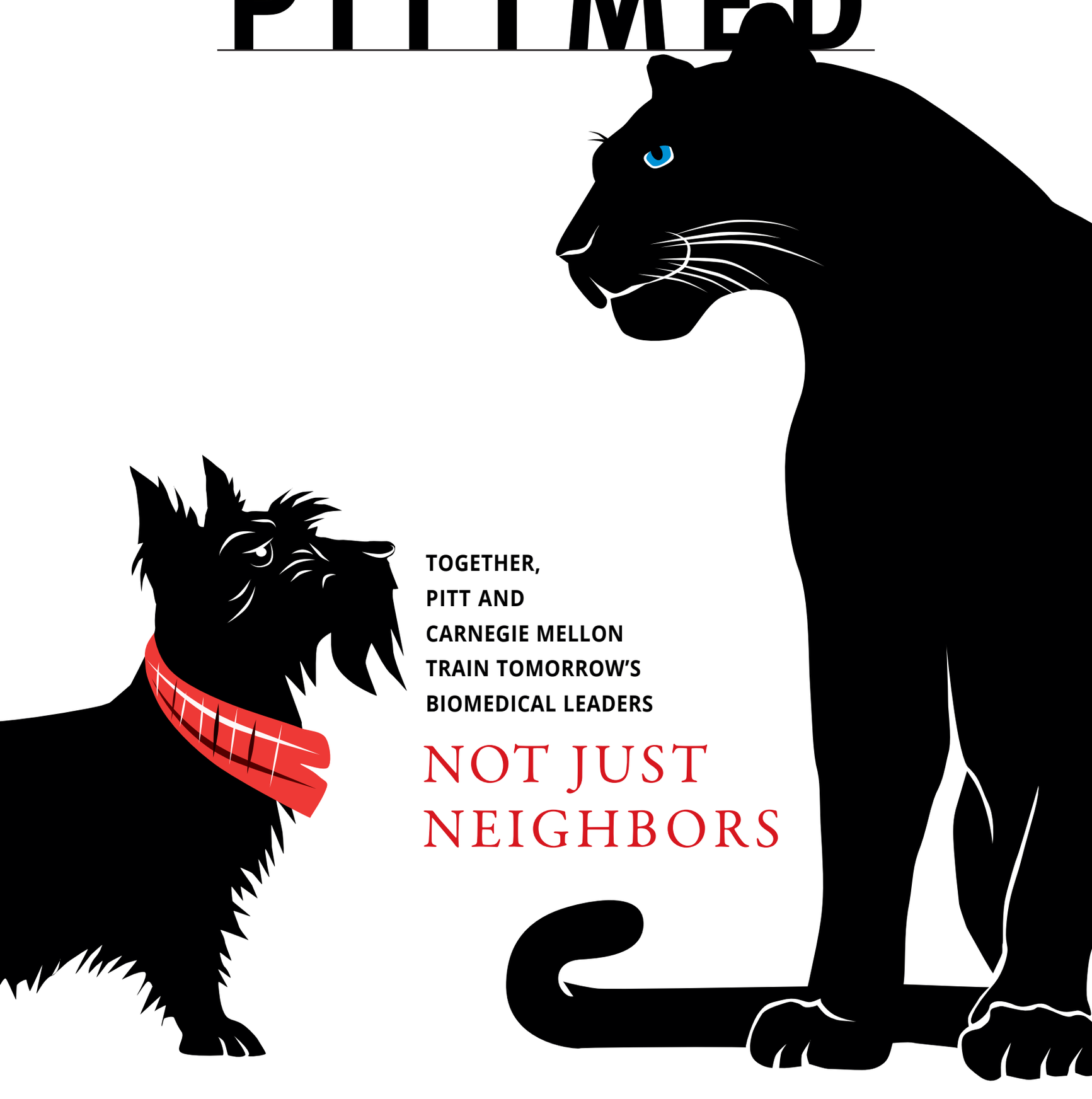
UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE | WINTER 2023/24

PITTMED



TOGETHER, PITT AND CARNEGIE MELLON TRAIN TOMORROW'S BIOMEDICAL LEADERS

NOT JUST NEIGHBORS

WE SECOND THAT

We enjoyed reading the fall issue of Pitt Med. Charlie Scott's letter, "Reflecting on rebirth," was one we could relate to. Like Charlie, we owe the rebirth of our son Peter to his donor and the incredible medical care he received at UPMC Children's Hospital of Pittsburgh. Peter received a liver transplant on May 9, 1989, at age 3, from Thomas Starzl-trained surgeon Andreas Tzakis (Fel '85). Peter is now 34-plus years out. (Charlie's age certainly provides great inspiration!)

UPMC gave our son a second chance at life and the opportunity to enjoy so many milestones—a healthy, happy childhood, college, marriage, fatherhood and much, much more. Every day has been a gift.

Peter promotes organ donation through volunteer work and ran the Boston Marathon on his 30th transplant anniversary, raising funds for the New England Organ Bank.

Both Charlie and Peter are great success stories, of which Pitt and UPMC can be proud!

Julie and Mark Bodenstab
Laconia, New Hampshire

CHARACTER AND COMMITMENT

Thank you for the information on the Brown brothers, 1904 Pitt Med graduates, in "From oppression to prominence." They had to be committed to helping people in the community and mentally strong to achieve their degrees. As an African American whose parents were sharecroppers from the South, I can understand their achievement.

James (left) and Harrison Brown were in Pitt Med's 1904 graduating class.

Ray Brodie, MD '77
Delmar, Maryland

RECENT MAGAZINE HONORS

Winner, 2023 Graphic Design USA Health + Wellness Design Awards, Publication in Print, Website, Mobile, Digital (2023 Summer Issue)

Winner, 2023 Press Club of Western Pennsylvania Golden Quill, Excellence in Written Journalism, Medical/Health—Division 4 (E. Vitone, "911, What's your emergency?")

Finalist, 2023 Press Club of Western Pennsylvania Golden Quill, Excellence in Written Journalism, Medical/Health—Division 4 (M. Passmore, "Hidden in plain sight")

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Email: **medmag@pitt.edu**

Pitt + CMU = game changers

"I can do things you cannot, you can do things I cannot; together we can do great things."

—*Mother Teresa*

AIMEE OBIDZINSKI/UNIVERSITY OF PITTSBURGH

Dear Pitt Med Readers,

Pittsburghers often proudly describe their city as one of neighborhoods. In my few years here, I've come to know it as a city that is also quite neighborly—where people are willing to reach out to one another with an abundance of goodwill. That neighborly ethos has seeped into our academic community as well, contributing to a remarkably rich intellectual environment.

Here in Oakland, we are fortunate to have an excellent academic neighbor in Carnegie Mellon University, whose faculty members are the medical school's most frequent external collaborators—to the tune of almost $16 million in research funding last year alone. Beyond generating significant grant funding, bringing together the complementary expertise of the two institutions creates extraordinary teams whose work is often game-changing.

Consider some of these exciting breakthroughs: Adam Feinberg's lab team at Carnegie Mellon designed and built a 3D-printed version of a developing heart that began pumping spontaneously, as hoped. And in Marco Capogrosso's lab at Pitt, research volunteers who'd been paralyzed by stroke gained use of their arms and hands again in an experimental intervention. Both projects involved investigators from both universities.

It's important to point out that at the heart of these collaborative breakthroughs are students and trainees of both institutions. Each year, dozens of students from Pitt Med and dozens from Carnegie Mellon enroll in a range of formal research programs jointly sponsored by the universities. Many graduates consider both schools their alma maters. We are proud to be preparing this next generation of innovators.

The faculty leaders of these teams are some of the world's most respected and promising scholars in medicine, nanotechnology, neuroscience, rehabilitation, biology, computation, philosophy, psychiatry, bioengineering, robotics and other fields. I encourage you to read our cover story, "Not just neighbors," to learn more about the leading biomedical investigators coming out of these joint programs.

We are delighted to have a stellar academic partner within walking distance. Stay tuned for more reports. I fully expect our alliance will grow even stronger and more fruitful.

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

PITTMED

UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE MAGAZINE

WINTER 2023/24 VOL. 26, ISSUE 1

University of Pittsburgh School of Medicine

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Sometimes, it all comes down to seeing a kind face, a patient in the Homewood Home Visits program says.

DEPARTMENTS

ABOUT THE COVER Pitt Med and Carnegie Mellon train the next generation of biomedical leaders through a range of joint programs. The universities being just a dog walk apart—preferably, that dog would be Scotty, the Carnegie Mellon mascot—has contributed to an extraordinary academic environment in Oakland. Silhouettes by Frank Harris. © 2024.

Pitt Med is published by the Office of the Dean and Senior Vice Chancellor for the Health Sciences and produced quarterly for alumni, students, staff, faculty and friends of the School of Medicine.

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"We're part of a field that revolves around helping others, but I think it's also important to help each other. It makes the whole of the field better and makes for better, healthier medical students."

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FEATURES

CONTRIBUTORS

Chicago-based **RACHEL MENNIES** ("Invaluable service, done gratis") has been a Pitt Med contributor for nearly a decade. A writer since childhood, she earned her MFA in poetry from Penn State and has since written two poetry collections ("The Naomi Letters" and "The Glad Hand of God Points Backwards") and taught writing courses at multiple universities. For Pitt Med, she enjoys writing about trainees and med students, such as the creators of the Giving a Boost organization, which she describes as "incredible and such a necessary offering" amid the daunting costs and complexities of applying to medical school.

Illustrator **MAGGIE NEGRETE** ("1, 2, 3, then an MD") is a Southwestern Pennsylvania native and Vassar College alum whose career has featured numerous gallery showings, fellowships and residencies in Pittsburgh. Her art style, centered around zine culture, was deeply influenced by the tradition of printmaking within her family. She is part of the #notwhite collective, a group of women artists in Pittsburgh, and she teaches art in after-school programs. Through programs like Pitt Med's three-year MD, Negrete says, "We're rethinking what it means to be professionalized, to access education and then provide services to the community."

U.S. ARMY PHOTO BY CHRISTOPHER KAUFMANN

COOPER GETS NATIONAL MEDAL OF TECHNOLOGY AND INNOVATION

The University of Pittsburgh's Rory Cooper has dedicated his career to improving the lives of people with disabilities through assistive technology, especially advances in wheelchairs. That crusade has now earned him the nation's highest honor for technological achievement.

At the White House in October, President Joe Biden awarded Cooper the National Medal of Technology and Innovation for his work, which has included the first smart wheelchairs and the first ergonomic rims. He joins a list of laureates that began with Steve Jobs and Steve Wozniak in 1985. Pitt alumni Herbert Boyer and Nobelist Paul Lauterbur, pioneers in gene splicing and MRI technology respectively, have also received the medal.

Cooper is a PhD Distinguished Professor and FISA and Paralyzed Veterans of America Professor of Rehabilitation Science and Technology who also holds appointments in orthopaedic surgery, physical medicine and rehabilitation, bioengineering and mechanical engineering.

He has a personal connection to his work: While he was stationed in Germany with the U.S. Army at the age of 20, a bus collided with him while he was riding a bicycle. The injury left him paralyzed from the waist down.

Cooper, whose work has resulted in more than 20 U.S. patents, is also Pitt's first assistant vice chancellor for research for STEM-health sciences collaborations.

In his letter nominating Cooper for the award, Rob Rutenbar, Pitt's senior vice chancellor for research, notes that he has worked with many remarkable scientists and scholars in his career. "Few manifest with impacts across as many areas of vital

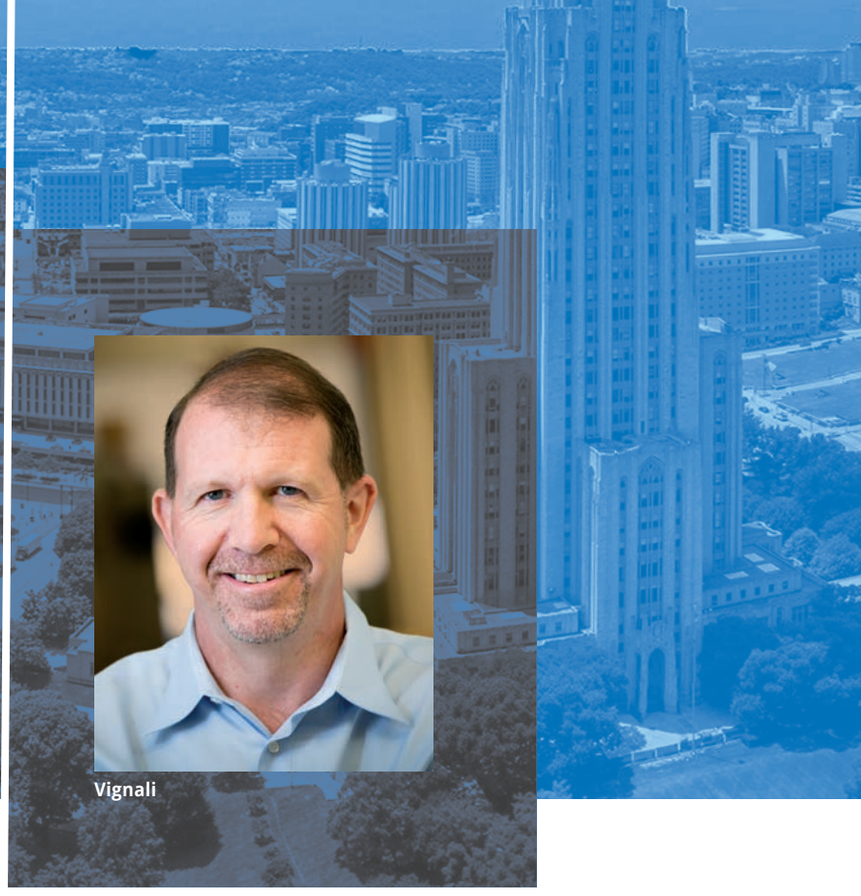
FLASHBACK

Peter Safar, the Pitt Med professor who co-developed CPR, published an autobiography a few years before his death in 2003. The book is extremely hard to find in its physical form, but the Wood Library-Museum of Anesthesiology has made a free digital version available.

In the late 1950s, Safar pioneered the development of the ABCs (airway, breathing and circulation) of resuscitation, including the mouth-to-mouth technique. These formed the foundation of CPR.

Safar's autobiography, Volume 5 of the Careers in Anesthesiology series, is downloadable as a PDF at pi.tt/safarbook. It covers the birth of CPR, Pittsburgh's groundbreaking Freedom House Ambulance Service (regarded as the first such service in the United States staffed by skilled paramedics), the origins of the Departments of Anesthesiology and Critical Care Medicine at Pitt, the history of the Safar Center for Resuscitation Research as well as the great doctor's own fascinating personal story.

Lennon



Vignali

Lennon appointed chair of medicine

Anne Marie Lennon, an MBBCh, PhD and leading innovator in the early detection of pancreatic cancer, will become chair of the Department of Medicine at the University of Pittsburgh and chair of medicine at UPMC effective March 1, 2024.

Lennon, the first woman named to these positions, comes to Pitt from Johns Hopkins University, where she is the Moses and Helen Golden Paulson Professor of Gastroenterology and holds joint appointments as a professor in medicine, surgery, radiology and oncology.

In Pittsburgh, Lennon will lead one of the nation's largest departments of medicine, with 1,092 faculty, 1,458 staff members, 350 residents and clinical fellows and 151 postdoctoral trainees. "The departments of medicine at Pitt and UPMC are incredible—truly among the best in the country. And what makes them so impressive are the people," Lennon says.

An internationally recognized expert in the management of precancerous pancreatic lesions, Lennon focuses her research on the development of tests for early cancer detection and their translation into clinical practice.

"We're confident that Dr. Lennon's vision for the Department of Medicine, already top-ranked, will further elevate its national and international standing, as well as enhance population health and health equity in our local communities," says Anantha Shekhar, an MD, PhD, senior vice chancellor for the health sciences and John and Gertrude Petersen Dean of the School of Medicine at Pitt.

Mark Geraci, an MD and associate vice chancellor for interdisciplinary research, health sciences, as well as vice dean for research in the School of Medicine, has served as interim chair of medicine since the departure of previous chair Mark Gladwin in 2022. *—Staff reports*

national interest as Rory—with contributions ranging from fundamental science to unique, commercialized assistive technologies."

The award adds to a long list of accolades for Cooper, a fellow of the National Academy of Inventors and American Association for the Advancement of Science. In October, he was inducted into the National Inventors Hall of Fame.

Speaking recently with Pittsburgh NPR affiliate WESA, Cooper said that the city offers a great collaborative environment for his work—as well as physical and meteorological features that put his inventions to the test. "We have weather, we have hills. You can kind of test everything here.

"If it works in Pittsburgh, it probably would work pretty much everywhere." *—Staff reports*

Vignali to lead immunology

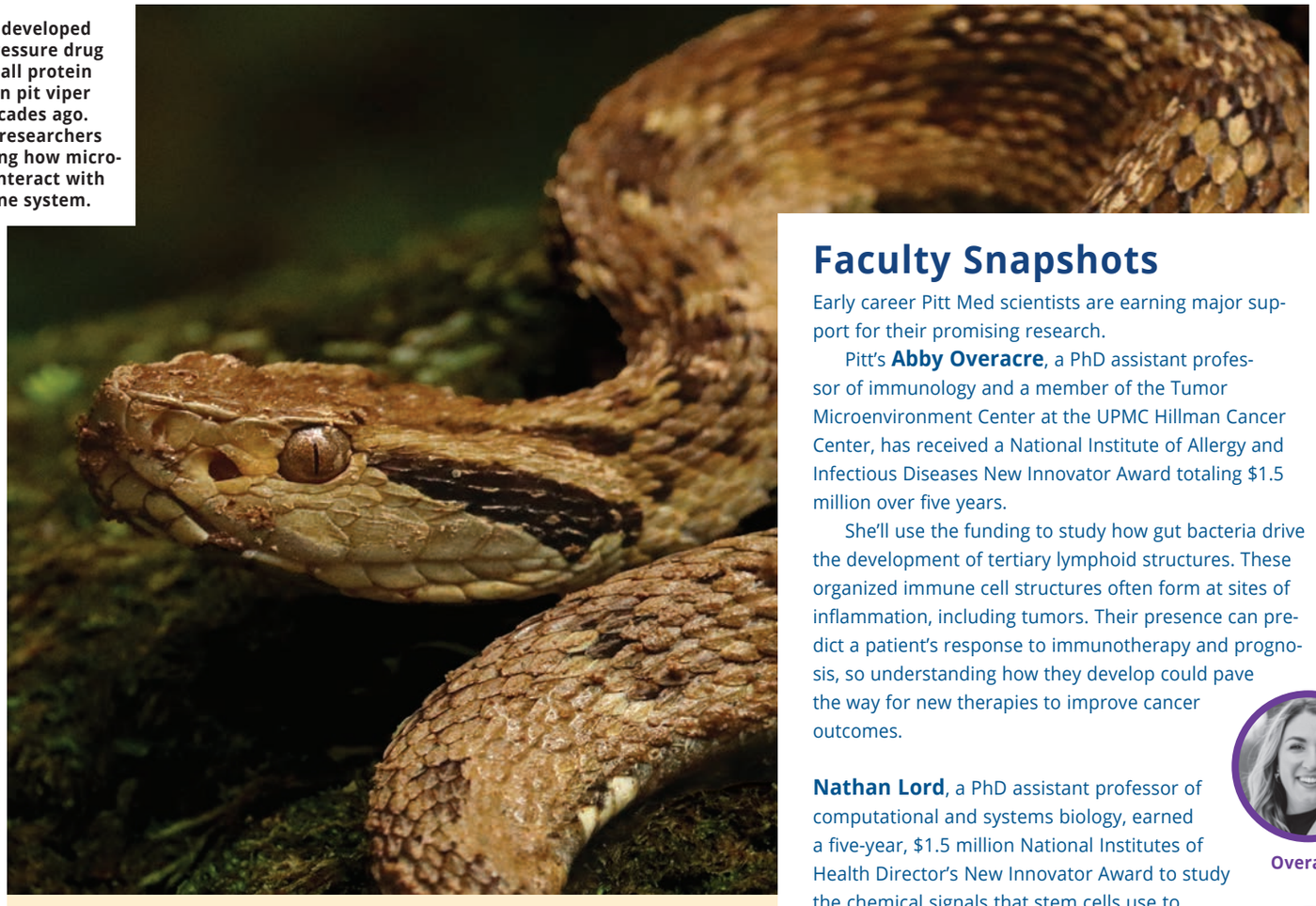
Dario A.A. Vignali, a PhD, has been appointed chair of the Department of Immunology.

In a career spanning three decades, Vignali has conducted highly cited discovery-based research, translating novel findings to the clinic, and training and mentoring the next generation of cancer immunologists in academia and industry.

He is a Distinguished Professor of Immunology, the Frank Dixon Professor in Cancer Immunology and codirector of the Cancer Immunology Training Program. He served as interim chair of immunology from August 2022 until his permanent appointment.

For 30 years, Vignali has studied immune regulation and cell signaling and how these processes affect disease. He also leads discovery-based programs aimed at identifying novel targets for therapeutic intervention and works closely with scientists and clinicians to translate his findings into clinical practice, with a focus on solid tumors that are likely to respond to immunotherapies.

—Staff reports



GETTY IMAGES/SOSTENES PELEGRINI

Scientists developed a blood pressure drug from a small protein in Brazilian pit viper venom decades ago. Now, Pitt researchers are learning how microproteins interact with the immune system.

BIG NIH SUPPORT TO STUDY TINY PROTEINS

Decades ago, scientists developed a blood pressure drug from a small protein found in a pit viper. Embedded within the stretches of our genome are thousands of tiny genes with instructions to make other small proteins that have no obvious function. The National Institutes of Health (NIH) has awarded a team of Pitt Med researchers a five-year, $7.6 million Director's Transformative Research Award to find out how these microproteins interact with the immune system. If the proteins are seen as invaders, they could be related to autoimmune diseases, disorders in which the body attacks itself.

The award is part of the NIH's High-Risk, High-Reward Research program, which supports transformative project proposals that are untested but have the potential to create or overturn fundamental paradigms.

"Are microproteins good for health because they help fight pathogens or bad for health because they trigger the immune system, or both?" asks Anne-Ruxandra Carvunis, a PhD associate professor of computational and systems biology and one of the principal investigators. "We are looking forward to finding out. This will be fun!"

Carvunis will work with Pitt co-PIs Alok Joglekar, a PhD assistant professor of immunology with a joint appointment in computational and systems biology, and Maninjay Atianand, a PhD assistant professor of immunology. Rasi Subramaniam, a PhD at the Fred Hutchinson Cancer Center in Seattle, is a fourth investigator. *—Brandie Jefferson and staff reports*

Faculty Snapshots

Early career Pitt Med scientists are earning major support for their promising research.

Pitt's **Abby Overacre**, a PhD assistant professor of immunology and a member of the Tumor Microenvironment Center at the UPMC Hillman Cancer Center, has received a National Institute of Allergy and Infectious Diseases New Innovator Award totaling $1.5 million over five years.

She'll use the funding to study how gut bacteria drive the development of tertiary lymphoid structures. These organized immune cell structures often form at sites of inflammation, including tumors. Their presence can predict a patient's response to immunotherapy and prognosis, so understanding how they develop could pave the way for new therapies to improve cancer outcomes.

Overacre

Nathan Lord, a PhD assistant professor of computational and systems biology, earned a five-year, $1.5 million National Institutes of Health Director's New Innovator Award to study the chemical signals that stem cells use to communicate and form spatial patterns in embryos, allowing them to develop into the cells that make up a functional organism.

Lord

By better understanding these spatial patterns, Lord hopes to learn how to direct the growth of the new tissue at will, which could transform the field of regenerative medicine. "If we want to understand, manipulate or use these cells to make things that are useful to us, like replacement organs or tissue, we need to learn how to read and write this spatial language," Lord says.

Capogrosso

Marco Capogrosso, a PhD assistant professor of neurological surgery and director of Pitt's Spinal Cord Stimulation Laboratory, has received a 2023 Young Investigator Award from the Society for Neuroscience. The award, funded by Sumitomo Pharma America, recognizes outstanding achievements and contributions by early career neuroscientists.

His research has given new hope to patients dealing with paralysis after stroke. Working with collaborators at Pitt and Carnegie Mellon University, Capogrosso used spinal cord stimulators to temporarily restore patients' hand and arm function. He is the first scientist from Pitt to win a Society for Neuroscience Young Investigator Award, which counts a Nobel laureate as a past recipient.

—Staff reports

MARTHA RIAL

Med students Chinemeh Eyiba (far left) and Fidelia Gaba see patients in their homes in Homewood, with guidance from Thuy Bui (right). BELOW: Eyiba says that visiting patients in their homes takes some getting used to, but it helps build a more personal connection. (Kenneth Critten, interviewed here, is not pictured.)

Overheard

Care and a kind face

For **Kenneth Critten**, it all comes down to seeing a kind face. A patient in the Homewood Home Visits program, Critten is among a group of seniors and others regularly visited by Pitt medical students. The program is run by the Pitt chapter of the Student National Medical Association and **Thuy Bui**, an MD professor of medicine.

Critten is a patient of Bui's at UPMC Montefiore (where we spoke to him) and typically has to rise early to catch the bus to get there. Between his appointments, he benefits from house calls at the senior facility Homewood House, where aspiring doctors like third-year **Chinemeh Eyiba** check in on needs that may otherwise fall through the cracks. The program also partners with the Greater Pittsburgh Community Food Bank to offer groceries to patients in case they have trouble accessing affordable options.

Mr. Critten, what brings you to the clinic?

Kenneth Critten: I have a history of stroke, diabetes and high blood pressure. [I've had these] for a long time now, but things are getting better the more I come to see my doctor. Been seeing [Bui] for 12 long years, wouldn't trade her for her weight in gold. A lot of my friends aren't here anymore, just because of the simple fact that they didn't take care of themselves.

What does a typical home visit look like for students?

Chinemeh Eyiba: Usually, we meet at an elementary school in Homewood and pick up food and nonperishables—Costco-sized boxes—and put these in the car and divvy them up. Dr. Bui then gives us a run-down of the patients. Recently, we were seeing how Mr. Critten had been acclimating to home life and if he had been able to keep up on his meds. A doctor can prescribe the medication, but the patient still has to take it. And a big part of that is access.

How are patients during Homewood Home Visits different from what you see in the wards?

CE: People in Homewood, they're in an in-between spot. Some are on the sicker end of sick but don't need to be in a hospital. You have to tailor your behavior a bit; sometimes it's a little weird to go inside someone's home—it takes some getting used to. Even prior to medical school, my main volunteer job was working with older people, so I think that helped prepare me. Most, if not all, the patients are Black, and I am also a Black individual. I think it provides some familiarity and comfort to see someone that looks like them and they can be themselves around.

One thing I really enjoyed was seeing [Mr. Critten's] progression. When I first saw him, he could barely walk to the door, and his throat hurt so bad that he couldn't swallow his pills. Being able to see him go through that, to be able to open the door and fully breathe while he's talking, has been really good to see.

Mr. Critten, what are your thoughts about the Homewood Home Visits program as a patient?

KC: There's lots of elderly people that can't get to the hospital, so it's good that sometimes the hospital comes to them. Everyone needs somebody to care for them, one way or another. Even though they don't know you, it's good to see a kind face, a good greeting. If it was up to me, it would go on forever.

—Interviews by Vivian Wang, who is a second-year med student and Homewood Home Visits volunteer. Fellow med student Tonge Enoh provided background information. Interviews were condensed and edited for clarity.

HOK

Pitt breaks ground for its BioForge facility at Hazelwood Green this spring.

Gabriel named CEO of BioForge

RJ THOMPSON/UNIVERSITY OF PITTSBURGH

Gabriel

When the University of Pittsburgh set out to find a visionary to lead the development of Pitt BioForge, its facility in Hazelwood Green that will accelerate innovations in biomanufacturing, it needed someone with an extensive background in technology and the life sciences. It found that person in Kaigham (Ken) J. Gabriel.

In early January, Anantha Shekhar, senior vice chancellor for the health sciences and John and Gertrude Petersen Dean of the School of Medicine, appointed Gabriel the inaugural chief executive officer of BioForge and director of Pitt's Advanced Biomanufacturing Institute.

"Ken's depth of experience as an innovator across government, academic and commercial sectors makes him a perfect fit for leveraging Pitt's world-class research in medicine and the health sciences at BioForge," Shekhar says.

With Gabriel's appointment, Pitt embarks on an ambitious venture to develop mRNA, cell and gene therapies at BioForge that can treat a range of conditions, including cancer and blindness, and help position Pittsburgh as a leader in life sciences commercialization.

Gabriel believes that as more and more precision therapies and personalized medicines are developed, manufacturing them will require the innovations that BioForge will be demonstrating and prototyping.

"Existing pharmaceutical manufacturing processes are structured and optimized to produce millions to billions of the same drugs and therapies, designed for the nominal, 'average' target recipient—exactly the opposite of what's needed for precision medicines," he says.

Gabriel was most recently the founding chief operating officer of Wellcome Leap, an international organization working at the intersection of life sciences and engineering to deliver critical medical and health care innovations on accelerated timelines. In a little more than two years, he helped develop 10 ongoing programs—ranging from artificial kidneys to resilient aging—with annual funding of $200 million to more than 150 international research organizations on six continents.

Before that, he spent five years as the president and CEO of Draper—an MIT spin-off known for developing the Apollo guidance computer in the 1960s. He expanded the company's offerings to include biomedical innovations in end-to-end cell therapy, engineered human organ-on-a-chip platforms for drug discovery and the world's first adaptive pediatric heart valve.

Gabriel previously served as a corporate vice president and the founding co-lead of the Advanced Technology and Projects group at Google and deputy director and acting director of the Defense Advanced Research Projects Agency in the U.S. Department of Defense. He also was a tenured professor in both the Department of Electrical and Computer Engineering and the Robotics Institute at Carnegie Mellon University.

Gabriel, who earned his bachelor's degree in electrical engineering at Pitt, has a doctorate in electrical engineering and computer science from MIT. He is regarded as the "godfather" of MEMS, which are miniaturized and integrated mechanical and electrical devices that make a range of game-changing capabilities possible in smaller packaging: They help cell phones orient themselves, airbags know when to fire and biomedical tools save lives. He is cofounder of Akustica, a start-up that pioneered digital silicon microphones that was acquired by Bosch, and is recognized as a World Economic Forum Technology Pioneer.

In 2021, the Richard King Mellon Foundation announced it would provide a $100 million grant to Pitt to build BioForge. The Cambridge, Massachusetts-based company ElevateBio will be the facility's founding anchor tenant. *—Roberta Zeff*

WHAT THE CEO OF BIOFORGE WANTS YOU TO KNOW:

"The best treatment for you is you. That's the power and promise of biologic, precision medicines—medicines designed to recruit your own body's capabilities to heal."

"Manufacturing these medicines requires innovations just as potent as those that led to their invention."

"BioForge's mission is to accelerate breakthroughs in both the development and manufacturing of new biologic, precision medicines to speed their delivery, use and impact."

ANTICIPATED TIMELINE

Groundbreaking: spring 2024

Preliminary operations (at the Riviera on Technology Drive): spring 2024

Construction finished: 2026

ElevateBio operations begin: 2027

Tight-knit community

On a chilly October afternoon, eight Pitt Med students sat around an array of yarn in Alda Maria Gonzaga's (MD '00, Res '04, MS '06) living room. They drifted between tranquil focus on knitting or crocheting and lively conversations that ranged from their favorite forms of dance to plans for the flex weeks built into the curriculum as a break amid heavy coursework.

Knitt Med, the student-run textile art club at Pitt Med, draws aspiring MDs who want to take time in their busy schedules to decompress with some D.I.Y. Gonzaga, associate dean for student affairs and professor of medicine and pediatrics, serves as the group's adviser.

First active from 2018 to 2020, Knitt Med was revived in 2023 by current copresidents Lily Bessette (Class of '30) and Siddhi Shockey (Class of '26), who saw an opportunity to build a crafty community with peers.

"It's really nice because it feels like the opposite of what I'm doing in my day-to-day med school life, where I'm trying to be efficient and work very quickly," says Knitt Med treasurer Julia Bulova (Class of '26).

At Knitt Med, she says, "you are working for very long periods of time on something that can feel very monotonous. But I think that's actually kind of satisfying and very stress relieving."

Knitt Med began largely as a community outreach project in 2018 led by Ruby Holland and BaDoi Phan (who've both received PhDs and are pursuing MDs through the Medical Scientist Training Program) with Alexa Jordahl (MD '21).

"We wanted to come up with an opportunity that would allow people to use their creative interests to serve the medical community," says Holland. Coordinating with UPMC Hillman Cancer Center and UPMC Magee-Womens Hospital, they'd often knit with patients.

The reinstated Knitt Med is recapturing that community connection. They have knitted and crocheted with residents at Moorhead Tower Apartments, housing designed for the visually impaired, the elderly and people with disabilities. The group also has budding connections with UPMC hospitals.

With plans to create and sell crafts to raise funds for health-related causes, Knitt Med's leadership hopes newcomers will be excited to support patient communities in need. Says Shockey, "Come with whatever skill level you have and create—and hopefully create a little change along the way, too."

—Juliana Briggs

—Photo by Aimee Obidzinski/University of Pittsburgh

Researchers found that the antibodies in donated breast milk had a binding response unique to each donor. It remained consistent within and across pregnancies.

PROTECTION LIKE NO OTHER

EACH MOTHER'S MILK CONTAINS A UNIQUE SET OF ANTIBODIES

BY KIRA GOLDENBERG

Gopalakrishna

Johnson-Hence

Hand

Before coming to the University of Pittsburgh to complete her PhD in human genetics, Kathyayini Gopalakrishna spent three years working as a physician in a South Indian neonatal intensive care unit (NICU).

There, Gopalakrishna treated some preterm infants struggling with necrotizing enterocolitis (NEC), a life-threatening condition in which the underdeveloped intestines of newborns are unable to fight off bacteria. It's treated either with heavy-duty antibiotics or, in cases where the invader kills its host tissue, by removing part of the intestine—drastic surgery that can result in lifelong side effects.

Scientists still don't fully understand the precise causes of NEC, making any potential prevention or protection worth exploring. But breast milk seemed to be a possible X factor.

"I had personally seen babies [with NEC] improve a lot when they were fed with mother's milk," she says. Though breast milk has long been promoted globally to minimize various known health risks in infants, much remains a mystery about the specific protective mechanics of the most homemade beverage. Researchers did know that preterm formula-fed infants are three to four times more likely to develop NEC than preterm infants who are tube-fed breast milk.

Gopalakrishna decided to work with Pitt's Timothy Hand, a PhD associate professor of pediatrics and of immunology, to find out how breast milk increased positive outcomes in her tiny patients. (She is now a postdoctoral fellow at the California Institute of Technology.)

"As a physician, you can have an impact, but it's one life at a time," says Gopalakrishna, who also has an MBBS. "In research, there's an opportunity for you to impact thousands of lives at a time."

In 2019, Gopalakrishna was the lead author on a Nature Medicine paper that identified an antibody necessary to prevent NEC in infants.

The Hand lab team built on that finding with a study led by Chelseá Johnson-Hence, an MD who completed a neonatal-perinatal medicine fellowship at Pitt and is now an assistant professor at UT Southwestern Medical Center.

In 2023, the researchers reported in the Journal of Experimental Medicine that premature infants who don't develop NEC are protected by specific antibodies in breast milk—and that not all breastfeeding parents have them to give. The paper looked at the ability of antibodies in donated breast milk samples to bind to Enterobacteriaceae, the bacteria that, unchecked, cause the majority of NEC cases.

They found that every donor's milk sample had a unique binding response, though individual donors remained consistent within and across pregnancies. That is, whether or not breastfeeding confers protection against NEC depends, pretty randomly, on whether the parent has previously encountered the bacteria that trigger the antibodies to fight it.

"The idea that different people have different antibodies is not controversial," says Hand, the paper's senior author. "But nobody had ever shown it in breast milk before."

The team developed a methodology, which they've patented, to determine the specificity of antibodies from maternal milk samples.

In their studies, the team saw "huge variation," Gopalakrishna says, in terms of which donor antibodies bound effectively to the bacteria they were studying. "There was no uniformity," she says. "It was all depending on what the mother has seen throughout her life."

A global review in 2020 estimated that 7% of babies with very low birthweight admitted to the NICU will develop NEC. The new findings suggest a path toward making the disease rarer.

In the short term, if parental milk is unavailable, donated breast milk is statistically preferable to formula, Hand says. Looking forward, premature infants could perhaps have NEC-fighting antibodies routinely added to their tube-fed diet.

"We as a field are now very good at making monoclonal antibodies," says Hand.

Those potential solutions will only become clearer as their work continues. The researchers are looking beyond NEC and trying to understand how the components of breast milk, especially antibodies, shape the development of the newborn microbiome. Scientists already know that breastfed infants have a decreased likelihood of developing allergies and asthma.

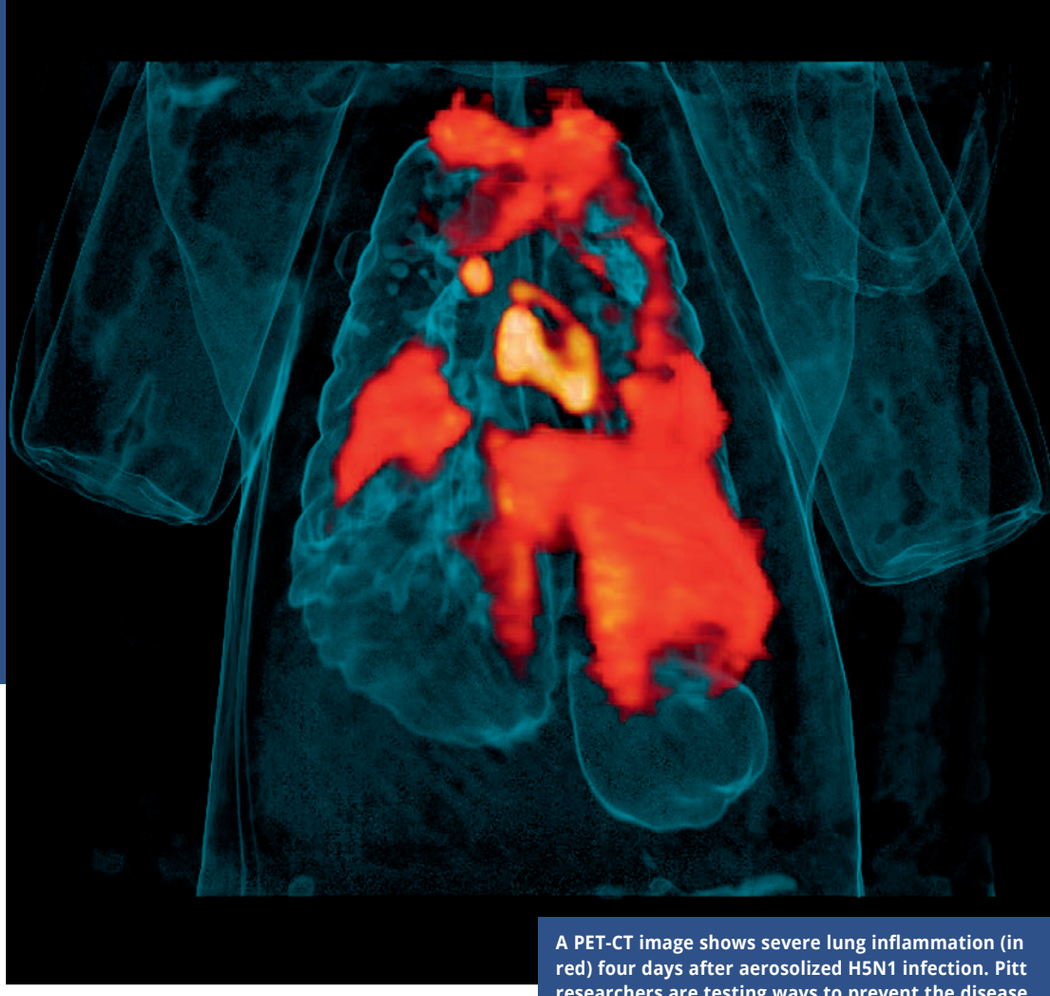
"It's opened up a whole new area of research for us," Hand says. "You can learn so much about how the immune system is responding to bacterial colonization in the intestine; you're born sterile, then you have to learn to deal with all of these different bacteria." ■

GETTY IMAGES/STATICNAK1983

EARLY BIRDS

RESEARCHERS PREPARE FOR THE THREAT OF AVIAN FLU

BY PHOEBE INGRAHAM RENDA



A PET-CT image shows severe lung inflammation (in red) four days after aerosolized H5N1 infection. Pitt researchers are testing ways to prevent the disease.

PAULINE MAIELLO

Spreading across the globe among birds and mammals, even to unprecedented areas like the Antarctic, a new strain of H5N1 avian influenza A that appeared in 2021 has raised concerns about the virus's threat to humans. While human H5N1 infections have only occurred sporadically since 1997, more than half of these cases have been fatal.

Barratt-Boyes

Reed

Among those alarmed by a possible future pandemic risk were the University of Pittsburgh's Simon Barratt-Boyes, a PhD professor of infectious diseases and microbiology in the School of Public Health, and Douglas Reed, a PhD associate professor of immunology in the School of Medicine. The researchers created an improved model to test ways to prevent the disease. They've found some promise in seasonal vaccines—but also see potential in alternatives that could protect people very quickly should an outbreak in humans arise.

Animal models that mirror the pathology of fatal human H5N1 infection are crucial for studying the virus and testing disease prevention measures. However, Barratt-Boyes and Reed saw that macaques—a monkey often used as a model organism in biomedical research—that were exposed to lethal H5N1 through traditional inoculation of liquid in the nose and throat didn't get sick.

Surprised that a deadly virus suddenly wasn't deadly, Barratt-Boyes and Reed thought that exposure might come from inhaling the virus as an aerosol. "People are working with poultry, the virus, feathers and various things that are getting aerosolized," explains Barratt-Boyes, who has a secondary appointment in immunology in the School of Medicine.

To mimic aerosol exposure, Reed used a vibrating mesh nebulizer with a glovebox biosafety cabinet. The device creates a fine mist by passing an electric current through a metal mesh, causing it to vibrate and separate any liquid traveling through it into tiny droplets.

As a mist, the virus showed its true nature. "In the immunological analyses, we saw a massive inflammatory response to the infection. And that's almost identical to what's been reported in humans," says Reed.

That out-of-control immune response, called a cytokine storm, caused severe inflammation and damage to the barrier in the lungs between air and blood. In turn, that damage caused acute respiratory distress syndrome—a life-threatening condition.

Looking to use their model to test ways to prevent the disease, the researchers noticed evidence that people with prior exposure to seasonal flu had lower rates of avian flu infection. Barratt-Boyes and Reed wondered if they could mimic this protective effect in their model with an adjuvanted influenza vaccine, a seasonal influenza vaccine containing an additive that enhances the immune response.

In 2017, they were the first to develop a macaque model of severe disease. In a 2023 follow-up paper published in iScience, they reported that vaccinated macaques still got very sick, but the infection was no longer lethal when they were exposed to a lower dose of the virus.

While their results indicate that vaccines are possible, they hope to do even better. "One of the things we saw with SARS-CoV-2 was the use of monoclonal antibodies and antivirals, like remdesivir and Paxlovid, as potential therapies," says Reed, who has a secondary appointment in infectious diseases and microbiology in the School of Public Health.

Barratt-Boyes and Reed are currently studying whether a monoclonal antibody that is protective against several viruses can also protect against H5N1 in their infection model.

Monoclonal antibodies provide rapid immune protection by targeting and neutralizing the virus, much like the protection babies receive from antibodies in breast milk (see page 11). "You'd give them the antibody and they would be protected that day," says Barratt-Boyes. Vaccines, on the other hand, require the body to generate an immune response, which could take weeks.

Says Barratt-Boyes, "The antibody that we're working with at the moment could be used as a single dose at the beginning of a flu outbreak and protect for the season." ■

GETTY IMAGES/VIOREL KURNOSOV

LOST IN TRANSLATION

LANGUAGE INCLUSIVITY LAGS IN PEDIATRICS RESEARCH

BY NICOLE MATTHEWS

As a health equity researcher, Maya Ragavan, an MD, MPH, MS assistant professor of pediatrics at Pitt's School of Medicine, has seen firsthand the challenges experienced by patients whose language identity doesn't match the predominant language where they live.

Studies have consistently shown that, in the United States, language barriers adversely affect non-English speaking communities' access to high-quality health care, their relationships with their physicians and their personal safety. Children of non-English-speaking parents statistically experience higher medical errors.

Ragavan wondered about the extent to which there are language inequities in pediatric research. And so, she partnered with Jaime E. Sidani, a PhD, MPH assistant professor of behavioral and community health sciences, to conduct a review of more than 5,000 studies published in three pediatrics journals from 2012 to 2021.

In an October 2023 paper in JAMA Pediatrics, Ragavan and Sidani reported that only 9% of the studies they reviewed included non-English-speaking participants. "Excluding individuals who do not primarily speak English but are interested in participating in the research process reduces [the] generalizability of results and does little to improve the trustworthiness of research," says Sidani. Annie Chen, a med student and the first author on the study, notes, "Diversity in research not only makes science better, but it also helps to dismantle structural barriers."

They also found that of the studies that included non-English-speaking participants, only a small fraction provided specific details about how the research team communicated oral and written information (22% and 29%, respectively).

Failing to include bilingual staff members in research hinders the participation of non-English speaking participants, but the problem goes deeper. Inconsistent translation and interpretation of research materials such as consent forms can lead to confusion about certain concepts and omitted details. To achieve language equity, says Ragavan, who is associate vice chair for diversity, equity and inclusion research in the Department of Pediatrics, all research participants must receive materials in their primary language from start to finish.

Though the findings paint a bleak picture, Ragavan, who is also part of Pitt's Clinical and Translational Science Institute (CTSI), says the research community met them with interest, support and excitement to work on solutions.

In 2023, CTSI, the Department of Pediatrics Office of Diversity, Equity and Inclusion, and the Mid-Atlantic Regional Public Health Training Center cosponsored the Linguistic Justice in Research Conference, attended by 250 scientists nationwide. "I'm grateful to CTSI and Pitt researchers who are passionate about inclusivity in general," Ragavan says.

Ragavan also commends the work of her colleagues and codirectors of the CTSI Community PARTners Core: Elizabeth Miller, an MD, PhD who is the Edmund R. McCluskey Professor of Pediatric Medical Education, and Mylynda Massart, an MD, PhD associate professor of family medicine. They're working to build relationships with community partners who "understand the language identities of the immigrant and refugee communities that they're serving," says Ragavan. "They also understand how to include people equitably—how to recruit people in a way that's not coercive."

Ragavan

One such partner is Global Wordsmiths, a Pittsburgh-based social enterprise that provides language assistance services to UPMC.

"People who do not communicate in English are irrefutably excluded from science, including medicine, if they are unable to participate in the process," says Mary Jayne McCullough, chief executive officer of Global Wordsmiths. "Dr. Ragavan's work is vital to advancing language accessibility awareness in research so that this inequity can be transformed into a culture of participation, representation and improved outcomes for everyone."

In the course of her own research, Ragavan has provided materials to participants in 13 different languages.

Looking to introduce future researchers to inclusive strategies early on, Ragavan leads seminars on language equity and teaches a course on community-partnered research and knowledge translation with Miller. "I want to get to people while they're trainees," she says. "So, then we build this whole new generation of people who are excited about [language equity] and know how to do it well." ■

THE LONG VIEW ON COVID

GRANT WILL HELP EXPAND CARE AND UNDERSTANDING OF THE CONDITION

BY ROBERTA ZEFF

GETTY IMAGES

The UPMC Post-COVID Recovery Clinic has treated at least 1,200 patients. But Alison Morris, an MD professor of medicine, notes one of the challenges: Long COVID, the often-debilitating multisymptom condition that can affect a patient long after a COVID-19 infection, is not well defined.

The University of Pittsburgh and UPMC will expand care and understanding of the condition, thanks to a grant from the U.S. Department of Health and Human Services. The first-of-their-kind awards, given to nine organizations, provide $1 million per year for the next five years to study science-based best practices for the condition.

The Post-COVID clinic will use the grant to partner with UPMC Family Medicine Academic Clinic Practice to establish the Pitt Improving Access to Culturally Relevant Long COVID Care and Treatment (IMPACCT) Program. The program will teach the next generation of community providers about long COVID care—especially doctors and trainees in family medicine—and improve access to primary and specialty care for patients from underserved and rural populations.

Some patients with problems like exercise intolerance, cardiopulmonary issues and brain fog might have undiagnosed long COVID, the researchers say. At a kickoff meeting for the grant on Nov. 20, 2023, Morris said the project aims to address the gaps in outreach and equity, noting that only 8% of the UPMC Post-COVID Recovery Clinic's patients are Black. "That doesn't reflect the population of Pittsburgh or the impact of COVID, which disproportionately affected the Black community," she said.

The Black Equity Coalition (BEC), a group of physicians and health experts, will provide input on culturally and socially relevant care to ensure an equitable approach. Tracey Conti, an MD, chair of family medicine and a leader of the BEC, says, "Anytime we can take practices and implement them to a broader portion of the population, we're excited to be a part of that."

Morris is one of three principal investigators on the project, along with Frank Sciurba, an MD professor of medicine, and Howard Degenholtz, a PhD professor of health policy and management in the School of Public Health.

Conti

Degenholtz

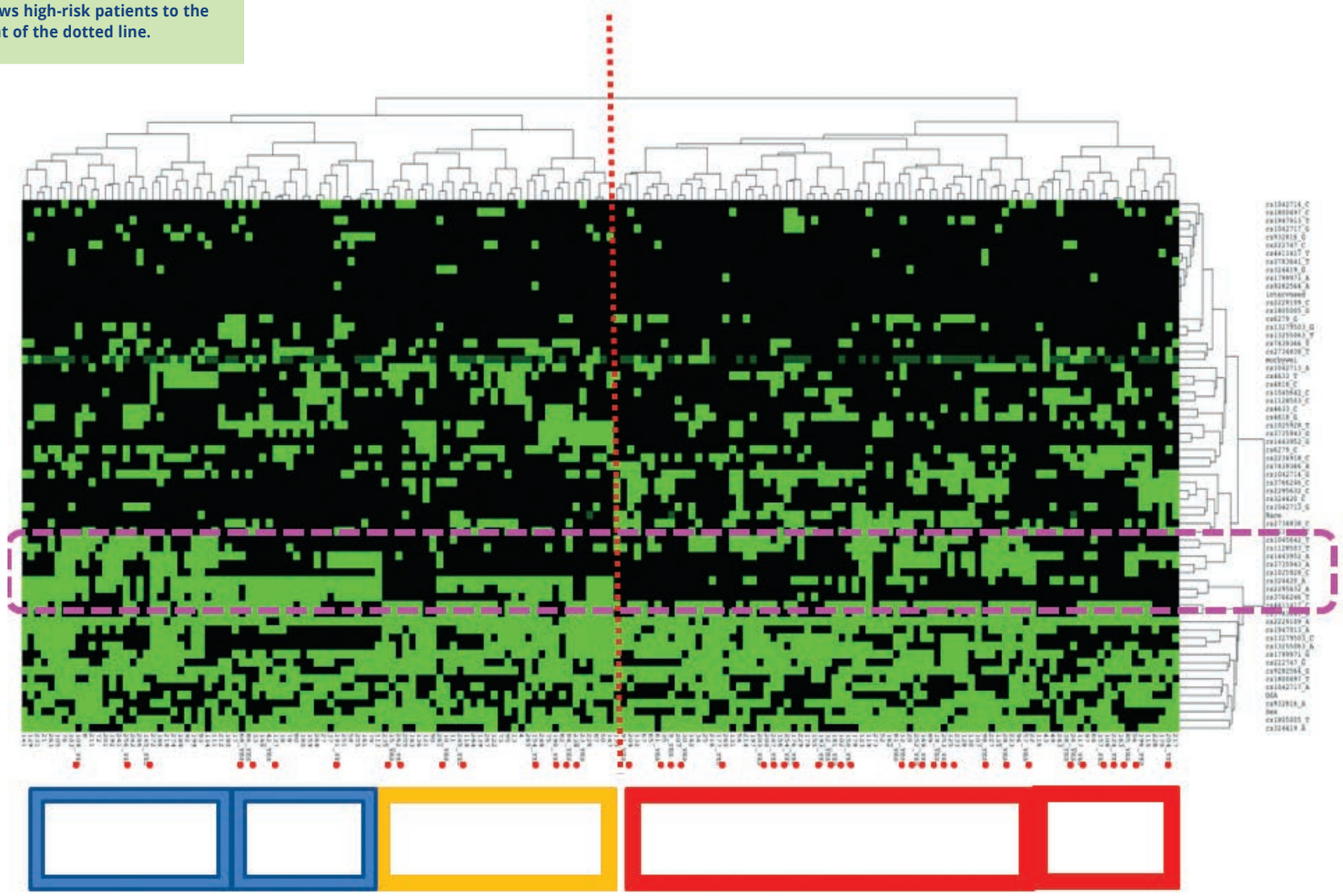
"This is representative of the collaborative environment that exists at the University of Pittsburgh," Sciurba says. "The ability to build collaborations across disciplines really sets us apart."

At the kickoff meeting, one patient of the Post-COVID clinic described her experience with fatigue so severe that when she tried to go roller-skating, she could not untie the laces of her skates. "It feels like I'm in a sinking boat alone trying to bail the water out," she said. A community engagement manager for the BEC, who also has been dealing with long COVID symptoms, thanked her for speaking. "You're not in this boat by yourself," she said. "You've just taken some water out of my boat, and I know that I'm not crazy." ■

Morris

Sciurba

Patients with certain genetic variations have a higher risk for respiratory depression when they take opioids to relieve pain after surgery. The heat map shows high-risk patients to the right of the dotted line.



PAIN IS PERSONAL

WHAT WORKS BEST TO ALLEVIATE AGONY AFTER SURGERY? IT DEPENDS ON THE PATIENT. | **BY ANDREW DOERFLER**

One of the most common surgical procedures for children—a tonsillectomy—can be among the most painful. And in the urgency to free children from agony after the operation, doctors often turn to opioids.

Early in his career as a pediatric anesthesiologist at Cincinnati Children's Hospital Medical Center, Senthil Sadhasivam, an MD, MPH, was horrified to see a devastating result of this practice: A child at another hospital died from respiratory depression brought on by the prescribed opioids.

The disturbing outcome—and dozens of others throughout the country where children died or suffered brain damage—inspired a direction for his research. "My interest was, in and around surgery, why opioids kill some patients and cause adverse outcomes in others, while many survive and do well," he says. The disparate responses from child to child, he and his then-colleagues suspected, could have to do with differences in their genes. One genetic variation linked to the rapid metabolization of certain opioids had already been identified in children who died after taking codeine for tonsillectomy pain.

After recruiting 2,000 children undergoing tonsillectomies, Sadhasivam and his collaborators found answers. In a 2014 paper published in the journal Pharmacogenomics, they identified three genetic variations that, when found together, were associated with and highly predictive of morphine-induced respiratory depression. The variations influenced receptors, enzymes and other proteins that play a role in how the body metabolizes, transports and responds to opioids. Certain patients, the findings indicated, were genetically more susceptible to dire and even fatal outcomes from a routine opioid prescription.

Sadhasivam, who went on to Indiana University before joining the University of Pittsburgh in 2021, would build on this research, identifying genetic variations associated with a range of other responses to opioids—from adverse side effects like nausea and vomiting to a dependence on the medication.

Such findings open new possibilities for care providers who manage pain around surgery. Using preoperative genotyping, they can identify a predisposition before a child undergoes surgery and, armed with this info, proactively plan for alternative pain management methods or lower doses. The approach is an example of pharmacogenetics, in which providers tailor medications to genetic variations in individual patients, rather than waiting to react to how a patient responds. Sadhasivam and his colleagues put in place such guided pain management at Cincinnati Children's, and he is now working with others to expand the practice at UPMC hospitals.

The need for a more targeted approach to opioids has become urgent. As Sadhasivam was conducting his early research, concern about the overuse of opioids was mounting throughout the country on multiple levels.

In 2013, the FDA issued a warning about the safety risks of using codeine after tonsillectomies for children; in 2017, the agency went further by restricting the use of it and another opioid, tramadol (though Sadhasivam says that doctors continue to prescribe other opioids, like oxycodone and hydrocodone, that carry similar risks).

At the same time, opioid use disorder, addiction and overdose deaths were skyrocketing across the United States.

"Everyone—nurses, physicians, surgeons—wanted to make sure the patient would not have pain," says Pitt's Jacques Chelly, an MD, PhD, director of acute pain clinical research and a professor of anesthesiology and perioperative medicine and of orthopaedic surgery. "And opioids were prescribed like candies."

In October 2017, the federal government declared the opioid epidemic a public health emergency. Many doctors had long turned to opioids as a blunt instrument to knock out pain, without a full appreciation of how its risks varied from patient to patient; now they had to consider how prescribing opioids after surgery contributed to the crisis.

One large study cited in a 2019 U.S. Department of Health and Human Services report showed that among a group of patients who were given a course of opioids to treat pain following surgery and had not used opioids before, about 6% became chronic users. For certain operations, such as lumbar spine fusions, Sadhasivam says, the rates are higher. While the

Chelly

Sadhasivam

Wasan

percentage may seem small, 50 million surgical procedures happen each year in this country.

But the risk is not the same for everyone. Just as Sadhasivam's work had highlighted how drastically a patient's genome could affect their response to opioids, a litany of factors determine how susceptible they are to opioid misuse. The Health and Human Services report, for example, notes that patients were more likely to become chronic opioid users after surgery if they had a history of tobacco use, alcohol and substance use disorders, anxiety, depression, other pain disorders or comorbid conditions.

Doctors and health agencies began to appreciate that more individualized treatment for pain was necessary. Across the field, researchers are trying to figure out how to alleviate suffering while taking into account a patient's risk of adverse side effects, dependency, misuse and addiction. Truly personalized care calls not only for a better understanding of the patient, but more evidence-backed alternatives rather than a one-size-fits-all approach.

When Sadhasivam joined Pitt two years ago as a professor in the Department of Anesthesiology and Perioperative Medicine, executive vice chair for clinical quality, patient safety and clinical research, and director of Perioperative Research and the Perioperative Genomics Program, strides toward identifying alternatives to opioids, as well as a more personalized approach to treat pain, were already well underway in his new departmental home.

'IT MIGHT WORK FOR YOU'

Ruthann Smyth (not her real last name) is no stranger to pain. She has undergone several operations on her neck, knees and spine over the last 30 years. Along with the acute pain she suffered from those procedures, Smyth was diagnosed in 2000 with rheumatoid arthritis, leaving her with chronic pain. Nonetheless, she avoids opioids.

"I don't want to be addicted," she says. "It could be really easy when you're hurting all the time."

She also had a bad experience in the past: Morphine she received for a neck surgery in 1993 left her nauseated and hallucinating. "I didn't like that feeling," she says, and has since sought to manage her pain through other means.

In 2017, though, Smyth fell and tore the labrum in her hip. The torment was bad enough that she desperately needed a new solution. "I couldn't get any relief. The pain was just crippling," she says. "I couldn't move my left leg at all." Since 2004, she had been seeing Chelly for relief.

Chelly recommended that Smyth try a device called the NSS2-Bridge that stimulates nerves of the ear.

"Dr. Chelly told me, 'I have this device, and I think it might work for you,'" she says. The device, battery-powered and disposable, uses electrodes to stimulate the nerves in a patient's ear to help relieve pain with what's known as auriculotherapy. It was already FDA-approved to treat opioid withdrawal symptoms such as abdominal pain. When Chelly learned about the device, he reached out to the company, proposing to test it on other kinds of pain.

Smyth, who is also a UPMC employee, was willing to try anything that didn't involve an opioid prescription. Instructed to use the device when she felt the pain, she tried it for four days—and says it made a big difference. Her leg soon felt good enough that she was able to start physical therapy. As she continues to manage her pain, she appreciates Chelly's willingness to explore different options that match her preferences and history. "He has really helped me immensely," she says.

Chelly and Sadhasivam are now collaborating on a four-year National Institute on Drug Abuse grant to study whether using the NSS2-Bridge can reduce the opioid requirement for patients after open surgery. They'll also study whether it reduces psychological symptoms that can increase a patient's experience of pain, like anxiety and depression, and lead to more opioid use. In a small study, Chelly found evidence that use of the device was associated with reductions in pain and less opioid use after kidney donor surgery.

"Everyone—nurses, physicians, surgeons—wanted to make sure the patient would not have pain. And opioids were prescribed like candies."

Exploring the effects of the Bridge device is just one example of the Department of Anesthesiology and Perioperative Medicine's commitment to finding new options for patients. Chelly and Ajay Wasan are the directors of the Center for Innovation in Pain Care, focusing on acute pain and chronic pain, respectively. The center, begun under department chair Aman Mahajan, aims to enhance outpatient care with multiprong, interdisciplinary treatments and digital health tools that reduce reliance on opioids. Their work considers genetics and mood disorders that contribute to pain syndromes and opioid use disorder—looking at the "whole patient."

The drive to reduce opioid reliance has long been an area of emphasis among the depart-

ment's faculty. When Chelly joined Pitt and UPMC in the early 2000s, he says, the department "started a regional anesthesia program to focus on reducing the amount of opioid at that time, even when the crisis was not really recognized."

Their push for more alternative approaches to opioids, in collaboration with others across UPMC departments, has led to changes at system hospitals. Wasan, an MD, MSc who joined Pitt in 2013, and other administrators in their department led a pain steering committee that helped coordinate better pain care and opioid prescribing through education efforts and outreach.

"When we look at the amount of opioid that we use [at UPMC] today, it is a fraction—and when I say a fraction, I mean 80 or 90% less—of what it was when Dr. Wasan and myself joined," Chelly says. "And we are not stopping."

Supported by a Shadyside Hospital Foundation grant, Chelly is working with colleagues to develop an opioid-free surgery pathway at UPMC Shadyside Hospital, making use of nonopioid medications, regional anesthesia and even complementary and alternative techniques like mindful breathing, aromatherapy and hypnosis. His team will also develop tools to identify patients who are a good fit for the pathway. (Meanwhile, Pitt's School of Dental Medicine has established opioid-free prescribing guidelines for the vast majority of procedures performed at its clinics.)

Research funding has been catching up with the opioid crisis. Five years ago, the National Institutes of Health (NIH) established the Helping to End Addiction Long-term (HEAL) Initiative, which has awarded tens of millions of dollars to Pitt researchers, including Sadhasivam and Wasan, to study prevention and treatment strategies to address opioid misuse and addiction. About a quarter of the initiative's funding is going toward improving pain management, especially approaches beyond opioids.

"The receptiveness has warmed up over the years," says Wasan. "Unfortunately, it took an opioid crisis and an epidemic to actually create a lot more funding for pain [management] that maximizes nonopioid approaches."

Wasan is not only a pain management specialist, but also a psychiatrist. "Appreciation that psychological factors have a major impact on pain, pain experience and disability has been around for literally 50 years now," Wasan says. Tending to those conditions can bring down the need for opioids.

"Unfortunately, it took an opioid crisis and an epidemic to actually create a lot more funding for pain [management] that maximizes nonopioid approaches."

But even though that understanding has long existed for chronic pain, Chelly says it is only much more recently—in the last decade—that psychological and psychosocial factors have been taken seriously in relation to acute and postsurgical pain. Findings are promising: A 2018 study in the Journal of Pain by researchers in Iowa tested a one-day therapy workshop on veterans who had high levels of pain and psychological distress before they underwent orthopaedic surgery. The 44 patients who took part in the workshop—which involved acceptance, mindfulness and behavioral training—saw quicker pain relief and stopped using opioids sooner than those who didn't in the three months after their procedures.

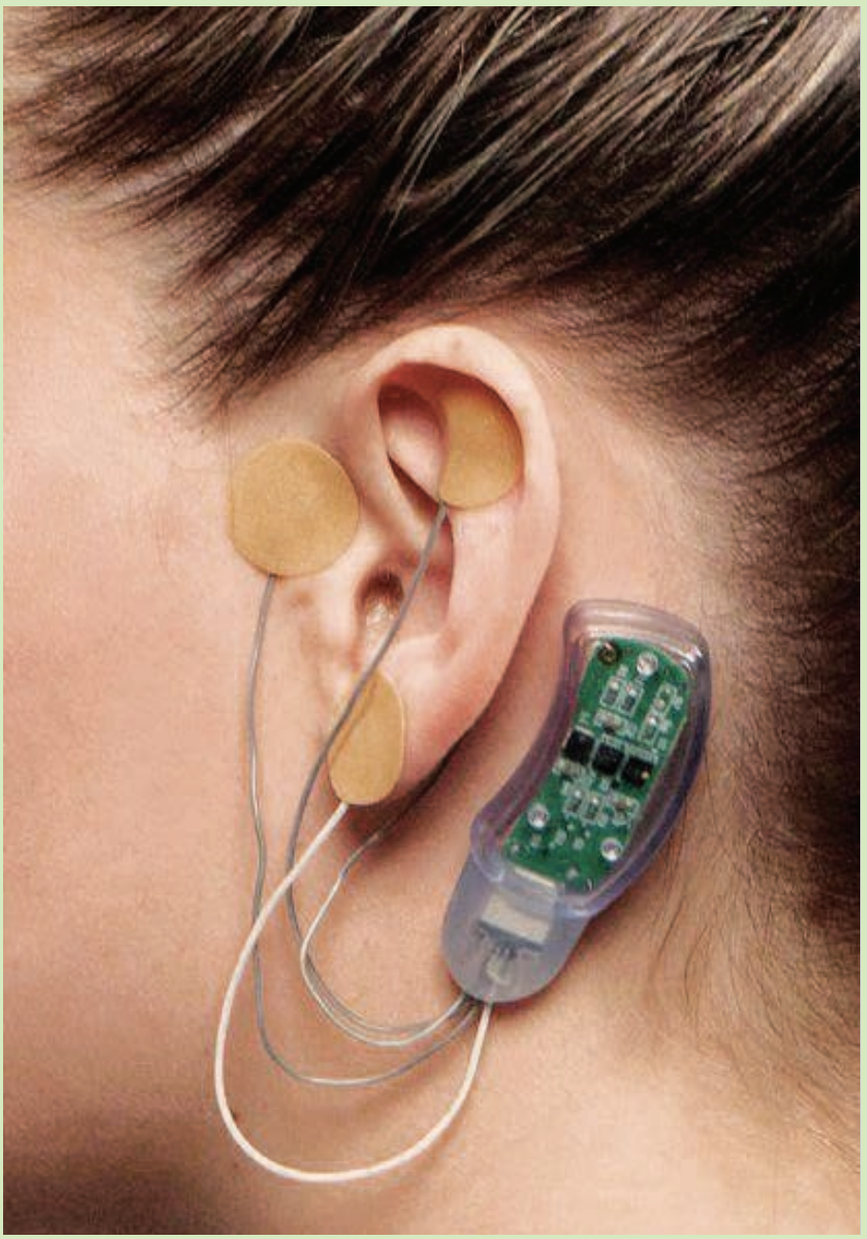
Chelly and others at Pitt are investigating other means of providing relief to surgical patients who want to avoid opioids through methods that aim to reduce anxiety. In trials at UPMC Shadyside, Chelly saw that aromatherapy reduced opioid use by more than 30% after hip replacement. And Shiv Goel, an MD clinical associate professor of anesthesiology and perioperative medicine and chief anesthesiologist at Shadyside, has been studying whether music therapy helps to reduce anxiety and pain among the hospital's surgical patients.

The NIH and other funding organizations have started to offer more support to researchers like Chelly to study methods that have long been in use as alternative medicine or for other purposes but currently lack strong evidence to treat surgical pain.

In another study, published in November in the Journal of Clinical Medicine, Chelly and Sadhasivam shared findings from a pilot study of a device called the NeuroCuple; it's a patch that contains billions of "nanocapacitors," minuscule structures that store electrical charges, and reduces pain by using the charges to bring down inflammation. They found that patients using the patch reported less pain in the first three days after total knee and hip arthroplasty and were less likely to request an opioid prescription after they were discharged. More evidence is still needed to establish either the NeuroCuple or the NSS2-Bridge as an effective pain management tool, but each may become a future routine option for a patient looking to avoid opioids or take less of them.

PROACTIVE PRECISION

Sadhasivam remains frustrated with how reactive much of current pain management is. Doctors prescribe opioids based on simple factors like weight, he says, then respond to reactions or continued severe pain. About a decade ago, he and colleagues implemented preoperative genotype-based risk assessment at Cincinnati Children's based on their research, which showed its potential. But later, he says,



COURTESY INNOVATIVE HEALTH SOLUTIONS

The NSS2-Bridge uses an electrical form of acupuncture on the ear. Pitt doctors are testing how well it relieves various kinds of pain, including pain after surgery.

the hospital stopped the practice after insurers rejected reimbursements for it.

The practice remains rare, even in many of the best academic medical settings. "Even if they do it, they may do one or two genes, and the average anesthesiologist or surgeon doesn't know what to do with it," Sadhasivam says.

In response, he started a company, OpalGenix, supported by multiple NIH Small Business Programs grants, to develop a platform backed by his research to assess the risks of opioids for a patient before a procedure. (Its name is a mashup of opioid, algesia and genetics.) He hopes to help physicians more easily conduct genotype-based risk prediction and build up evidence of its benefits.

Along with the predisposition for severe side effects of opioids that Sadhasivam has studied, researchers have also identified a genetic variation, carried by at least 2% of people, associated with addiction. Opioids don't bind as well with certain opioid receptors in these patients, so they need a higher dose to experience the analgesic effect—but don't suffer bad side effects. The combination—higher dose, few adverse effects—leaves them more susceptible to addiction. In December 2023, the FDA approved the first genetic test for identifying genetic risk for opioid addiction. Sadhasivam, Chelly and Wasan are now working on implementing it in some high-risk UPMC surgical patients.

The OpalGenix platform, though, will go beyond genetics to produce a risk assessment grounded in other considerations such as medical history, demographic factors and psychological conditions.

Taking all this into account, the algorithm will then offer a personalized recommendation for the patient's pain care that could include lower dosing, nonopioid medications and alternative therapies. "With our approach, it's all proactive," Sadhasivam says.

As OpalGenix moves toward bringing a product to fruition, he is championing the expansion of preoperative genotyping at UPMC hospitals, in collaboration with the UPMC Genome Center.

With support from another NIH grant, Sadhasivam is implementing a screening for genes that influence opioid metabolism and responses among pregnant women undergoing cesarean sections at UPMC Magee-Womens Hospital. At UPMC Children's Hospital of Pittsburgh, Sadhasivam and his collaborators are genotyping teenagers undergoing spine fusion surgery so that doctors can minimize adverse outcomes from methadone prescriptions. With Phil Empey, a PharmD and PhD at the School of Pharmacy and the Institute for Precision Medicine, Sadhasivam is working toward incorporating preoperative genotyping for pain management into UPMC patients' electronic health records.

Although getting genotyping into the clinic has its hurdles, he says, a proactive approach will make the initial care more effective, reducing the length of hospital stays and bringing down costs for patients, insurers and hospitals. The commercial route, he says, can get these new approaches to the clinic more quickly, where they can help patients.

"If you can make even a small difference," he says, "that would save a lot of suffering." ■

Pitt launched its three-year MD program in the 2023-24 academic year.

1, 2, 3, THEN AN MD

A NEW ACCELERATED MD PROGRAM GETS PRIMARY CARE PHYSICIANS INTO THE COMMUNITY FASTER, WHERE THEY ARE SORELY NEEDED.

BY MICAELA CORN

ILLUSTRATION | MAGGIE NEGRETE

Studies show optimal health outcomes in populations where 40% of the physician workforce practices primary care, yet only about 33% of American physicians do.

The dearth of primary care physicians in the United States is well documented. For decades, the number of new doctors training in primary care relative to specialty care has been declining. Then, COVID-19 walloped the primary care system, exhausting and further whittling away its workforce.

"It's already happening, but we are going to be short PCPs in the next 20 to 40 years," says Amanda Casagrande, an MD practicing family medicine in Pittsburgh who's an assistant professor of family medicine at the University of Pittsburgh. A quarter of today's primary care physicians are expected to retire in the next decade.

Fewer doctors, says Casagrande, "means more patients for us [existing PCPs]. We always feel the crunch."

In response to the mounting need, this academic year Pitt Med launched the Primary Care Accelerated Track (PCAT), a three-year path to an MD degree. Casagrande directs the program, which is a partnership between the School of Medicine and UPMC Medical Education (the residency and fellowship programs).

The goal of PCAT is to attract outstanding future physicians to pursue careers in primary care specialties, particularly in Western Pennsylvania, ultimately improving quality and access to care in the region.

Students who successfully complete the PCAT requirements have preferred entry into (i.e., "are ranked favorably" by) the UPMC residency program of their choice: family medicine at UPMC St. Margaret, UPMC Shadyside and UPMC McKeesport; internal medicine at UPMC Montefiore; or, starting next year, pediatrics at UPMC Children's Hospital of Pittsburgh.

Casagrande

Rosenstock

Earning the MD in three years also means 25% less tuition than a four-year program, a welcome prospect to anyone facing a mountain of student loans, which is most medical students.

That's especially important for recruiting new MDs into primary care careers, which don't have starting salaries or earning potential as high as other medical specialties.

"I'm ready to kind of get my life on the road, so I'm happy that [PCAT] helps on that front," says Caleb Jones, a nontraditional student at age 28 and one of three students in the program's first-year cohort.

Jones applied to Pitt Med after doing an AmeriCorps City Year program, teaching microbiology as an adjunct after earning a master's in biology from American University and working for a year at an ophthalmology clinic near Washington, D.C. Another year doing bacteriophage therapeutics research made him miss the clinic. In retrospect, he sees how each step in his journey has pointed him here, to becoming a primary care doctor.

"The accelerated track is really for students who know what they want to do," says Casagrande, something she admits can be challenging.

For Amrita Mani, a North Carolina native and PCAT student straight out of undergrad, "it definitely took a lot of conversations—" not just with PCPs but with other docs—to realize what type of doctor she might become. (PCAT also encourages broader exploration and shadowing opportunities in nonprimary care specialties.) It was while working at a free community health clinic in Durham that the psychology major's many interests coalesced into a career Mani could imagine for herself.

"I loved seeing how resourceful the doctors and nurses there had to be." She enjoyed working with medical translators for non-English-speaking patients and developed a deep appreciation for doctor-patient relationship building as fundamental to good health care.

TRAINING GROUNDS

First-year PCAT students spend a half day every other week at their residency site of interest. Jones is at UPMC McKeesport.

The day after his clinic, his four-year peers often ask him what he saw. "I'll give a HIPAA-friendly version. But it's always striking how relevant it is to what we're learning," he says.

"One of [the residents] said that having me around was an interesting addition. They think in terms of orders and the running of the clinic and the very outward appearance of these diseases. But I'm still thinking very much in terms of the hormones and the proteins and the muscles. It was encouraging to hear him say it was a good reminder to them all, of where they started."

At her UPMC Shadyside clinical placement, Mani works with a program for expectant mothers at the same stage in their pregnancy.

"They take classes and workshops together, and when they give birth, their babies become patients at Shadyside." Family medicine in action.

Casagrande worked with associate dean for medical education Jason Rosenstock, an MD (Res '96), and the committee overseeing the new Three Rivers Curriculum to make sure that PCAT students would be integrated with the rest of their class when both programs launched in the fall.

To earn the MD in three years, PCAT students make the most of their summers. One month before the traditional term starts, PCAT first-years take a course on community health, clinical skills and health care systems. They explore the county health department and free clinics in surrounding communities.

In July 2023, Mani, Jones and Aaron Chacko, the third student in the accelerated program, spent their first week at the Pitt Vaccination and Health Connection Hub on the Pittsburgh campus.

The Hub (for short), born out of the urgency for equitable COVID-19 vaccine distribution in the early days of the pandemic, quickly became a hands-on classroom for Pitt students across the health sciences. The Hub teaches about all aspects of running a vaccination clinic, from billing to bedside manner. Casagrande serves as one of the Hub's medical directors.

Her second day there, Mani learned that nearly 90% of Americans live within five miles of a community pharmacy. That insight offered food for thought: What if more aspects of patient care were provided in pharmacies, which would increase access to care in underserved areas? Nonphysician health professionals and doctors alike already share some administrative and basic care duties.

Yet, pharmacists are also overtaxed these days—another community provider shortage. At the same time, the American Medical Association has been pushing back against what it considers "scope [of practice] creep."

Something needs to budge. An October 2023 analysis by the federal Bureau of Health Workforce projects that nonmetro areas of the country will see a nearly 56% shortage of physicians (across all specialties), compared to a 6% shortage in metro areas by 2036.

At the Hub, says Mani, "We talked a lot about the various restrictions that different states have on what the different health care professionals can do."

She's already seeing potential for redressing health inequities.

"Changing those laws to give more allowances," she believes, could help close the gap.

When students graduate from the program, they go on to residency at a UPMC site, where they are already known.

A FULL SPECTRUM OF CARE

PCPs treat the broadest range of conditions and illnesses among the physician specialties—acute and chronic, physical and psychological. You can see your PCP for a rash, fever, strep test, Pap smear, skin biopsy, to deliver your baby or to maintain your cholesterol.

"From a health care equity standpoint," Casagrande says, "we are the touchpoint to the health care system for patients." She thinks of primary care physicians as the quarterback of the care team, coordinating, breaking it all down and making sure the patient understands what's going on.

Chacko embraces this role: As a PCP in training, he says, "I am someone who sees not just the disease but a person as a whole.

"I hope to form long-term relationships such that I can be an advocate and someone who is focused on preventing disease rather than only fixating on the cures."

It is widely accepted that PCPs can help save the system money, says Casagrande. "I think more health systems are starting to recognize this benefit; but saving money still isn't the same as making money, and a lot of what we are able or unable to do in health care is unfortunately related to money."

Casagrande welcomes this top 10 in National Institutes of Health–funded research institution doubling down on its investment to develop committed PCPs. Pitt is not the first to offer a three-year MD. More than 30 other medical schools in North America have developed three-year programs since 2015.

Chacko was attracted to Pitt Med's PCAT from New Jersey because of the collaborative atmosphere. "I was enthusiastic about the small, case-based learning groups and the abundance of opportunities to interact with patients within the curriculum."

PCAT emphasizes that students can always change their minds. They can drop out of the accelerated track at any time and are not required to go to any UPMC residency program nor to pursue primary care if their goals change. Although, Casagrande says, "we hope as residents that they'll really hit the ground running because they'll already know all the faculty members and be integrated into their hospitals."

Earning the MD in three years also means 25% less tuition, a welcome prospect to anyone facing a mountain of student loans, which is most medical students.

As the program grows, Casagrande would like to recruit more students from the area. A Pittsburgh native herself, she believes "there's just something about people from the city training to become doctors here and staying to take care of the community."

Wherever PCAT students come from, "We expect they'll be great communicators, educators, leaders, health systems scientists and advocates for social justice. I hope that med students, if exposed to primary care early, will understand the full spectrum of what we can really do." ■

NOT JUST NEIGHBORS

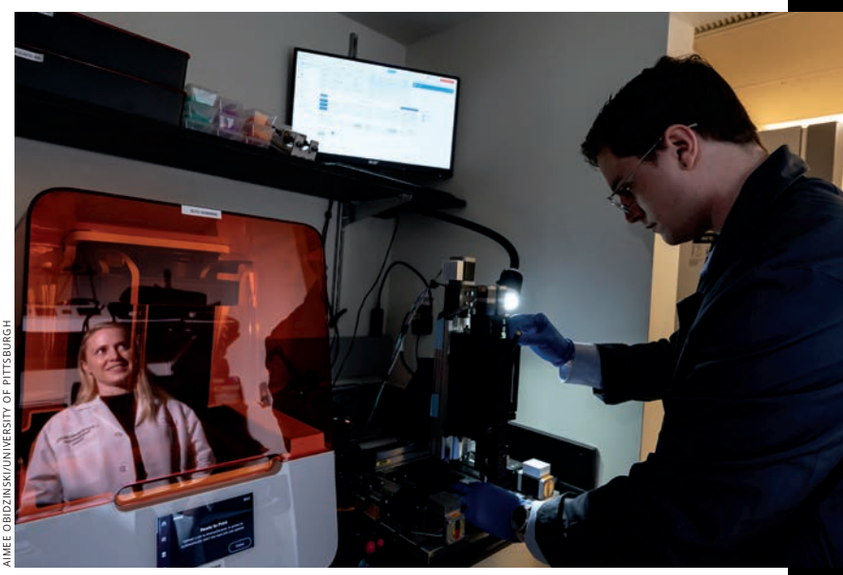
TOGETHER, PITT AND CARNEGIE MELLON TRAIN TOMORROW'S BIOMEDICAL LEADERS

BY MICHAEL AUBELE AND ANDREW DOERFLER
SILHOUETTES BY FRANK HARRIS
PHOTOGRAPHY BY AIMEE OBIDZINSKI/UNIVERSITY OF PITTSBURGH AND ERIN O. SMITH/VANDERBILT UNIVERSITY MEDICAL CENTER

Joshua Tashman couldn't divorce himself from his passion for engineering as he explored medical schools nearly a decade ago. So, he decided there was only one way to round out his formal education: He'd marry medicine and materials science.

That choice led him to Pittsburgh, where the University of Pittsburgh School of Medicine and Carnegie Mellon University run the Medical Scientist Training Program (MSTP), through which he earned his PhD in bioengineering in 2021 from Carnegie Mellon and his MD from Pitt in 2022.

"The real benefit here is that they're different schools with different expertise," says Tashman, grateful that he had the chance to learn from and train under brilliant faculty at both universities.



AIMEE OBIDZINSKI/UNIVERSITY OF PITTSBURGH

Joshua Tashman's (right) work on 3D-printed organs has spanned projects with Carnegie Mellon bioengineers and Pitt's Cary Boyd-Shiwarski (left).

The universities share broad research interests and overlapping expertise in several fields—think neuroscience, robotics and bioengineering—and partner in programs beyond the MSTP.

Carnegie Mellon graduate student Kendra Noneman has a Pitt faculty advisor through the Center for the Neural Basis of Cognition, where researchers at both universities investigate the cognitive and neural mechanisms that give rise to biological intelligence and behavior. Working with J. Patrick Mayo, a PhD assistant professor of ophthalmology, gives her a chance to see clinical research firsthand as she studies where animals are looking based on neurons in the cerebral cortex.

Emily Lopez, another Carnegie Mellon student co-advised by Mayo, was excited that the partnership with Pitt connected her with a broader neuroscience community in Pittsburgh.

"It just increases the amount of and types of research I am exposed to and the people I can meet, which makes for a richer graduate student experience," says Lopez, whose optogenetics research is part of a collaboration between Mayo and her Carnegie Mellon advisor, Matt Smith, a professor of biomedical engineering and codirector of the Center for the Neural Basis of Cognition. "In all honesty, I tend to lose track of which professors and students are from Pitt and which are from CMU; we are often mixed together at various events and even within labs."

Together, the two universities are nurturing the next generation of biomedical leaders as their faculty pursue life-changing research.

"I think that over the years, the two universities have collaborated effectively to attract the best students to the city because of their complementary research strengths," says Saleem Khan, PhD associate dean for graduate studies and academic affairs and professor of microbiology and molecular genetics in Pitt's School of Medicine. "This is a great thing, because it helps both universities attract and recruit faculty and expands the breadth of their research."

He says it also gives faculty bargaining power in attracting grant funding. Today, research projects at the School of Medicine involve collaborators from Carnegie Mellon more than any other institution outside of Pitt. In fiscal year 2023, their collaborations included 65 principal investigators and spanned 48 awards with a total worth of over $15.8 million.

Theresa Mayer, vice president for research at Carnegie Mellon, notes that, overall, "the University of Pittsburgh is by far and away CMU's most frequent and deepest partner in research. Research at CMU is supported from funding awarded in partnership with the University of Pittsburgh more often than through any other source, outside of direct funding awards from major federal agencies like the National Science Foundation and the U.S. Department of Defense."

And of course, Pitt and Carnegie Mellon share a neighborhood. Many faculty say they can't immediately name another instance of having one of the country's best medical schools sitting a few blocks from a top computer science school. In the Boston area, you'll find a close case in Harvard Medical School and MIT. Yet those schools sit roughly two miles apart.

James Faeder, a PhD Pitt Med associate professor of computational and systems biology and Pitt's program director for the joint Carnegie Mellon–University of Pittsburgh PhD Program in Computational Biology (CPCB), says there are intangible benefits to Pitt and Carnegie Mellon's proximity, as well. Faculty from the two universities don't just work in the same neighborhood, they often live in the same neighborhoods and socialize outside the lab. And on the student side, he points to the pride they take in their joint education:

"Our students view themselves as alumni of both schools."

The serendipitous geography has made it easy to forge alliances that maximize complementary strengths in medical research. Dozens of Pitt students as well as dozens of Carnegie Mellon students are enrolled in formal programs between the universities.

Examples include the aforementioned MSTP and CPCB programs; the Molecular Biophysics and Structural Biology graduate program, where students can pursue research in disciplines ranging from cellular biophysics to virus structure and nanomachinery; plus the Program in Neural Computation, where computationally minded students can move seamlessly among neuroscience labs at both universities. And there are more informal collaborations than you can shake a pierogi at.

"This is a special part of the Pittsburgh community," says Douglas Weber, a PhD and the Akhtar and Bhutta Professor in mechanical engineering and neuroscience at Carnegie Mellon. "There are elite institutions that are unable to collaborate between departments. But we're able to do that here across institutions."

An emerging generation of physicians and scientists has taken advantage of this city's extraordinary academic offerings to enrich health care—not only in Pittsburgh, but well beyond. What follows are stories from three of these investigators.

NOW IN 3D

When **Joshua Tashman** tells you what he accomplished as part of a research team at Carnegie Mellon, you can understand bioengineering's appeal to him, especially after he tells you a little about himself.

The self-professed tinkerer used 3D bioprinting to engineer models of the human heart—including one that pumped for weeks.

Tashman, who earned a bachelor's in mechanical engineering from Cornell University, played an integral role on the Carnegie Mellon team that 3D-bioprinted a functioning tubular heart that is similar to one in embryonic development. They took cardiomyocytes and cardiac fibroblasts—the cells that make up the heart muscle and the ones that produce connective tissue, respectively—that were derived from stem cells and printed them in a tube made from collagen. The tube spontaneously began contracting within a few days of construction and pumped for roughly a month.

Tashman's most recent work in Pittsburgh

ERIN O. SMITH/VANDERBILT UNIVERSITY MEDICAL CENTER

Eric Strobl knew he wanted to use big data to find new treatments.

was in Pitt Med's Division of Renal-Electrolyte under the direction of Cary Boyd-Shiwarski (MD '12, Res '14, Fel '16), an assistant professor of medicine. There he investigated how potassium depletion can lead to kidney injury.

Before he headed to Boston over the summer for a Mass General Brigham Combined Residency in pathology, Tashman explained that cell culture generally is two-dimensional, so it has limitations: The lab-grown cells aren't exposed to the same environment that they are in the body.

"They're exposed to a mechanical environment and a flow environment that is specific to the geometry and physiology in the human body," he says of kidney cells. "These cells line a tube in the body with a flow [of water and solutes] passing over them. And these things are very important for the kidney cells to think that they're in a kidney and that they should behave like kidney cells."

So, when running experiments on how potassium levels affect the creation and excretion of ammonia, the most common lab model doesn't reproduce many of the same biomarkers found in the kidney. "The idea then is, can we 3D print something that allows us to recreate the mechanical and chemical cues?"

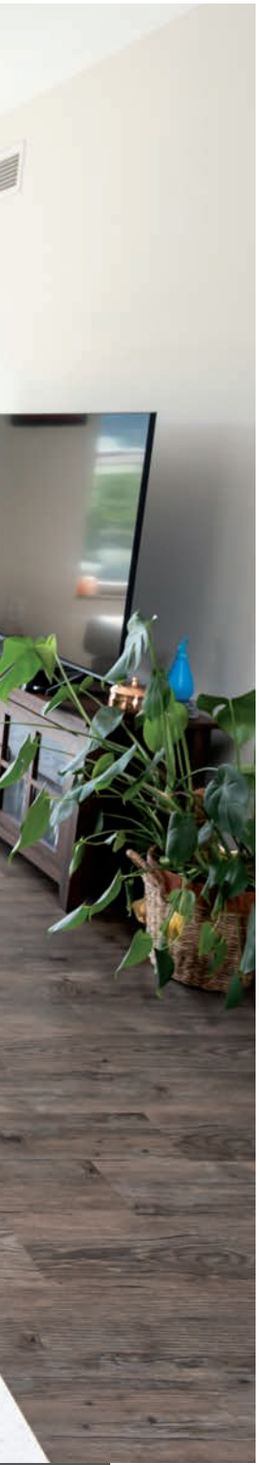
Tashman collaborated with Daniel Shiwarski, a PhD and Pitt assistant professor of bioengineering and medicine who also studied at Carnegie Mellon (and is married to Boyd-Shiwarski), to focus on engineering the system as closely as possible so that proximal tubule cells grow on it.

Tashman had teamed up with Daniel Shiwarski before. It was while earning his PhD that he and Shiwarski worked in the group that constructed the heart models—that was in the lab of Adam Feinberg, the Arthur Hamerschlag Career Development Professor in the Departments of Biomedical Engineering and Materials Science and Engineering at Carnegie Mellon. The researchers made computer models of tissue and organs and recreated them with printed biological materials.

Feinberg encouraged the team to spread their newly acquired know-how to biomedical engineers everywhere, Tashman says. "He published open-source papers. So, he would let me make step-by-step guides, and we would give all the designs away so that other people could actually build everything that we designed.

"I've seen people on Twitter, for instance, post videos of things that I've helped design that they printed out and built themselves. That's been pretty cool."

Janie French tapped into expertise at Carnegie Mellon for her dissertation on bacterial coinfection.



AIMEE OBIDZINSKI/UNIVERSITY OF PITTSBURGH

BIG DATA, BIG OPPORTUNITIES

Eric Strobl (PhD '17, MD '19) remembers reading about the human brain in high school and thinking it was the most interesting subject he'd ever encountered. He knew he wanted to study it. But as he got to college, he found himself wondering what he would do with all the knowledge he was accumulating.

Computer science and biomedical informatics gave him an answer. Strobl liked the idea that he could contribute to medical knowledge—and maybe even identify new treatments—by mining big datasets; the approach helps researchers find answers more quickly and economically than clinical trials would. "I was not convinced that the phrase, 'Correlation does not imply causation,' was the end of the story," he says. He wanted to see if stronger conclusions could be drawn from big data, particularly from large sample sizes.

Strobl went on to pursue his MD and PhD through the MSTP; he found himself pulled toward an area of study called causal discovery—a way of determining cause-and-effect relationships from big data. Researchers like Strobl's advisor Shyam Visweswaran, an MD, PhD Pitt professor of biomedical informatics and a neurologist, develop algorithms to tease out causal connections waiting to be found in medical data like electronic health records—and use those takeaways to come up with new treatments.

As he got deeper into his research, Strobl's ideas caught the attention of Peter Spirtes, a Carnegie Mellon philosophy professor and one of the originators of causal discovery.

"I was very skeptical of what he was saying, and it made me want to talk to him in more depth," Spirtes says. "And he convinced me that he did know what he was doing."

Strobl began collaborating with Spirtes and Kun Zhang, also of Carnegie Mellon's philosophy department. Many faculty in that department look for ways to apply technical approaches in mathematics, statistics and computer science to big questions about knowledge.

Just as Pitt's proximity to Carnegie Mellon allowed Strobl to work with some of the foremost experts in the theoretical side of causal discovery, Spirtes and Zhang appreciated the chance to work with those embedded in the world of patients and treatments.

"[Strobl] was really motivated by real problems," says Zhang. "We're working on the ideas and the methodologies. So his contribution was essential to our work."

Strobl's PhD dissertation would demonstrate new ways of thinking about feedback loops in causal discovery that combined approaches from both biology and computer science. Philosophy and physics treat feedback loops—where a system's output either spurs on or hinders the system—as if two things caused each other simultaneously, which doesn't reflect what's happening in the body.

So Strobl developed a new algorithm that outperformed a commonly used one in its predictions. He also took into account the different stages of a disease that may be reflected in data from a sample. The dissertation won the Drs. S. Sutton Hamilton MSTP Scholar Award, recognizing Strobl's contribution to scientific literature.

Strobl also published papers that mathematically defined and identified root causes of disease from data with the goal of applying the methods to psychosis. Psychosis is complex—which lends itself well to Strobl's approaches. They're helpful in sorting through the manifold factors involved in a disease.

Strobl is now a psychiatry resident at Vanderbilt University Medical Center, but he won't be away from Pitt for long. In July 2024, he'll join Pitt's faculty as an assistant professor of biomedical informatics with a secondary appointment in psychiatry. Visweswaran is excited that his onetime advisee will be the Department of Biomedical Informatics' first faculty member with a clinical appointment, helping to apply their work to pressing, real-world problems. He also hopes Strobl's arrival will mark the beginning of a renewed interest in causal inference at Pitt, which they expect to expand on with future hires.

Strobl's research will use genomic data for causal inference to address autism and neurodevelopmental disorders. He'll continue to work with Carnegie Mellon's Spirtes and Zhang to fine-tune his algorithms. Pitt, he says, offers a collaborative community that brings together his different interests.

"It's very rare to have a lot of expertise in both medicine and causal inference in the same place," he says. "It's also rare, I think, to have a combination of people who are interested in biology and clinical medicine. Usually, the communities are very separate."

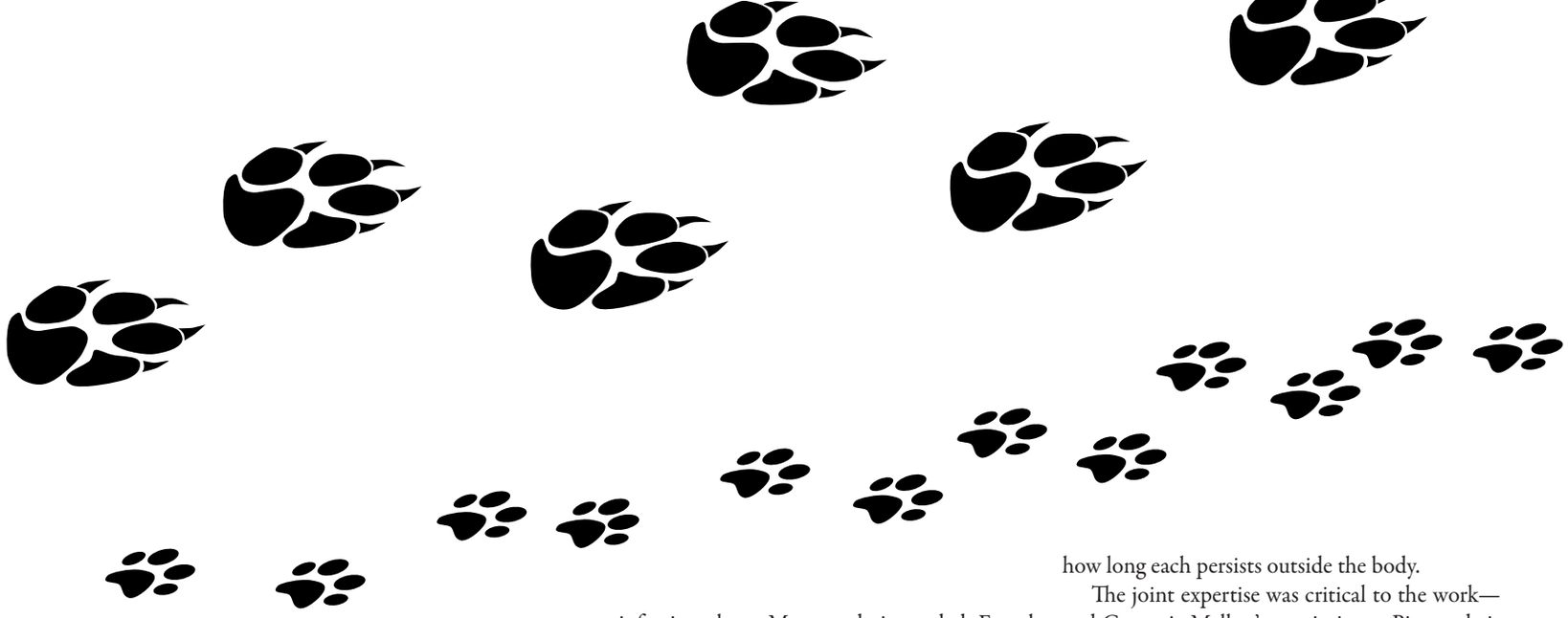
COINFECTION COLLABORATION

Janie French (PhD '23) first became interested in microbiology after a harrowing spring break with her rowing team at the University of Wisconsin, Madison. On a training trip in Oak Ridge, Tennessee, the whole team came down with norovirus. Having no idea at first what was causing the collective gastrointestinal distress was the scariest part. "Knowing what we had was the first step to feeling better about it," French says. (Thankfully, they made it back home and healthy after a few days of misery and a canceled race.)

The experience, along with an undergraduate class in virology, set her on the path toward a PhD in microbiology and immunology. French is now a medical science liaison for HeathTrackRx, a company that performs diagnostics for infectious diseases. As a graduate student, she worked in the lab of Seema Lakdawala, then a PhD assistant professor at Pitt who studies influenza A, which has been the culprit behind some of history's worst pandemics and regular seasonal epidemics.

"When I was rotating [labs], I really liked the translational aspect of Seema's work," French says. Studying ways to mitigate transmission, "you didn't have to search very hard to connect our work to improved health outcomes." (Lakdawala has since moved to Emory University.)

French found herself interested in study-



ing how the body battles two infections at once, with a project focused on coinfection of influenza virus with the bacteria Streptococcus pneumoniae. The latter, a major cause of bacterial pneumonia and other infections, has been known to worsen death rates during flu outbreaks, including the 2009 H1N1 pandemic. French wanted to understand more about how and why that happens.

"As a flu lab studying transmission, we wanted to know whether the pathogens truly were synergistic. And if they were, what exactly was going on there?" French says.

To learn whether and how these infections were collaborating to wreak havoc, French had to do some collaborating of her own. She turned to an expert on S. pneumoniae: N. Luisa Hiller, the Eberly Family Career Development Associate Professor of Biological Sciences at Carnegie Mellon.

The team also included Pitt's Valerie Le Sage, a PhD research assistant professor, and Lakdawala, as well as Karina Mueller Brown, a PhD who was a Carnegie Mellon graduate student at the time. Together, they looked at coinfection in ferrets, which are naturally susceptible to flu, have a respiratory tract more similar to humans than mice do, and cough and sneeze like humans.

As they reported in a paper published in 2022, they found in ferret models that getting the bacterial infection after the virus led to more severe symptoms. But, surprisingly, it didn't increase transmission of the virus or the viral load—they actually found less virus in nasal washes of coinfected animals.

Why? One clue might be in mucus crusts the researchers noticed on the coinfected ferrets' noses, not seen during flu or pneumonia infection alone. More study is needed, French says, but "it's possible the virus is getting stuck in mucus deeper within the nasal passages." It's likely that coinfection prompts a heightened immune response.

In a paper published in 2023, they looked at aerosols expelled by coinfected ferrets through their coughs and sneezes. Surprisingly, says Hiller, it appears that when both pathogens are in the same released droplets, they can influence how long each persists outside the body.

The joint expertise was critical to the work—and Carnegie Mellon's proximity to Pitt made it easy to exchange samples, get feedback and share equipment.

"We couldn't have done the project without them," says French.

"And from the starting experiments, it blossomed into additional questions we were interested in asking and future directions we could take."

Says Hiller, "The right collaborations drive scientific discoveries." ■

TEAMING UP, GETTING RESULTS

Results of teamwork between biomedical researchers at Pitt and Carnegie Mellon often make headlines. In recent years, for instance, you might have learned about these breakthroughs:

Neuroscientists and physicians from the two universities showed that children with just one brain hemisphere were able to perform surprisingly well on tasks typically associated with the opposite hemisphere. Their work sheds new light on how the brain functions and develops by suggesting that for children, each brain hemisphere is plastic and capable of mimicking the other when necessary.

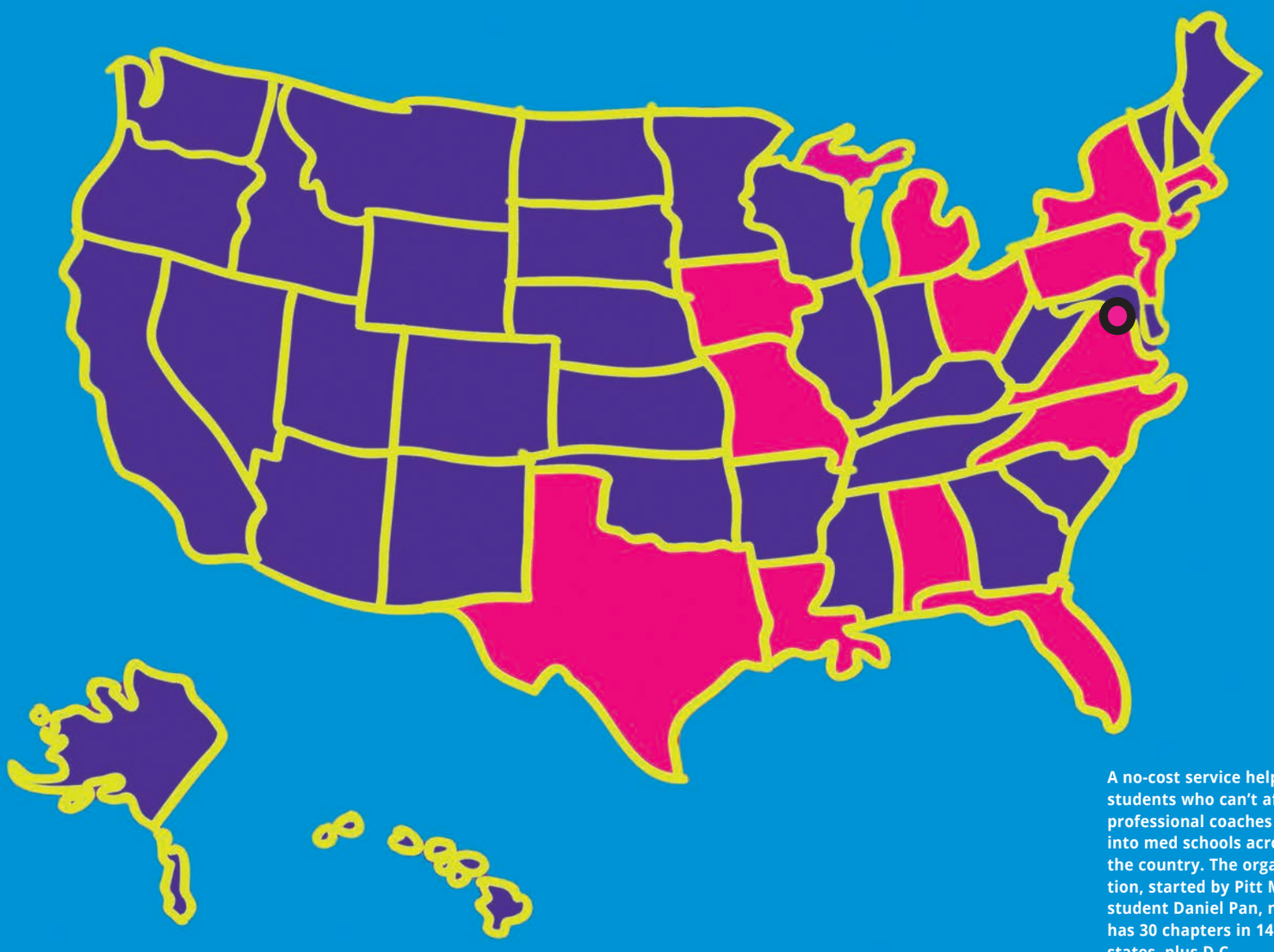
UPMC is stopping the spread of hospital infections with the Enhanced Detection System for Healthcare-Associated Transmission (EDS-HAT), machine-learning technology developed by Pitt clinicians, epidemiologists and Carnegie Mellon partners. The program couples genomic sequencing with algorithms connected to a vast trove of electronic health record data. When sequencing detects that two or more hospital patients have near-identical strains of an infection, the platform quickly mines those patients' health records for commonalities; it then alerts infection preventionists to investigate and halt further transmission. In October 2022, EDS-HAT flagged a drug-resistant infection linked to eye drops. Months later, the Centers for Disease Control and Prevention (CDC) issued a warning about infections from certain eye drops.

Pitt physical medicine and rehabilitation experts are working with faculty at the Robotics Institute at Carnegie Mellon to add artificial intelligence to the neuroprosthetic system that has allowed paralyzed research participants to use a robotic arm that they control with their minds. In a triumphant 2016 demonstration of the technology, one man fist bumped former President Barack Obama. The Henry L. Hillman Foundation was among those providing funds for this research, which originated in Pitt's neurobiology department.

And in an astonishingly promising turn for stroke research, scientists and surgeons from the universities found that spinal implant technology (commonly used for pain) allows stroke patients to move and use paralyzed arms and hands.

We can expect more good news once Pitt's BioForge, which will accelerate the manufacturing of living therapies, is built next to Carnegie Mellon's own advanced manufacturing innovation facility in Hazelwood Green. There, the universities will also be next-door neighbors.

—MA



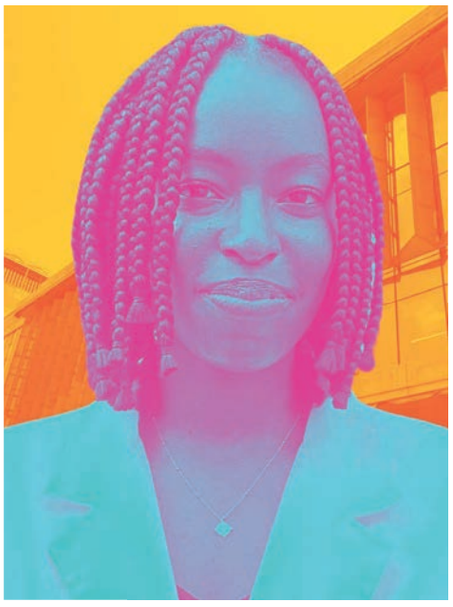
A no-cost service helps students who can't afford professional coaches get into med schools across the country. The organization, started by Pitt Med student Daniel Pan, now has 30 chapters in 14 states, plus D.C.

INVALUABLE SERVICE, DONE GRATIS

STUDENT MENTORS HELP 350 (AND COUNTING) GET INTO MED SCHOOL

BY RACHEL MENNIES

ILLUSTRATION | RJ THOMPSON



First, there are the academic prerequisites, the best-fit research and the MCAT prep and testing; next, there's perfecting your personal essay and shaping your activities into a compelling narrative, sitting for interviews and visiting campuses.

Applying for medical school often becomes a full-time job for aspiring doctors—and an expensive one, considering that application and testing fees alone can total thousands of dollars per application cycle. This cost prohibits some from entering the medical field, while others spend thousands more on consultants to increase their chances of acceptance.

Into this equity gap steps Giving a Boost, an organization founded by fourth-year University of Pittsburgh School of Medicine student Daniel Pan that connects current medical students with prospective mentees to "provide a local community service," Pan says, "and free support to those who can't afford the expensive paid services."

Giving a Boost, founded in 2019, prioritizes working with young people who self-identify as coming from underrepresented backgrounds—that includes students facing economic disadvantage, students with disabilities and first-generation college students, among others—and lends the expertise of student mentors directly, at no cost. Their support has reached more than 350 mentees who now attend medical schools like Pitt, Harvard, NYU and Yale; the organization—which began at Pitt Med serving Pittsburgh-area undergraduates—is now branching out to schools where former mentees have matriculated. Already, mentees turned mentors have started 30 chapters across the United States.

"I've tried to be the mentor I wished I'd had," says Pan, who did his undergrad at Princeton. His passion for the program, despite his clinical education load and, as we spoke with him, the approach of interviews for residency, is key to its growth and resiliency. "I sometimes feel guilty about not doing enough flash cards or practice questions," he says, "because, once I get back home, I enjoy working on Giving a Boost more than anything else."

His commitment and enthusiasm aren't unique at Pitt Med: "The med students at Pitt are extremely compassionate and love helping, so we've been able to get enough mentors every year," Pan says.

Shiva Yagobian, a second-year Pitt Med student and Pitt undergraduate alum, was a Boost mentee. "From classes, to research, to lifestyle, my mentor was happy to answer all my questions," she recalls. "The feedback on essays and mock interviews was invaluable." Yagobian has since returned to Giving a Boost as a mentor, one of 54 at Pitt this year.

At Rowan-Virtua School of Osteopathic Medicine in New Jersey, second-year medical student Tanvi Shah—who was also a Giving a Boost mentee as an undergrad at Pitt—is in the process of founding a Giving a Boost chapter at her school (where she also serves as president of her class council). She credits her experience as a mentee with helping to shape her application successfully; that process helped her realize "what was important for me to continue to pursue as a medical student"—notably being of service to her community.

Outcomes data collected by Pitt Med Giving a Boost mentors speak to the organization's success: For the 2020–21 and 2021–22 application cycles combined, 80% of mentees were accepted to medical school, compared with a national acceptance rate of around 40% for the same period. Less than 5% of the surveyed students said that they could have afforded similar paid mentorship and consulting services.

"During my application cycle," recalls Pan, "I wished I'd known someone in medical school who I could go to for help and advice." Through Giving a Boost, he's working to ensure that others will.

Pan is hoping to match into a physical medicine and rehabilitation residency and become a medical educator, so that he can continue to pursue his love of teaching, mentoring and advising, he says. ■

From left: Pan, Yagobian, Balogun, Albanowski, Sebastiani and Shah.

HELPING OTHERS ACHIEVE THEIR DREAMS

Zainab Balogun

Alma mater: Thomas Jefferson University
Hometown: Lagos, Nigeria

"My way of coaching . . ." says Zainab Balogun (Pitt Med Class of '24), "I'm incredibly honest. I'll tell all the secrets I know." Balogun is a Giving a Boost mentor who is also involved with the Student National Medical Association and Pitt Med's Global Health and Underserved Populations Interest Group. She says it's easy to find services you can pay for help in crafting a personal essay, yet those don't often advise on subtleties that medical schools look for. As an interview coordinator at Pitt Med who votes on candidates, she knows when she sees an impressive application.

"So yes, you have good scores, a strong GPA and you volunteer, but who are you outside of medicine? What are the other things that make you unique? Do you speak multiple languages or love to cook?

"I basically try to tell mentees to go beyond the traditional. I'll say, '[We know] you are smart, but you need to show your social side. You need to show what will make you an empathetic physician. If you volunteered or shadowed, what did you get out of it and how long did you do it? You need to have learned something that will impact you as a physician.'"

Romano Sebastiani

Alma mater: University of Pittsburgh at Johnstown
Hometown: Greensburg, Pennsylvania

"The big advantage of this is you're getting help from people who have gone through the process recently," says Romano Sebastiani (Pitt Med Class of '25), who has graduated from being a Giving a Boost mentee to mentor.

"In some cases, through other programs, you can find a mentor in someone who went through this 20 to 30 years ago, which is certainly helpful, but there's a bit of a divide. With Giving a Boost, you're working with people who applied one to three years ago and are up to date on current admissions standards."

Sebastiani, who played basketball for Pitt-Johnstown, says the money it would've taken to find a professional coach for his applications seemed out of reach. "You're talking thousands of dollars," he says. "It wouldn't have been possible." He worked with David Rivetti (MD '23), who's now a UPMC physical medicine and rehabilitation resident and who Sebastiani says was an invaluable resource, helping with virtually every step of the application process.

Sebastiani chose to mentor because of how important Giving a Boost was to him. "It was just super helpful, and I've tried to take what I've learned and use that knowledge to help however I can, from reviewing letters of interest to helping prepare for interviews."

Maya Albanowski

Alma mater: University of Pittsburgh
Hometown: Evans City, Pennsylvania

When it came time to consider applying to med schools, Maya Albanowski says she was headed in blind: "My parents weren't in medicine, so everything I knew about the application process I learned from online forums and YouTube videos."

As an undergrad at Pitt, she heard about Giving a Boost through a group message from a premed organization. Knowing the steep cost of the application process, she investigated Giving a Boost and wound up with a mentor who gave her very direct and practical advice on how best to approach the process from beginning to end.

"I had a mentor who reviewed my essays—my personal statement and activity statement—and gave great feedback. She explained how many interviews I could expect and then did a mock interview with me."

Albanowski (now a member of Pitt Med's Class of '26) has shifted from mentee to mentor and is working with a Pitt undergrad who has designs on going to medical school. She's engaged with other mentees at Pitt, too, conducting mock interviews and more informally talking to them about how things are going with their applications.

"My success in my application cycle was only possible because of the phenomenal medical student mentors that I had during college and during the process," Albanowski says. "We're part of a field that revolves around helping others, but I think it's also important to help each other. It makes the whole of the field better and makes for better, healthier medical students." *—Michael Aubele*

Hugo

Chudgar

Aaronson

Kang

CLASS NOTES

'60s

David L. Sharp (MD '67) spent his career of 55 years caring for "fussy babies." He still vividly recalls his early days as a family physician and can rattle off details of what he says in retrospect were humorous moments in his practice. The lessons he learned relying on his Pitt medical education and curiosity turned into a career-long research interest in infant colic, a subject about which he has written two books. Sharp was inspired to go to medical school by his uncle, Fred Zaidan (MD '45), and considers the challenge he was given at Pitt Med to be a lifelong learner to be one of the greatest lessons in his life.

'80s

Nancy Breslin (MD '83) has built an expansive portfolio in pinhole photography, a rare artform where a camera or light-tight box with a small hole in it—rather than a lens—captures a scene through a long exposure. Burned out, Breslin stopped practicing psychiatry at 40 and turned to the arts, earning an MFA from the University of Delaware and eventually teaching there for a couple of years as an adjunct professor. "I bought a pinhole camera on an impulse and ended up loving it," she says. She is producing "Velo Love," a stop-motion short film that tells the story of two bicycles that fall in love when they keep seeing each other at the café their riders visit every day.

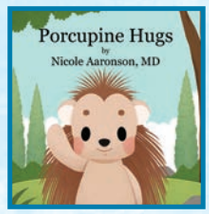
To help cover expenses from nursing school at Duquesne University, **Maryanne Hugo** (MD '88, Obstetrics and Gynecology Resident '92) joined the U.S. Navy. One tour of duty took her to Vietnam in 1970, where she worked aboard a 500-bed hospital ship off the coast, providing care for sick and injured soldiers. She spent time on Midway Atoll, among other places. After leaving Midway, and the Navy, Hugo earned a master's degree and became a certified midwife. She estimates she delivered 2,000 babies during a six-year period she spent living in California. The desire to become a doctor brought her back to Pittsburgh. She earned her MD 20 years after her nursing degree and delivered a few thousand more babies at UPMC Magee-Womens Hospital before her retirement. Recently, a group of friends Hugo made on board the hospital ship in Vietnam spent a week with her and her husband in Pittsburgh. Those friends, she says, have taken turns in recent years enjoying a week's vacation at their respective homes, in Maine, California and places in between.

'00s

Siren Chudgar (Family Medicine Resident '03) says the opportunity to work with inpatient case managers at UPMC St. Margaret sparked a career-driving interest in how managed care can improve health care delivery. Now at WellMed and Optum of UnitedHealth Group, Chudgar has been promoted to Florida regional medical director. Among other things, he provides clinical insights to improve health outcomes for Medicare Advantage members in the most cost-effective manner. Living in Florida but nostalgic for Pittsburgh, Chudgar still cheers on the Steelers with the First Coast Black and Gold, a Jacksonville-based fan club.

'10s

A few really good things came out of **Nicole Aaronson**'s (Pediatric Otolaryngology Fellow '17) time at UPMC Children's Hospital of Pittsburgh—increased skill and confidence as a physician, a network of colleagues and also "Porcupine Hugs." Aaronson published the children's book in summer 2023 that tells the story of Pru, a lost porcupine who tries to make friends during her journey to find her family. But Pru struggles because the other animals fear her quills. Aaronson started to write "Porcupine Hugs" during her fellowship and penned it with kids in mind who feel like they're on the outside because they might look different, sound different or just feel different.



Aaronson's book

Peter Kang (MD '12) has become the program director of the neurology residency training program at Washington University School of Medicine in St. Louis. "We have a large residency of 11 residents per program year—44 total," he says. "They come to train at our program from all over the country and enter into a wide range of careers within neurology." Kang, an assistant professor of neurology, teaches and sees patients with the residents, develops curricula and wellness initiatives, conducts clinical and translational research and is currently recruiting for next year's resident class.

Marginalized patients in need of genital reconstructive surgery, gender-affirming surgery, hormone therapy or other forms of primary care are seeking out UCSF Medical Center physician **Gaetan Pettigrew** (MD '12), an obstetrician/gynecologist who has built a practice that treats patients from well beyond the Bay Area. "We're building a practice that's taking care of people who traditionally don't have a lot of access to care," he says. Those patients include people of color and from gender-diverse communities, many of them traveling from towns across the Pacific Northwest and even internationally. Pettigrew is an assis-

Pettigrew

Tripp

Alade

tant professor of gynecology and gynecologic surgery at the University of California, San Francisco. He's the son of **Margaret Larkins-Pettigrew** (MD '94, Obstetrics and Gynecology Resident '98), professor and academic chair of obstetrics and gynecology at Drexel University, and **Chenits Pettigrew Jr.**, an EdD and Pitt Med associate dean for diversity, equity and inclusion and for student affairs, as well as assistant dean for faculty affairs.

"People can feel like they're on an island," says **Rickquel Tripp** (Emergency Medicine Fellow '17), Pitt associate professor of emergency medicine and vice chair of diversity, inclusion and health equity, Department of Emergency Medicine. She wants to create a village. "One of my personal goals is striving to cultivate change by controlling what things I can control and developing and interconnecting people so we can collaborate." Tripp received a YWCA Equity Award in November 2023 for being a bridge builder—for her commitment to overcoming racial injustice and creating systemic change.

'20s

Rachel O. Alade (Pediatrics Resident '23) has joined the Epidemic Intelligence Service of the Centers for Disease Control and Prevention (CDC). Working with the National Center on Birth Defects and Developmental Disabilities, she's evaluating the effectiveness of health surveillance systems in collecting data on birth defect incidence and prevalence. While her work is based in Atlanta, Alade is travel-ready to address national needs and public health emergencies as they arise. She likes to reflect on her residency, saying, "A lot of the people that I met and worked with in Pittsburgh I now consider like family and friends, so it will always be a very nostalgic place for me."

—Michael Aubele and Juliana Briggs

SPOTLIGHT

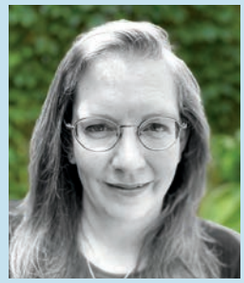
CIVIC MINDED

Mutchler

Stephanie Mutchler (PhD '19) has long been interested in policymaking. But it was the COVID-19 pandemic that pushed her to use her scientific expertise for the civic good.

"Seeing how the general public responded to actually witnessing the scientific method in action with all its uncertainty, incorrect hypotheses and conflicting data made me realize that we still have a long way to go in fostering scientific literacy and evidence-based decision-making in this country," she says.

Mutchler, a postdoctoral researcher in the Renal-Electrolyte Division of the Department of Medicine until this past summer, is among three Pitt Med alumni researchers chosen for the American Association for the Advancement of Sciences' (AAAS) newest class of policy fellows.



Stetler

Also selected were **R. Anne Stetler** (PhD '06), an assistant professor of neurology who studies the mechanisms underlying stroke pathogenesis, and **Amelia Stephens** (PhD '22), until recently a postdoc in microbiology and molecular genetics in Anthony Richardson's lab.

The three are learning policymaking while sharing their scientific knowledge during yearlong assignments at federal government agencies.

Mutchler was placed at the National Institute of Diabetes and Digestive and Kidney Diseases' Office of Scientific Program and Policy Analysis. Her research at Pitt, in Thomas Kleyman's lab, focused on how hormone signaling and diet can affect kidney function.

Stephens

Stetler is spending her fellowship at the National Science Foundation's new Directorate for Technology, Innovation and Partnerships (TIP). TIP works across the foundation's directorates with industry and nonprofit partners to accelerate or grow the basic sciences into translation. She first considered applying to the fellowship 17 years ago as a postdoc but says the experience and knowledge she's gained since has only increased her appreciation for the importance that policy plays in shaping research communities.

Stephens is working in the Office of Advanced Manufacturing at the National Institute of Standards and Technology. Her doctoral work focused on the intersection of bacterial genetics, virulence and metabolism in Staphylococcus aureus. She expects during the fellowship she will learn more about how basic science findings are translated into real-world applications and technologies that can be distributed to patients, a connection she sometimes felt was missing in her bench research.

After connecting with Pitt alumni who were past AAAS policy fellows and now working in government, Stephens feels encouraged to follow the same path: "I knew that I wanted to be able to work on something going forward that I could really feel proud of its impact on human health or society." *—Andrew Doerfler*

MARTIN-GILL HELPS EMERGENCY RESPONDERS SAVE EVEN MORE LIVES

Martin-Gill

If it's not an obvious STEMI, the most serious type of myocardial infarction, a heart attack can skirt an immediate diagnosis, making it even more dangerous. That, says **Christian Martin-Gill**, can delay proper treatment or cause unnecessary testing and treatment.

Martin-Gill (Res '08, Fel '10), an MD, MPH associate professor of emergency medicine and EMS division chief at the University of Pittsburgh, works with other Pitt Med researchers who want to give emergency responders and emergency room physicians a better way to diagnose cardiac events and plan their response to other instances of distress. Those researchers include Salah Al-Zaiti, a PhD assistant professor of emergency medicine and School of Nursing professor, and Clifton Callaway (Res '96), MD, PhD Distinguished Professor and Ronald D. Stewart Professor of Emergency Medicine Research, as well as executive vice chair of emergency medicine. They took EKG results from a few thousand patients at UPMC hospitals and another health system and created an algorithm that reveals the type of cardiac problem that normally might take upward of a day to diagnose.

"We gave a machine an algorithm of almost 700 different features to identify patterns, and the model we derived can detect heart attacks better than the clinic interpretation or existing algorithms," Martin-Gill says. In real time, the AI system would read EKG results from a patient complaining of chest pain and translate those to determine whether or not the patient is having a heart attack.

The team is now building hardware for use in the field that can send the results to hospital-based emergency physicians, an effort supported by the National Institutes of Health over the next four years.

Martin-Gill is involved in another effort likely to save lives far beyond Pittsburgh for years to come.

In 2016, the National Academies of Sciences, Engineering and Medicine issued a report highlighting that 20 percent of the nearly 200,000 trauma deaths each year in the United States could be prevented. That report has served as a driving force to create national guidelines for trauma care.

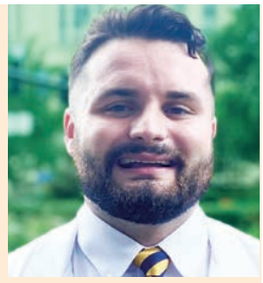
Martin-Gill, through his involvement with the National Association of EMS Physicians and the National Highway Traffic Safety Administration, leads efforts to create and promote standard guidelines for care in the prehospital realm, specifically evidence-based procedures for emergency personnel. At this point, protocols are likely to differ from state to state, and even county to county.

The focus in coming years, Martin-Gill says, is to "better translate science into recommendations and those into guidelines that we can disseminate widely."

Martin-Gill has been widely recognized for his efforts. In 2018, he received the Barbara A. Hess Research and Education Award from the Association of Air Medical Services, which recognizes those who contribute to the enhancement, development and promotion of emergency medicine research and education. His colleagues speak highly of his knowledge and contributions. Says Ankur Doshi (MD '00, Res '03), a Pitt associate professor of emergency medicine, "Chris is outstanding at many things. What stands out to me is his ability to build bridges between the many EMS services in our area and our health system for patient care and data, all of which leads to better patient outcomes."

—Michael Aubele

ONE TO WATCH—THOMAS RUBINO



Rubino

Setting a goal is easy enough, but knowing what it takes to get there is a little trickier.

For years, Thomas Rubino's (Class of '26) loftiest goal was becoming a Pitt Med student—"Ask any one of my friends growing up," he says. Now his sights are set on becoming a leading physician, maybe a cardiologist or cardiothoracic surgeon. (Steelers season ticket holder is on the list, too.) And meaningful connections, he believes, will help him realize his aspirations, along with other hallmarks of success such as hard work and discipline. Some serendipity, like what led him into the care of a renowned surgeon several years ago, won't hurt, either.

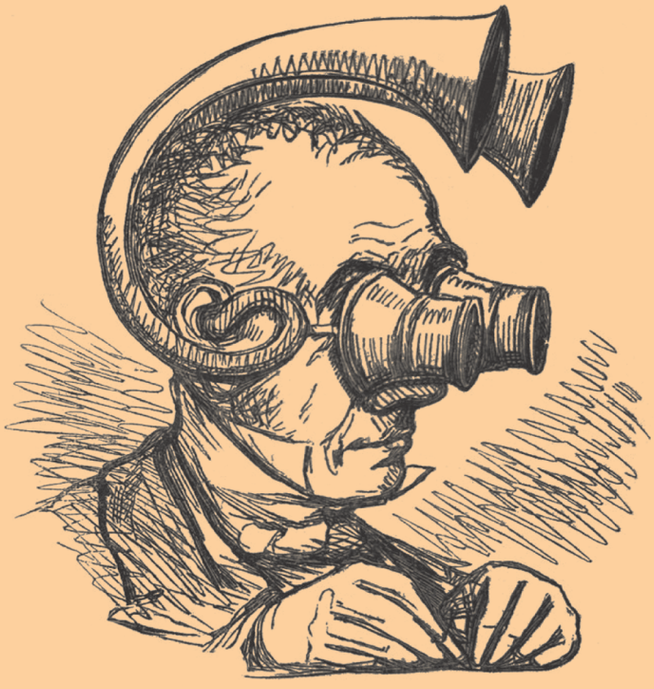
Having been diagnosed with a congenital heart defect after suffering a stroke, Rubino underwent open heart surgery at UPMC Children's Hospital of Pittsburgh while in high school. He knew beforehand that he wanted to become a doctor but hadn't pinned down what type. He became interested in cardiology, not only because he benefited from the care as a patient, but also because of the influence of his surgeon, Victor O. Morell, who he says, "saved my life."

Rubino now considers Morell, an MD and chair of cardiothoracic surgery at Pitt, a mentor—one of a few he says are shaping his career path and helping him develop the skills he will need as a physician.

As the Class of 2026 representative with the Medical Alumni Association, Rubino keeps adding to his network, building on the number of physicians he's learning from. But he doesn't want to just take, he wants to pay it forward. He'd like to one day be a resource for up-and-coming doctors.

Morell believes that Rubino is on the right track to achieve his goals. "I've always agreed with the concept that you get back what you put in," he says, calling out Rubino's drive, energy and approachability, which will make for a good mentor and leader. Morell notes that Rubino is already making a difference, that energy and passion like his have a reciprocal effect: "I can't say enough about Tom. His energy is contagious, and a lot of the other students and residents I mentor are the same way. That contagiousness makes you feel reenergized when you have these brand-new batteries around you every day, recharging your draining battery." *—MA*

STEP UP: PITT MED TRIVIA



GETTY IMAGES/CAMPWILLOWLAKE

Can you answer these without going online?

(We encourage you to call doctors-in-the-know for consults.)

1. First he built a powerhouse psychiatry department, then this former School of Medicine dean steered the transformation of Pitt's teaching hospitals into the University of Pittsburgh Medical Center, known as UPMC. Who was he?

2. Pitt Med has an agreement with Tsinghua University in China that gives many of its medical students the chance to engage in biomedical research in Pittsburgh for two years. Since the program's beginning in 2012, how many of these students has Pitt hosted?
   - **A. 112**
   - **B. 195**
   - **C. 229**

3. Yuan Chang, a Pitt Med pathology professor, and Patrick Moore, a Pitt professor of microbiology and molecular genetics, discovered in 2008 that the Merkel cell polyomavirus causes an aggressive skin cancer. Fourteen years prior, they discovered a herpes virus as the cause of _____, the leading AIDS malignancy.

4. Let's check your knowledge of the communities around campus: The corner of Centre Avenue and Crawford Street in the Hill District has a prominent place in the Civil Rights Era. What's the intersection known as?

Done? Now, check our inside back cover to find out whether you aced this one. And if you have an idea for a Pitt Med-related trivia question, send it our way; we're all ears: medmag@pitt.edu.

DENA HOFKOSH

OCT. 11, 1954 – SEPT. 26, 2023

Hofkosh

"Help me think about this."

Dena Hofkosh's colleagues were likely to have heard her say those words, perhaps while Hofkosh, a developmental pediatrician, was based at UPMC Children's Hospital of Pittsburgh, where she served as residency program director (1997-2014) and later as vice chair of faculty affairs for pediatrics (2018-21), or in the University of Pittsburgh School of Medicine, where she served as associate dean for faculty development (2015-18).

"We teased her, suggesting that it was her Tom Sawyer way of getting us to do work—and we did it joyfully," says Sara McIntire, an MD and retired professor of pediatrics.

Those kinds of discussions were highly prolific, it turns out. Hofkosh (Res '82, Fel '84) helped to develop the Medicine-Pediatrics Residency Program and the Triple Board Program, as well as specialized training tracks within the pediatrics residency. Not only was Hofkosh a leader at Pitt, she became president of the Association of Pediatric Program Directors.

Hofkosh was key to establishing the Office of Faculty Development in the Department of Pediatrics, the medical school's Med Ed Day (for medical educators) and the UPMC Physician Well-Being Symposium; she also prompted Pitt Med's Academy of Distinguished Medical Educators to transform from an honorary society to one offering programs that would inspire up-and-coming educators.

She was also vocal about LGBTQ+ issues in the medical community, supporting an affinity group, planning learning experiences for med students and serving on the board of directors of the Persad Center.

"Help me think about this," was a phrase Hofkosh might also use when approaching residents and others who "needed to be brought up to standards," says Ann Thompson, vice dean of the School of Medicine and MD, MCCM, Distinguished Service Professor of Critical Care Medicine and Pediatrics. Thompson was struck by "how gentle and kind" Hofkosh was when telling people to shape up. She was graceful about talking frankly to department chairs and higher-ups, too, Thompson notes. "Dena could say what needed to be said and have it be received well."

"She was a remarkable colleague," says Terence Dermody, an MD, Distinguished Professor, the Vira I. Heinz Professor and chair of pediatrics, who is also physician-in-chief and scientific director at Children's.

"No decision of any consequence was made without her insight and counsel."

In 2019, Hofkosh was diagnosed with ovarian cancer. She spent the next several years traveling with her daughters and around the country with her wife, Kim Patterson, in their RV, cooking, gardening and spending time with family and friends. She retired in 2021, as a professor emeritus of pediatrics.

"Her tremendous ability to convey respect and, frankly, love was enormously important to all kinds of students and faculty, from the newest to the most senior," says Thompson. —*Erica Lloyd*

RICHARD W. MORIARTY

OCT. 4, 1939 – SEPT. 7, 2023

Moriarty

Mr. Yuk sticker

Pediatrician Richard Moriarty (MD '66, Res '69, Fel '71) had a knack for connecting with audiences. Whether he was acting as a telephone repairman for a hospital charity show, giving remarks to the U.S. Consumer Product Safety Commission or making silly faces with a 2-year-old patron at a sandwich shop, Moriarty was a positive presence.

Audiences are still fond of the Mr. Yuk mascot Moriarty created with his team when he founded a poison control center at UPMC Children's Hospital of Pittsburgh in 1971. Mr. Yuk, a green sick (rather than smiley) face, was designed with input from kids on what kind of symbol would stop them from tasting inedible stuff like shoe polish. Moriarty's team gave away those stickers for families to put on household cleaners and beauty supplies. The green face even sang in Super Bowl and cartoon commercials.

"Mr. Yuk caught on like gangbusters," Moriarty marveled in a 2021 Pitt Medcast celebrating the mascot's five decades. "I still have people singing the tune to me 50 years later: 'Mr. Yuk is mean. Mr. Yuk is greeeen.'"

Like Mr. Yuk, Moriarty was "funny, but also serious," says Celia Conwell, whom Moriarty hired as lead nurse of the Children's poison center the same year Mr. Yuk was born. "His main interest was to save children from poisoning. He was nonstop. He was so infused with the need for this."

Moriarty organized and founded the National Poison Center Network, published toxicology research, chaired a national committee that set standards for child-safe packaging and advocated for manufacturers to plainly label ingredients.

He made a national impact but was devoted to his hometown. He grew up in Lawrenceville and served as a board member and supporter of Pittsburgh Public Theatre and president of the Discoverers program at Carnegie Museum of Natural History. He was a Pitt associate professor of pediatrics until 2004.

Alum Amerigo Ceccarelli (MD '90, Res '93) recalls that Moriarty was a "generous" mentor who advised premedical student societies and the Scope and Scalpel student actors. Moriarty became a pediatrician for Ceccarelli's son and helped Ceccarelli open a private pediatric practice; they then practiced together for about 10 years before Moriarty retired from private practice.

When Moriarty was hospitalized before he died in

IN MEMORIAM

'40s

MACY LEVINE, MD '43
OCT. 7, 2023

'50s

DAVID R. DEHAAS, MD '53
NOV. 8, 2023

DAVID A. HILES, MD '59, RES '65
SEPT. 14, 2023

Please send In Memoriam notices to mia97@pitt.edu.

September, spouse David Hairhoger, a 1978 Pitt Pharmacy graduate, kept Moriarty amused with good-natured pranks. Unsuspecting physicians and nurses were likely to discover chartreuse Mr. Yuk stickers on their backs after tending to Moriarty.

On the evening of his funeral, Pittsburgh's skyline glowed green. Children's Hospital, the UPMC Building and other Pittsburgh landmarks were lit as a tribute to Moriarty and his legacy. *—Cara Masset*

MACY IRVING LEVINE

MAY 19, 1920 – OCT. 7, 2023

Levine

On Pitt football game days in the 1960s, internist and allergist Macy Irving Levine (MD '43) would first bring his son to his office on Forbes Avenue. Levine saw patients or caught up on correspondence with his professional societies while Alan waited as patiently as a kid could for the highlight of the day: lunch at a restaurant followed by the game at Pitt Stadium.

Levine never complained about working long hours, and his passion for his career set an example for his four children, says Alan Levine, a retired MIT astrophysicist.

"Education and intellectual pursuits were important to him and became a family trait," adds son Paul Levine, an architect in Pittsburgh.

Levine died in October at 103. He was born in Johnstown, Pennsylvania, where he survived the flood of 1936. He studied chemistry at Pitt, and then enrolled at Pitt Med. Shortly after earning his MD and completing a brief internship, Levine joined the U.S. Army and cared for troops in occupied Japan. (In 1943, Pitt Med graduated two classes of med students, so they could be deployed overseas quickly.) His letters home are archived at the Heinz History Center.

After returning stateside, Levine completed a residency in internal medicine and allergy at the Pittsburgh VA hospital followed by a fellowship in Boston at the Lahey Clinic and then one with the U.S. Public Health Service at the Peter Bent Brigham Hospital. When Levine set up his private practice, he became a Pitt clinical professor of medicine. He sometimes traveled to special clinics for coal miners.

A man of letters who regularly played Scrabble with friends, Levine served as editor of the Allegheny County Medical Society Bulletin for more than three decades and as newsletter editor for Pitt's Medical Alumni Association. He was also a contributing obituaries editor for this magazine for many years. When the alumni association's Minute Men honored Levine in 1991, they designated him a commodore for his collegial rapport and leadership in medicine. *—CM*

STUART WEINBERG

OCT. 29, 1959 – JULY 18, 2023

Weinberg

Stuart Weinberg, an MD (Res '88, Fel '93) and associate professor of biomedical informatics and pediatrics at Vanderbilt University before his retirement in 2022, started his medical training at Pitt Med when informatics was gaining influence in health care. He rose to become a leader in the field.

Weinberg was an innovator and advocate in the field of pediatric informatics—an expert in such things as clinical reminders, personal health records and clinical decision support. He had national influence and led work on immunization tracking and registries.

Randolph Miller (MD '76, Res '79), former chief of Pitt Med's section in medical informatics, trained Weinberg during his fellowship at UPMC Children's Hospital of Pittsburgh and later became his colleague at Vanderbilt School of Medicine. He says Weinberg stood out in medical informatics in large part because of a dual commitment to helping peers and improving patients' health over time.

"Some of the best contributors to our field are clinician-informaticians with a decade or more of direct patient care experience who also possess considerable skill in inventing algorithms and writing code," Miller says. "They develop systems intended to help other clinicians and their patients."

"His leadership and vision for pediatric clinical informatics has benefited numerous informaticians of his and the current generation," says Srinivasan Suresh, an MD, MBA, Pitt Med professor of pediatrics and Division of Health Informatics director, who knew Weinberg through their involvement with the American Academy of Pediatrics' Council on Clinical Information Technology, which gave Weinberg its Byron B. Oberst Award in 2004 to recognize his contributions to the use of technology in pediatrics.

"His impact on both pediatrics and biomedical informatics is clear," says Michael J. Becich, MD, PhD associate vice chancellor for informatics in the health sciences and Distinguished Professor and chair of biomedical informatics. "The communities he served have lost a true leader." *—Michael Aubele*

'60s

ROBERT PACEK, MD '63
NOV. 30, 2023

'70s

THOMAS J. SADDORIS II, FEL '76
NOV. 26, 2023

'80s

JAMES E. BURGESS, RES '85
NOV. 20, 2023

FACULTY

ELIZABETH A. O'KEEFE, MBBCH
OCT. 31, 2023

CHARLES E. REESE, MD, RES '85
OCT. 11, 2023

GETTY IMAGES

FOR REAL! TWEEN SCIENCE

Code red! There's an invader in the body! It's … a peanut butter cookie?

Maybe you, or someone you know, has a food allergy. If so, you might already know what's going on here. The body's immune system normally attacks harmful invaders like bacteria and viruses. But sometimes, it accidentally sounds the alarm on something harmless, like peanut butter. An army of proteins called antibodies attack, which can lead to a release of chemicals that cause symptoms like sneezing, rashes, wheezing and constricted breathing. Reactions can be mild or life threatening.

Here's the good news: Food allergies aren't always forever. They can lessen over time—our immune systems grow up right along with us!

The exact science is a little fuzzy, but exposure to allergens is thought to play a role.

For example, most people outgrow milk or egg allergies naturally, and it usually happens early in life. Allergy experts have found that working little bits of milky or eggy foods into a little one's diet (such as in baked goods) may help speed up the process. The approach can train the immune system to take it easy on innocent snacking.

Milk and egg allergies are easier to outgrow than others for reasons that aren't completely clear. A peanut allergy, for example, is much less likely to go away. The lucky ducks who do outgrow it are usually told to keep eating peanuts regularly. Why?

That's the bad news: Allergies can come back. Regular exposure, scientists think, helps prevent this by making sure peanuts are familiar faces that the immune system won't mistake for strangers.

So if you're not allergic to peanuts right now, remember to savor your next Butterfinger!

—Juliana Briggs

Thank you to Laura West (MD '14, Res '17, '18, Fel '20), an assistant professor of pediatrics at Pitt and an allergist and immunologist at UPMC Children's Hospital of Pittsburgh, for helping us work through the mystery of allergies.

CALENDAR

FOR ALUMNI & FRIENDS

MATCH DAY
MARCH 15
Petersen Events Center

SAFAR SYMPOSIUM
APRIL 25-26
University Club
Winter Institute for Simulation, Education and Research
www.safar.pitt.edu/safar-symposium/2024-safar-symposium/

SCOPE AND SCALPEL
MAY 17-18
Charity Randall Theatre

DIPLOMA DAY
MAY 19
Soldiers and Sailors Memorial Hall

To find out what else is happening at the med school, visit health.pitt.edu and maa.pitt.edu.

Pitt Med Trivia *(from page 37)*

Answers:
1. Thomas Detre
2. B
3. Kaposi's sarcoma
4. Freedom Corner

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PITTSBURGH, PA 15261

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Paul Rogers, beloved emeritus professor (in tie), says "everything I have been able to achieve has been because of what Pittsburgh gave me." He's shown here at Pitt before his 2014 retirement.

UNIVERSITY OF PITTSBURGH

Teach. Train. Treasure.

With the wit and sarcasm he was known to use in the classroom, retired Pitt Med professor Paul Rogers jokes about his newest role and title:

"I'm enrolled in French classes at a local college, and my title is 'senior auditor,'" he says with a wry smile. "Now isn't that offensive."

But Rogers, an MD who retired in 2014 from the School of Medicine as the Ake N. Grenvik Professor of Critical Care Medicine, is happy to be a student again. He wants to speak the language more fluently the next time he visits France, a favorite destination.

Not able to completely divorce himself from the role of educator, though, Rogers continues to teach third- and fourth-year students at the University of North Carolina School of Medicine Asheville campus, near his home. And he has started to consider his legacy.

Rogers says he owes his success to the opportunities Pitt Med gave him. So he and his husband, Robert Barry, have established the Paul Leeds Rogers and Robert James Barry Medical Student Scholarship Fund, which leaves a large bequest and will also make some funds available for underrepresented students during his lifetime.

"The most important thing we can invest in is these young physicians' academic careers," Rogers says. "I want to do that in Pittsburgh because everything I have been able to achieve has been because of what Pittsburgh gave me."

Barry, whose background is in law enforcement, says, "We wanted to contribute to the education of future physicians."

Rogers, who trained under legendary clinicians and educators Ake Grenvik and Peter Winter, accumulated numerous honors, largely for his influence in simulation-based education. Some highlights include being recognized with the Chancellor's Distinguished Teaching Award and the Golden Apple Award (nine times) and being named critical care medicine faculty of the year (10 times). His former colleagues say his influence on students can't be overstated.

Paul Leeds Rogers and Robert James Barry

"Paul was the master of being able to push people to the edges of their thoughts," says Paul Phrampus, an MD and director of the Winter Institute for Simulation, Education and Research. "He would also share the mistakes he made as a young doctor and incorporate that into his teaching. I think that's why he excelled as a simulation-based educator."

Says Derek Angus, an MD, MPH Distinguished Professor and chair of critical care medicine, "He was arguably one of the most treasured and respected teachers the School of Medicine has ever had."

To make a gift to the medical school:
giveto.pitt.edu/medmaggive
Or call Jen Gabler: +1-412-864-5547