UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE | SUMMER 2015

PITTMED

"ONE MORE TIME!" SCOPE AND SCALPEL TURNS 60

SEX MED

I am a 91-year-old retired ob/gyn. I was trained at Magee-Womens Hospital of UPMC and from 1955–1990 was a member of a busy private practice there. I am still an emeritus member of the staff.

I enjoy reading *Pitt Med*. It keeps me informed about the great progress that is taking place in medical care and research. It was with that in mind that I read "Let's Talk About Sex" (Spring 2015). I enjoyed it very much but was a bit disappointed by the implication that doctors of my generation didn't know how to handle the problem of disorders of sex development.

We were very aware of complete androgen insensitivity syndrome. I had two patients with that condition in the early 1970s. As far as I know, neither of these patients was told their true diagnosis and had a very happy married life without the psychic trauma of Katie from your story.

Donald G. Birrell (Res '51)
Pittsburgh, Pa.

BIRDS AND THE READS

I just read my former student Micaela Corn's "Let's Talk About Sex" (Spring 2015). Excellent article and interesting—very nice job making the information accessible to the general public. I will make it a suggested article for the Biopsychology course students to read. And I will be sure to tell them that a Pitt alum wrote it.

Barbara Kucinski
Department of Psychology
University of Pittsburgh

ENCORE

The Spring 2015 issue of *Pitt Med* somehow reached me. It is the first I've seen, and I found it fascinating. I hope you will keep it coming while I'm still alive!

Margaret R. Dietze (MD '52)
Portland, Ore.

CORRESPONDENCE

We gladly receive letters (which we may edit for length, style, and clarity).

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UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE MAGAZINE, SUMMER 2015

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DEPARTMENTS

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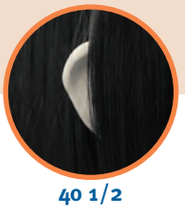

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28

FEATURES

CONTRIBUTORS

EM DEMARCO [Cover and "One More Time!"] often describes herself as a "seamstress-carpenter-baker turned journalist." While working as an investigative reporting fellow with *PublicSource*—an in-depth news outlet based in Pittsburgh—she broke a national story about shale gas wastewater. As you'll see in the feature on the making of the 60th Scope and Scalpel, she's an artist, too. She describes the story as "graphic journalism" or "comics journalism"—similar in style to a graphic novel, "but it is *not* a parody or caricature of real life. The journalist reports just like they would any in-depth story, and the end result is an illustrated version." DeMarco was embedded with the Class of '15 reporting for weeks.

NANCY AVERETT ["To Your Own Drum"] tackled some "super dense" neurobiology research for her story on how the brain builds connections for processing sound. "[The researchers] actually told me I was in for a doozy," says Averett. But she likes challenges. For the activist site TakePart, she recently wrote about an inmate in Ohio who nurtures endangered salamanders known as hellbenders. You might also see Averett's byline in *Audubon*, *Pacific Standard*, and *Runner's World*. A native of Colorado, Averett grew up camping and hiking with her father, a biologist.

COVER

Four years of med school, Gon' show dad that I'm no fool. Steeltown funksters, get your groove on over to p. 17 to see the makings of the 60th Scope and Scapel. *Yinz at? Pitt Med!*
(Cover: Em DeMarco © 2015.)

PITTMED

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In this head the all-baffling brain,
In it and below it the makings of heroes.
—Walt Whitman


JOSHUA FRANZOS

When forensic neuropathologist Bennet Omalu (Fel '02) published his 2005 *Neurosurgery* paper showing that the late and famed Steeler Mike Webster's brain was clogged with tau proteins, indicating severe and chronic traumatic encephalopathy (CTE) likely resulting from football trauma, he was met with derision. When he examined a second player's brain and found the same proteins (which are also found in Alzheimer's patients), he was attacked by other investigators and the sports community. It was the classic story of David and Goliath.

The diagnosis of "chronic traumatic encephalopathy" had been used to describe the dramatic cognitive decline of boxers; it presented differently in these football players. The brain appeared normal from the exterior, not shriveled or bruised. Though he'd worked with his mentors, including Pitt's top-tier neurologist Steven Dekosky and Ronald Hamilton, of pathology, to confirm his results, Omalu would be doubted for years.

People were not just skeptical, but angry that anyone would take on an American icon like football. But Omalu and colleagues kept presenting evidence; they kept doing the research.

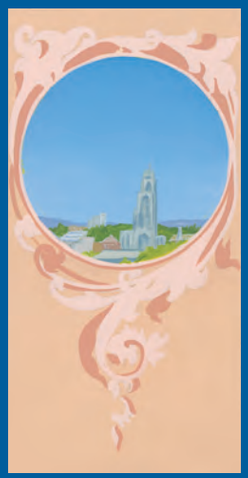
It can take courage to change conventional thinking. And scientists, like other fallible humans, have a difficult time shifting paradigms even in the face of new and compelling evidence. When Pitt's Bernard Fisher (MD '43) suggested that lumpectomy, a much less invasive surgery than the accepted treatment of radical mastectomy, was sufficient treatment for many breast cancers, he was doubted and scorned. He had concluded, on the basis of rigorous evidence, that breast cancer is a systemic disease, rather than local, and that local surgery plus systemic chemotherapy was at least as effective, and likely more so, than radical mastectomy. His basic research into the biology of cancer changed how we think about breast cancer and other malignancies.

Our school has a storied history of Davids up against doubting Goliaths. (See our Ernest Sternglass story on p. 23.) And now, Hollywood has recognized this. In July, the Chancellor and I flew to Los Angeles to meet Sir Ridley Scott, producer of *Concussion*, a movie to be released on Christmas Day, based on Omalu and Webster's saga (chronicled in a *GQ* story written by Jeanne Marie Laskas, a Pitt English professor). Our purpose was to discuss Pitt's deep engagement with this history.

Thanks in part to Omalu's perseverance, there is growing recognition that traumatic brain injury may be associated with contact sports, and the NFL (subject of a class-action lawsuit by retired players and their families) is now funding high-definition fiber-tractography research at Pitt that maps brain abnormalities associated with concussions. Pitt's Walter Schneider and our neurosurgeons are partnering with our concussion program faculty, including Micky Collins and Anthony Kontos. Notably, the association of acute brain injury with CTE is not limited to athletes—soldiers and others exposed to blasts are also vulnerable.

The movie will probably have a major influence on how we view seemingly "benign" concussions in young people. In some, perhaps those with a particular genetic susceptibility, a lifetime of neurodegeneration may follow. Whether a deeper awareness will mean an undoing, or reimagining, of a national institution like football remains to be seen. Americans would have to demand a change to a deeply imbedded cultural paradigm.

Arthur S. Levine, MD
Senior Vice Chancellor for the Health Sciences
John and Gertrude Petersen Dean, School of Medicine



Devoted to noteworthy happenings

at the medical school

Proven Medal

The American Surgical Association's top award, the Medallion for Scientific Achievement, is considered "the Nobel prize of surgery." Yet that grand comparison comes with distinctions. For one, the medallion isn't awarded annually—only when the ASA decides a person has amassed a worthy legacy—and it isn't given out for one achievement but rather a body of work. This year, the ASA bestowed the medal on Timothy Billiar, Pitt's George Vance Foster Professor and chair of surgery.

"He was the first to describe [inducible] nitric oxide synthase, and he linked it to septic shock and cardiovascular disease," says Timothy Eberlein (MD '77), chair of the nominating committee. These discoveries might help explain multiorgan failure and long recovery times from serious traumas like car accidents.

Billiar

Billiar, Distinguished Professor of Surgery and member of the Institute of Medicine, notes that "three of these awards have gone to Pitt people"—himself, Thomas Starzl in 1990, and Bernard Fisher in 2000. —*Nick Keppler*

FOOTNOTE

Richard Pan (MD '91, MPH '98) made headlines (and got some death threats) this June as coauthor of California's new law making vaccination requirements stricter for schoolchildren. Pan, a pediatrician and California state senator, used Pitt Public Health's FRED epidemic simulator to present the risks of not inoculating against measles. "No more preventable contagions. No more outbreaks. No more hospitalizations. No more deaths. And no more fear," Pan said.

MIKE DRAZDZINSKI/CIDDE

Chinese Vice Premier Liu Yandong and Arthur S. Levine mingle with students during a June showcase at Pitt.

TSINGHUA TIES STRENGTHENED

In a darkened room of the neurological surgery outpatient facility in UPMC Presbyterian, Chinese Vice Premier Liu Yandong donned black 3-D glasses.

"These two areas [of the brain] need to be connected, and there's some cables that connect these two areas from here to here," said Robert Friedlander, an MD, pointing to a brilliant, eye-popping image of fibers.

Friedlander, the chair and Walter E. Dandy Professor of Neurological Surgery, was demonstrating high-definition fiber tractography, a colorful imaging technology developed at Pitt. Friedlander's department was one of many stops for Liu and her high-ranking colleagues during a goodwill visit in June. The whirlwind tour of Pitt included, among other presentations, dancing language learners at the Confucius Institute and a detailed explanation of the Pitt-UPMC partnership by Arthur S. Levine, an MD, senior vice chancellor for the health sciences, and the John and Gertrude Petersen Dean of Medicine.

The talks reinvigorated existing China-Pitt collaborations as Liu headed to Washington, D.C., for U.S.-China High-Level Consultation on People-to-People Exchange talks with John Kerry and other international leaders.

Since 2011, Pitt med has hosted 67 students from Tsinghua University—Liu's alma mater—with 12 more expected this summer. At one point in her tour, Liu praised two Tsinghua visiting scholars, noting: "I was not as lucky as you are today. . . . Cherish this unique opportunity."

—*Robyn K. Coggins*

MARTHA RIAL

Overheard

Bedside Stories with Perri Klass

There's one prescription that Perri Klass, MD professor of journalism and pediatrics at New York University, gives to every patient: Read. As national medical director for Reach Out and Read, she helps doctors promote reading and give kids a free, age-appropriate book at wellness visits. That's 10 books by kindergarten, with millions gifted nationwide since the program began in 1989. She herself is the author of 11 books, both fiction and nonfiction. In *Treatment Kind and Fair: Letters to a Young Doctor* (Basic Books, 2008), Klass addresses her own son as he begins medical school. In the introduction to that book, she writes, *So what I'm going to do now is tell you how I have spent my own life as a student. I'm going to tell you what it's like learning to take care of patients—to listen to their stories and to touch their bodies. I'm going to tell you about the challenge of keeping up with science as new discoveries are made, and about the complexities of making a living as a doctor as medicine changes.* Klass was the med school's 2015 commencement speaker, so a new crop of docs were privy to her insights.

What book do you think every doctor or parent should have?

We get a lot of traction with *Goodnight Moon* because everybody wants a book that will help a child go to sleep! I just love the idea of the books being in the house and being in the children's routines and showing up at bedtime.

How has pediatrics changed since your med school days?

As long as I can remember, it's been part of our job to partner with parents and help parents feel that we're on the same side, which we are, and that we're working toward the same things. In that context [we] sometimes say, *You know, I think you might want to think about doing this differently,* or *You might not want to worry about this*. The forms change a little bit with time, but I think the complexities of it are sort of built in.

What's important for new MDs to remember?

When I worked in the newborn intensive care unit in residency . . . [it] was totally terrifying. The babies were insanely small . . . the buzzers were buzzing and the lights were flashing and, *What if I bump against a baby and something terrible happens?* Then, by the time you've done it for a couple of months even, you walk in, and it's like, *Ah, this is the safe place!* . . . When you start feeling that, then, of course, one of the things that's happened is you've completely lost the ability to see it the way the terrified parents of a new baby see it. That's important; you want to feel like that about your workplace. But it's very different from the way everybody else feels walking in.

—Interview by Robyn K. Coggins

Faculty Snapshots

Angela Gronenborn, a PhD, has been inducted into the German National Academy of Sciences, Deutschland's highest academic honor. The UPMC Rosalind Franklin Professor and chair of structural biology joins the ranks of greats like Charles Darwin and Max Planck. Gronenborn's work has helped describe an exceptionally detailed view of the HIV-1 capsid, among other challenging protein structures.

Gronenborn

Professor of medicine Linda Siminerio has been elected to chair the National Diabetes Education Program, an effort of the National Institute of Diabetes and Digestive and Kidney Diseases with the Centers for Disease Control and Prevention. As executive director of Pitt's Diabetes Institute, Siminerio, a PhD with a secondary appointment in the School of Nursing, studies self-management of diabetes, as well as translational research for the disease.

Siminerio

For his substantial contributions to clinical and basic neuroscience, Ian Pollack (Res '90, Fel '91) was awarded the 2015 H. Richard Winn, MD, Prize of the Society of Neurological Surgeons, making Pitt one of only two institutions with two Winn awardees (Robert Friedlander, chair and Walter E. Dandy Professor of Neurological Surgery, being the other). Pollack is codirector of the Brain Tumor Program at the University of Pittsburgh Cancer Institute, chief of pediatric neurosurgery at Children's Hospital of Pittsburgh of UPMC, and the A. Leland Albright Professor of Children's Neurosurgery at Pitt.

Pollack

Director of the Stem Cell Core and assistant professor of developmental biology Lei Yang, a PhD, received an NIH Director's New Innovator Award for his efforts toward making a functioning heart out of stem cells. The award "supports exceptionally creative, early career investigators who propose innovative, high-impact projects."

Yang

Kara Bernstein, a PhD assistant professor of microbiology and molecular genetics, received one of six Outstanding New Environmental Scientist Awards, an effort by the National Institute of Environmental Health Sciences to bridge funding gaps for young researchers. Her lab studies double-strand-break repair and how misregulation of DNA repair contributes to cancer predisposition. *—RKC*

Bernstein

Grassroots Grannies

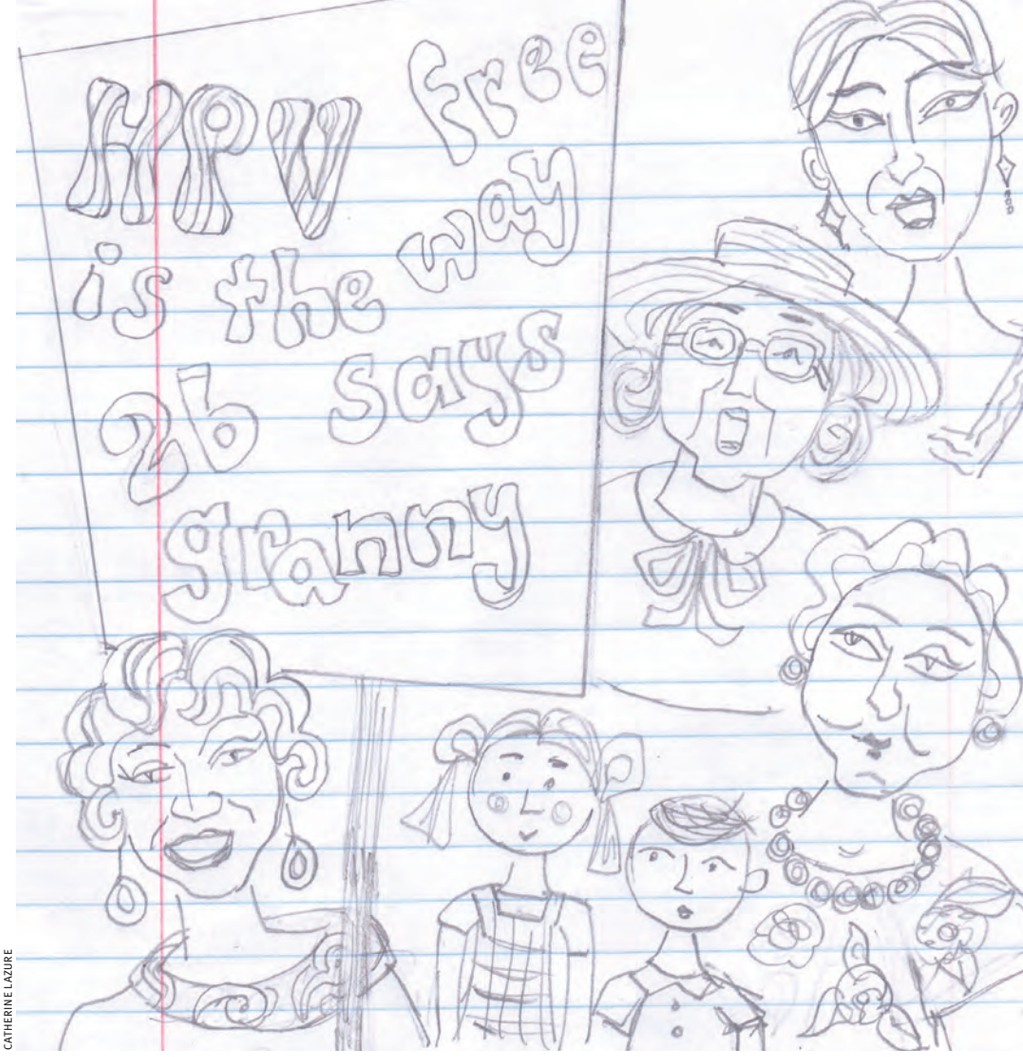
They say word of mouth is the best advertising. Well, some of the wisest voices are speaking up to boost awareness of the human papillomavirus (HPV) vaccine. "I grew up in the civil rights, anti-war movement," says Eileen Lane, cochair of the Pittsburgh chapter of Grandmother Power—a global movement of women who seek a better life for future generations. "I've seen grassroots efforts work."

In collaboration with Pittsburgh's Jewish Healthcare Foundation and the Eye & Ear Foundation (which supports Pitt's ophthalmology and ENT departments), Grandmother Power is working to increase use and knowledge of the vaccine. Only 38 percent of girls and 14 percent of boys receive the full three doses. Although usually linked to cervical and genital cancers, HPV can also cause throat and oral cancers.

Sonya Borrero, an MD associate professor of medicine and of clinical and translational science at Pitt, says Grandmother Power could make a big difference. She serves on the organization's advisory board. "Grandparents have a longitudinal perspective that may allow them to see the forest through the trees."

The organization partnered with the Jewish Healthcare Foundation on educational events during health expos in Highland Park and Homewood this summer.

"There's a lot of skepticism now around vaccines," adds Karen Wolk Feinstein, president and CEO of the Jewish Healthcare Foundation. "We have a vaccine that can prevent cancer, and it is not being used. These are not just inconvenient cancers; they are killers." *—Kristin Bundy*



CATHERINE LAZURE

FACULTY AAP-LAUDED

This spring, seven University of Pittsburgh faculty members were elected to two of the most prestigious medical societies—the American Society for Clinical Investigation (ASCI) and the Association of American Physicians (AAP).

Jeremy Kahn, MD associate professor of critical care medicine and of health policy, and **Pawel Kalinski**, MD/PhD professor of surgery and immunology in the medical school (who is also on the faculty of Pitt Public Health and the School of Engineering), were included in a short list of physician-scientists elected to ASCI for outstanding achievement in biomedical research. With 59 ASCI members to date, Pitt outnumbers Yale, Vanderbilt, and UCLA.

Five faculty members were inducted into the AAP this year for their excellence in basic and clinical science: **John Kirkwood**, MD professor of medicine, dermatology, and translational science, who is the Sandra and Thomas Usher Professor; **Juan Celedón**, MD/DrPH and Niels K. Jerne Professor of Pediatrics and professor of medicine, epidemiology, and human genetics; **Yoel Sadovsky**, an MD scientific director of Magee-Womens Research Institute, Elsie Hilliard Hillman Professor of Women's and Infants' Health Research, professor of obstetrics, gynecology, and reproductive sciences, and of microbiology and molecular genetics; **George Michalopoulos**, MD/PhD chair of pathology and Maud L. Menten Professor of Experimental Pathology; and **J. Timothy Greenamyre**, MD/PhD professor of neurology who holds the UPMC Chair in Movement Disorders. AAP's total membership includes about 2,000 active, emeritus, and honorary inductees. *—KB*

I'LL ZETTABYTE

"Big data" sometimes seems more buzz than brass tacks, but the reality is that the United States has nearly a zettabyte's, or a trillion gigabytes', worth of health care data, and that number is doubling about every two years. If that information is going to be put to use in new tech, from apps to wearables to genomic tests to IT systems, someone needs to make sense of it.

Pittsburgh's "innovation corridor" on Forbes Avenue is tripling down with its new Health Data Alliance. UPMC is funding the efforts of Pitt and Carnegie Mellon University faculty as they synthesize these data stockpiles. Two new centers will be birthed from the Alliance—the Center for Machine Learning and Health and the Center for Commercial Applications of Healthcare Data. UPMC has pledged $10–20 million per year throughout the next five years for basic research and commercialization of the collaborative work.

"This isn't George Jetson—it's right now. It's reality," said Mayor Bill Peduto at the March press conference announcing the triumvirate. *—RKC*

COURTESY TIME MAGAZINE (VIDEO)

TIME FOR PITT MED

Mario Lemieux isn't the only comeback kid around here. As part of their ongoing "Solutions that Matter" story series, *TIME* magazine produced *Pittsburgh: The Comeback*, a documentary that highlights Pitt med, UPMC, and Carnegie Mellon University as the city's innovation leaders. Onscreen, Pittsburgh emerges from the Fort Pitt Tunnel as many of us have come to know it: a dynamic metropolis of meds and eds, rather than of steel and coal.

"This is one of the few medical schools in the country being driven by an interest in research" on the part of students as well as faculty, says Arthur S. Levine, senior vice chancellor, health sciences, and the John and Gertrude Petersen Dean. The film also features Edward Burton, MD/DPhil professor of neurology, and Pitt's zebra fish lab, as well as Carnegie Mellon University's robotics programs. The takeaway is optimism. As Burton puts it for *TIME*: "Research is hope."

Watch the 10-minute program: http://ti.me/1O7dxNV. *—Susan Wiedel*

Appointments

Pitt's School of Medicine has chosen one of its own to chair the Department of Medicine. **Mark Gladwin**, MD chief of pulmonary, allergy, and critical care medicine since 2008 and director of the Heart, Lung, Blood, and Vascular Medicine Institute at Pitt, is an expert on sickle cell disease and its pulmonary complications. His research has elucidated how hemoglobin, nitrite, and nitric oxide function in the body, especially regarding blood vessel dilation, as well as hemolysis-associated endothelial dysfunction and pulmonary hypertension.

Gladwin

"We face many opportunities to translate the remarkable progress in science to better care for our patients and to develop new therapies," Gladwin, the Jack D. Myers Professor, says. "I am convinced that Pittsburgh will continue to be home and catalyst for new models of efficient and high-quality patient-centered care and the training of future generations of physicians and scientists."

Gutstein

Howard Gutstein, an MD, is the newly appointed chair of anesthesiology, following his tenure as professor at the University of Texas–MD Anderson Cancer Center. Gutstein's research focuses on the molecular biology behind opioid tolerance and dependence. Specifically, Gutstein found that the cellular process that causes morphine tolerance in the brain can be blocked by a redeveloped form of imatinib, a drug used to treat multiple types of cancer. In Pittsburgh, Gutstein will continue his National Institutes of Health–supported research and initiate clinical trials.

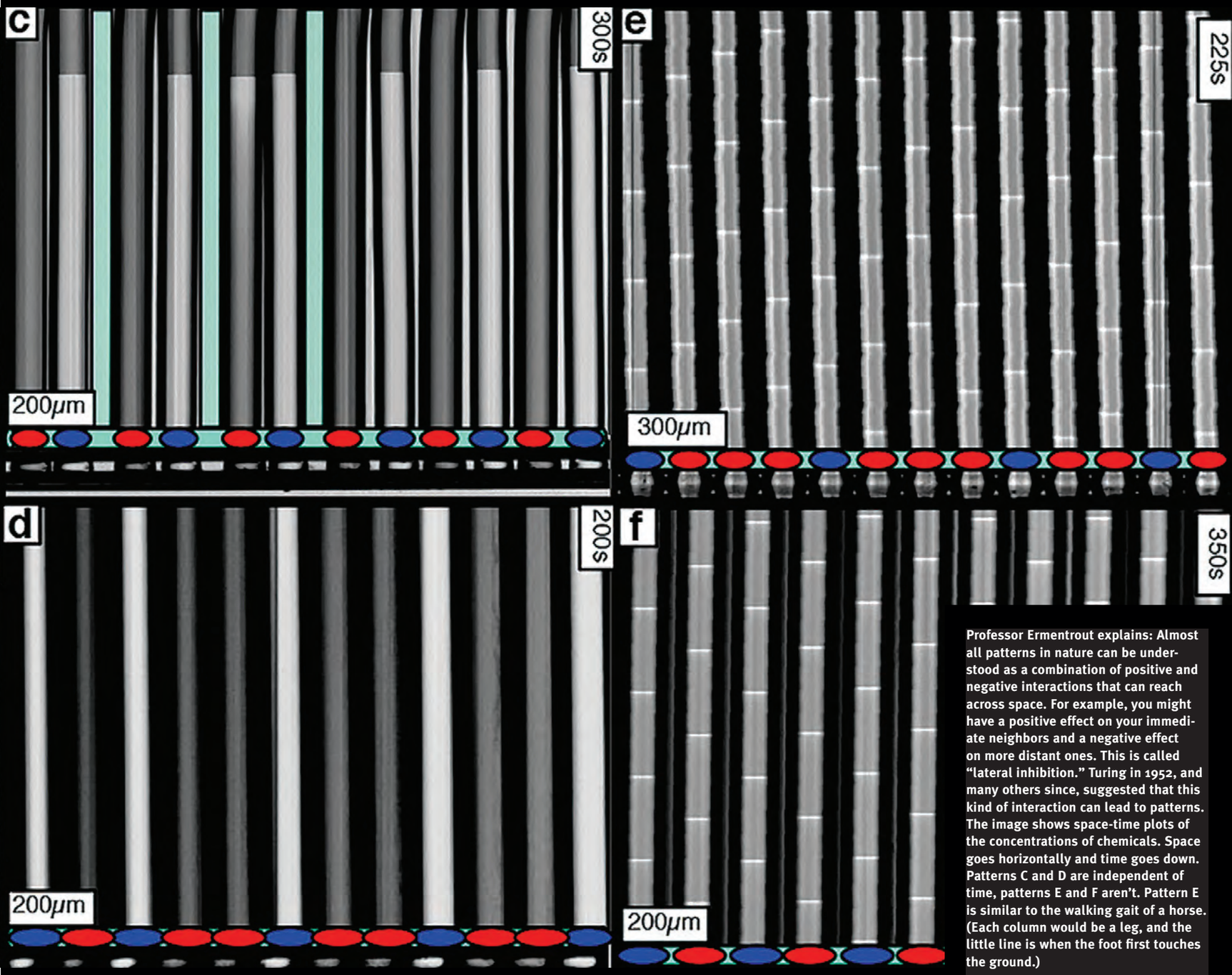
In August, neuroscientist **Nathan Urban** (BS '91, PhD '98) returned to Pitt, his alma mater and where he became a Rhodes Scholar, to join the Department of Neurobiology in the School of Medicine; he'll serve as vice provost for special projects, associate director of Pitt's Brain Institute, and codirector of the Center for the Neural Basis of Cognition, a joint Pitt-Carnegie Mellon University program. Urban discovered how the variability of neurons allows the brain to process and communicate information more resourcefully than computers. He is also interested in the workings of brain cells behind the olfactory system; a paper related to this work was recommended by Faculty of 1,000 as among the best in neuroscience. His work is funded by the National Institutes of Health, National Science Foundation, and Defense Advanced Research Projects Agency. In 2005, *Scientific American* named him one of the top 50 leaders in science and technology.

Urban

Williams

Pitt's Department of Pediatrics and Children's Hospital of Pittsburgh of UPMC have named **John V. Williams** (Res '97) chief of the Division of Pediatric Infectious Diseases. After completing his residency, Williams, an MD, accepted a fellowship in pediatric infectious diseases at Vanderbilt University, where he later joined the faculty in 2003. Williams is an internationally recognized expert on molecular viral diagnostics and human metapneumovirus (MPV). In the last several years, his lab has identified how MPV and other acute respiratory viruses impair certain immune cells in the lung through a signaling pathway that had previously only been linked with cancer and chronic infections. In addition to his research accomplishments, Williams is known for his devotion to clinical and classroom teaching. *—SW*

TOMPKINS, NATHAN, ET AL. "TESTING TURING'S THEORY OF MORPHOGENESIS IN CHEMICAL CELLS." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 111:12 (2014): 4397-4402.



Professor Ermentrout explains: Almost all patterns in nature can be understood as a combination of positive and negative interactions that can reach across space. For example, you might have a positive effect on your immediate neighbors and a negative effect on more distant ones. This is called "lateral inhibition." Turing in 1952, and many others since, suggested that this kind of interaction can lead to patterns. The image shows space-time plots of the concentrations of chemicals. Space goes horizontally and time goes down. Patterns C and D are independent of time, patterns E and F aren't. Pattern E is similar to the walking gait of a horse. (Each column would be a leg, and the little line is when the foot first touches the ground.)

THE PATTERN OF YOU

You have around 37 trillion cells in your body. Skin cells and spleen cells. Bone, blood, and eyelash cells.

This wasn't always the case, of course. Once, you were just a single cell, the gelatinous consequence of a union between egg and sperm. How did this humble envoy turn into all that is you?

Back in 1952, Alan Turing—of WWII code-breaking fame—posited an explanation to this question, one based on symmetry in chemistry. He called it the Theory of Morphogenesis.

More than 60 years later, a team of researchers from the University of Pittsburgh and Brandeis University has provided the first experimental evidence for Turing's theory using cell-like droplets of oil. They published their findings in the *Proceedings of the National Academy of Sciences*, in time for the debut of the Turing biopic, *The Imitation Game*.

It all comes down to inhibitors and activators, says G. Bard Ermentrout, a PhD and Distinguished University Professor of Computational Biology and Mathematics at Pitt and a coauthor of the study.

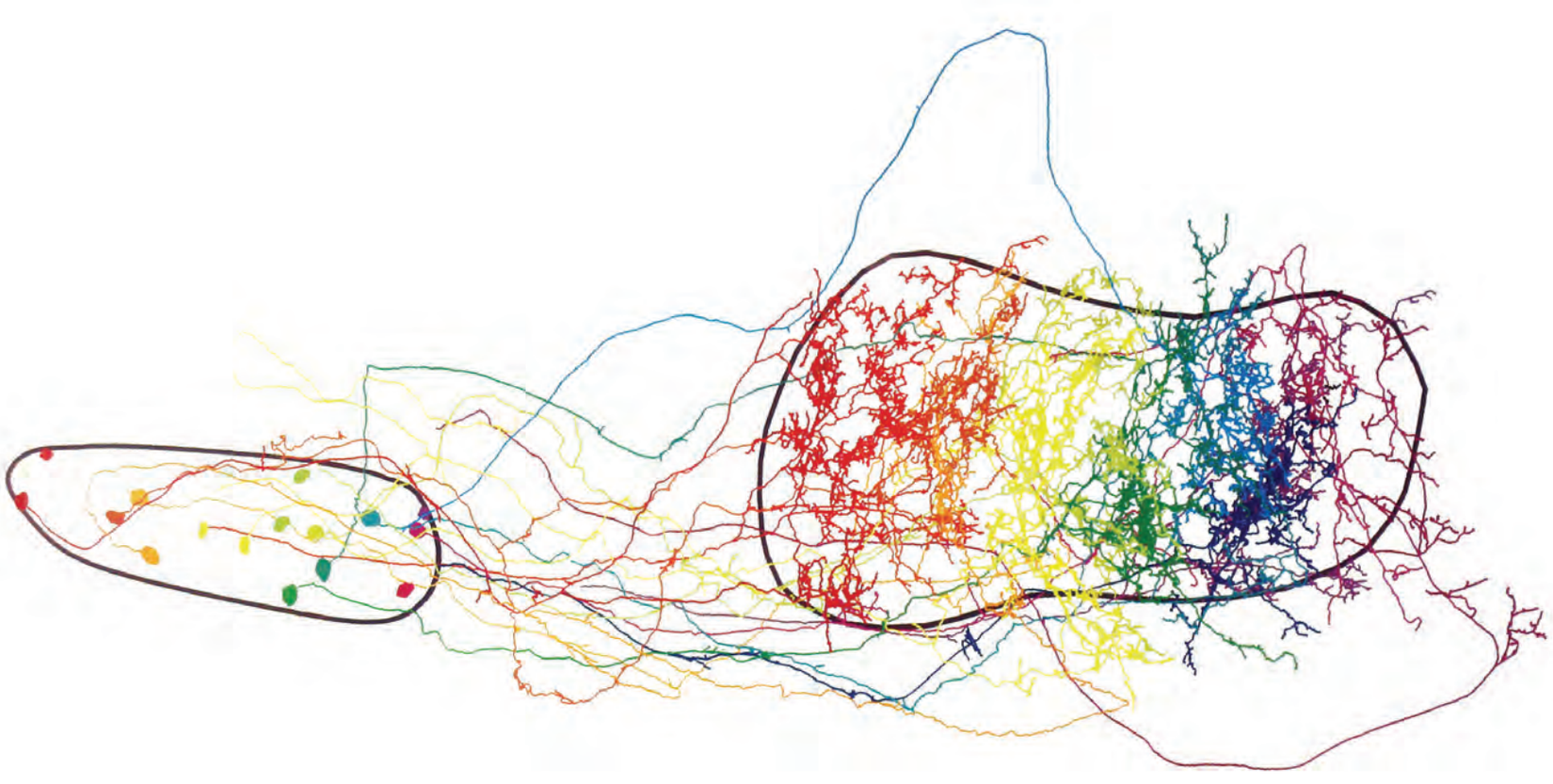
Imagine cells as tiny, somewhat selfish people. Each cell wants to help itself and those it's closest to, while at the same time depriving cells farther away of resources.

"These systems have certain kinds of symmetries," says Ermentrout, "and these symmetries force a pattern."

Six patterns, according to Turing's theory, all of which the team observed with their oil droplets. They also saw a seventh pattern, not foreseen by Turing but predicted by others.

Differentiation happens when the symmetries break down, notes Ermentrout.

Everything then, from a zebra's stripes to the face of a child, may just be the result of microscopic patterns wrought out over the course of trillions of cells. Each of us is symmetry run amok. *—Jason Bittel*



In control mice, the pathway between the brain regions MNTB (medial nucleus of the trapezoid body) and LSO (lateral superior olive) is organized in an orderly fashion. Red neurons (as seen here) respond to high frequencies; purple and blue neurons respond to low frequencies. As the neurons' axons project from the MNTB (smaller oval on the left) to LSO (larger oval on the right), there is no, or little, intermixing of colors. For example, red ends on the left side of the LSO, and blue and purple end on the right. A pulse from the inner ear seems to ensure that the axons are organized appropriately for sound processing.

TO YOUR OWN DRUM

THE RHYTHM OF THE INNER EAR COACHES THE BRAIN TO HEAR

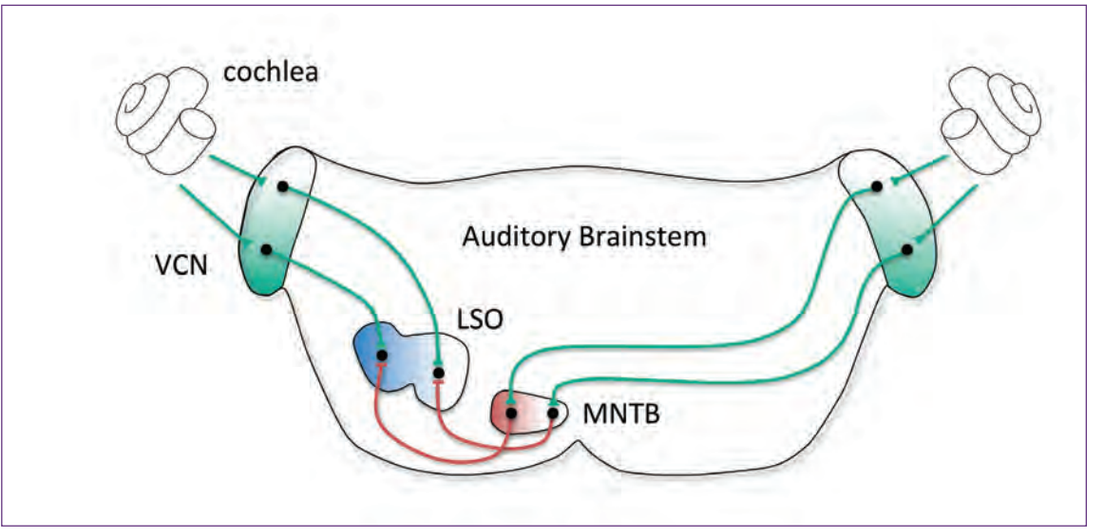
BY NANCY AVERETT

OPPOSITE PAGE: COURTESY AMANDA CLAUSE AND KARL KANDLER. THIS PAGE: COURTESY KARL KANDLER.

Many mammals are born deaf and don't begin hearing until weeks later. Until then, all's not exactly quiet, though—the inner ear is already pulsing with electrical activity. Researchers have long speculated about the function of this rhythm, which begins in the inner hair cells of the cochlea and travels along the auditory nerve to the brain. Now, University of Pittsburgh researchers have discovered that the precise pattern of this drumbeat is what tells the brain how to form the right connections for hearing and processing sounds.

Karl Kandler, a PhD professor of otolaryngology, neurobiology, and bioengineering at Pitt, and colleagues studied a strain of mice with a genetic mutation that slightly tweaks the metronome. Kandler and his co-investigators found the resulting botched beat gave the mice subtle hearing deficits. Their study, published in the May 2014 issue of *Neuron*, has implications for humans, whose inner-ear rhythms may occur in utero.

About 2 to 3 percent of children are born with good hearing but have difficulty interpreting the meaning of sounds—an impairment known as central auditory processing disorder (CAPD) that often accompanies disorders of speech, language, and learning. "In these children, something is wrong in the circuits in the brain that process sound," Kandler says, adding that his team's animal-model studies may be the first step to better understanding the biological cause of CAPD.



Kandler's group looked at an area of the brain important for, among other things, distinguishing low- and high-frequency sounds. This schematic shows neural pathways to the lateral superior olive (LSO). Red shows inhibitory pathways and green indicates excitatory ones.

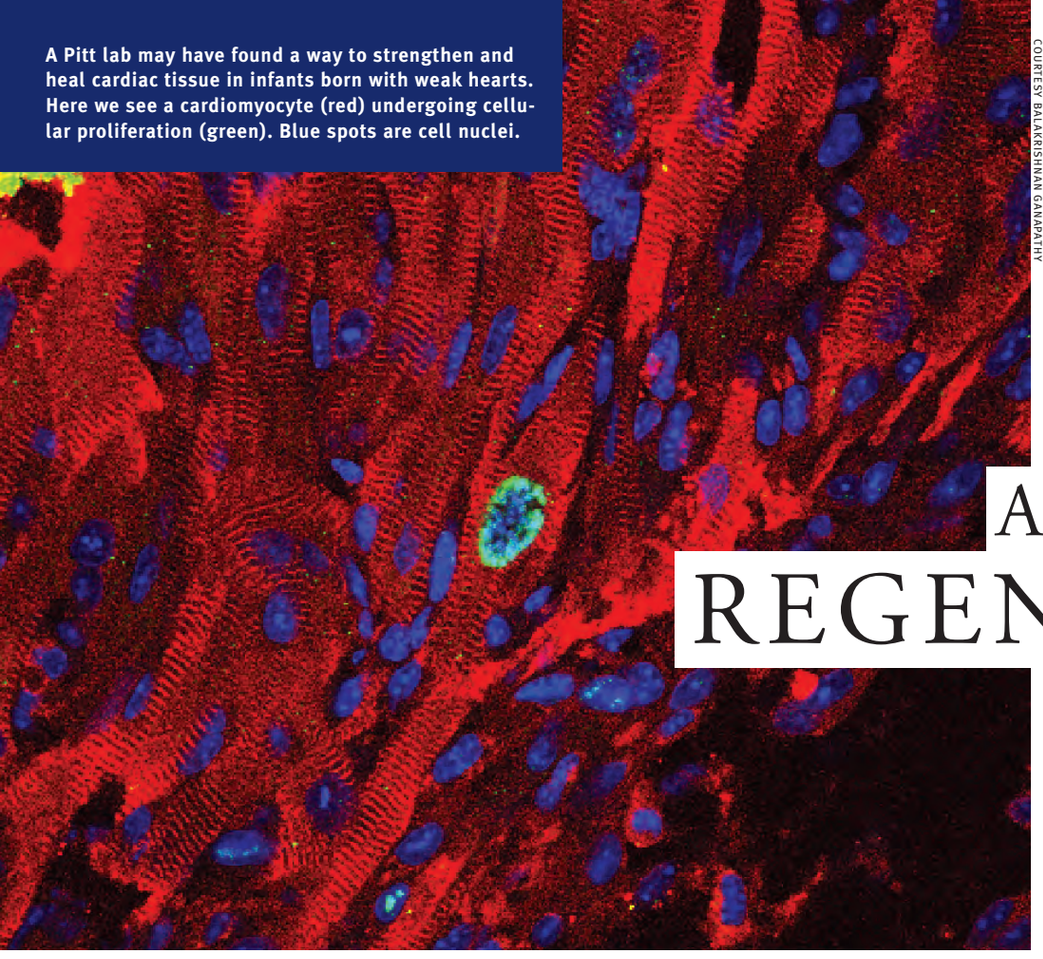
Some background: Hair cells inside the cochlea emit a series of spontaneous electrical impulses. In Kandler's control mice, those impulses occurred in predictable patterns with precise intervals in between. In his mutant mice that model CAPD, these patterns were slightly "blurred," with impulses occurring more randomly. "That's the only difference we found. Everything else we looked at in the ear was quite normal," Kandler says. "We couldn't believe it at first. . . . This little difference has huge consequences on the brain."

The impulses spread along the auditory pathway into the brain, coaching it to set up networks for hearing. At first these networks, or neuronal maps, are not very precise. The neurons grow "exuberantly," says Kandler, connecting to more targets than is necessary. Then, as the mammal matures, patterned neuronal activity prunes incorrect connections and strengthens correct ones.

Kandler looked at one specific area in the brain that is evolutionarily similar in rodents and humans: the inhibitory neuronal pathway, which runs from the medial nucleus of the trapezoid body (MNTB) to the lateral superior olive (LSO).

He found that as the mutant mice matured, the neuronal maps in this pathway did not go through as robust a refinement process as those in the control mice. The mutant mice had many more neuronal connections spread out over a wider area. "If the wrong rhythm drives them, the neurons cannot make a clear decision," Kandler says. "They cannot really dedicate themselves to using one set of connections and cutting other ones. Instead they keep too many inputs going and keep them all in a weak state."

Though the mutant mice could hear fine, they had trouble distinguishing different pitches. "What this study shows," says Kandler, "is that small, very subtle deficiencies in the pattern of spontaneous activity in the inner ear before hearing onset can have very long-lasting consequences." ■



A Pitt lab may have found a way to strengthen and heal cardiac tissue in infants born with weak hearts. Here we see a cardiomyocyte (red) undergoing cellular proliferation (green). Blue spots are cell nuclei.

COURTESY BALAKRISHNAN GANAPATHY

HOW TO STRENGTHEN A TINY HEART, POUND FOR POUND

BY HEATHER BOERNER

AN OUNCE OF REGENERATION

The heart of a newborn is small but powerful—usually. For babies born with heart defects, though, the muscle can be marred by holes and malformed valves, or simply pump weakly. Surgery can close the holes and fix the valves.

But a weak heart? Medicine hasn't been able to do much about that. Beta blockers and ACE inhibitors, common treatments for adults, are ineffective in children. Worse, corrective surgeries can cause scar tissue that further limits the heart's power to pump. Left untreated, a weak heart can cause pediatric heart failure.

"This is where regeneration comes in," says Bernhard Kühn, an MD associate professor of pediatrics at Pitt and director of research in the Division of Pediatric Cardiology at Children's Hospital of Pittsburgh of UPMC. "If we can give these kids just half an ounce [more] heart muscle, that may potentially make a big difference for the duration and quality of their lives."

And it seems Kühn might have found a way to do that, at least in the lab. As reported in a *Science Translational Medicine* paper published in April, Kühn's team applied to injured mouse hearts and isolated human tissue a protein called recombinant growth factor neuregulin-1 (rNRG1). The protein is known to stimulate cell growth in many organs and the nervous system. Kühn's team stimulated cell growth. This complex, multipart study not only found rNRG1 to be effective but also pinpointed the narrow window in which to target future clinical trials.

In a previous study, Kühn and his team found that people with healthy hearts can generate new heart cells until about age 20. But no one knew how long an infant with an unhealthy heart would be able to grow new heart cells. So they set out to answer that question, as well as the question of whether rNRG1 could kick-start the process.

After fine-tuning their own adaptation of an animal model of pediatric heart disease, the team studied the timing of rNRG1 administration. They had assumed starting at 4 days old would be plenty early—but not so. Frustrated, they started all over again, introducing the protein at birth.

Everything changed. "When we started seeing positive results," says Balakrishnan Ganapathy, a lab manager and research technologist at Children's, "we realized we were on to something really big."

Among rodents that received rNRG1 at birth, only one in 10 still had a scar across the entire thickness of the heart wall when they were examined later (compared to 75 percent of the hearts that received rNRG1 at 4 days old). That is to say, rNRG1 seems to generate cell growth, which can repair heart damage and build a stronger muscle. What's more, rNRG1 seems to protect healthy heart tissue from dying.

"We do now have, in the data, some indication that the scar is now pumping [blood]," says Kühn.

At the same time, the lab was studying human heart tissue from infants who'd undergone heart surgery. They found that in the dish, the heart cells stopped proliferating in patients older than 6 months of age. And for those infants who did exhibit cell growth, it was slow.

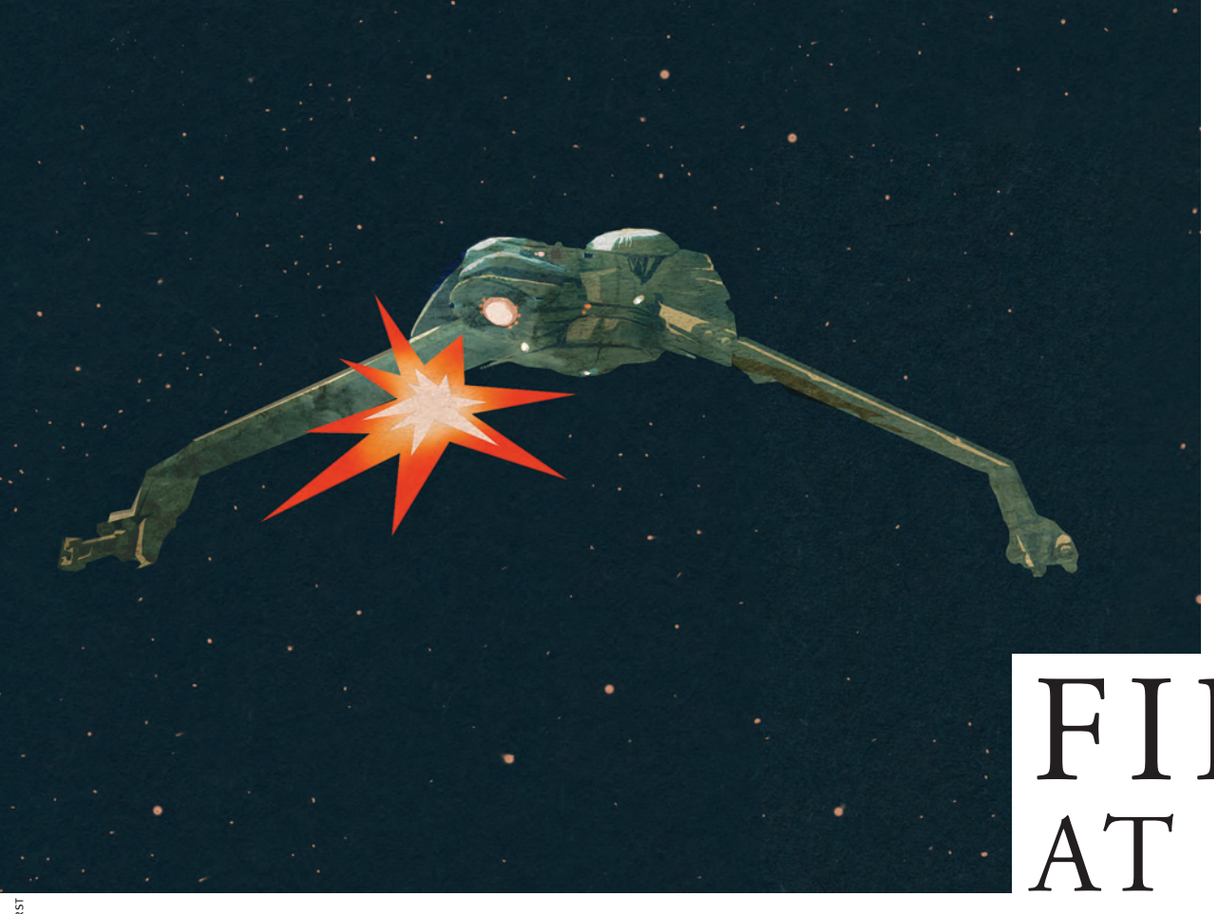
But when they applied rNRG1 to the cells?

"The surprising thing is that the heart-muscle pieces actually liked it," says Kühn. "They had striations, so their molecular motors were visible with the microscope. The striations were still parallel, meaning when they contracted, they all pulled in synchronicity. The electrical connections were still present."

Kühn and his team are hopeful that the same treatment might be effective in clinical trials that target children from birth to 6 months of age. Ganapathy, meanwhile, has begun studying the safety of rNRG1 administration in rodents. So far, he's seen no serious side effects.

In this era of ever-improving neonatal medicine and surgery, the question is less often, *Can we save this baby?* says Kühn.

"The question is," he says, "*How will this person live when he or she is 10, 20, 30, 40, 50, 60, 70, even 80 years old?*" ■



STACY INNERST

OXYGEN CAN BRING DOWN TUMOR DEFLECTOR SHIELDS

BY CHERYL ALKON

FIRE AT WILL!

In the *Star Trek* universe, when the *USS Enterprise* encounters a dreaded class of warship called the Bird of Prey, it's a nail-biter: Not only can the attacking Klingon vessel raise its deflector shields—standard-issue 23rd century technology that protects starships from enemy fire—but it can also activate a unique "cloaking" device, a force field that renders the Bird of Prey virtually invisible.

Cancer works the same way, says Edwin K. Jackson, a PhD professor of pharmacology and chemical biology at the University of Pittsburgh. Tumors "try to cloak and shield themselves so they can't be seen or attacked by the immune system," releasing chemicals that keep them from being taken out. They "blind" the immune cells and "put them to sleep" to prevent attack.

But Jackson—along with the study's principal investigator, Michail Sitkovsky, a PhD and director of the New England Inflammation and Tissue Protection Institute at Northeastern University, and 16 coauthors from Northeastern, the University of Miami, and Boston's Brigham and Women's Hospital—has found what might be the key to deactivating tumors' deflector shields: oxygen.

Typically, tumors grow fast, and as they expand, their blood-supply needs increase, Jackson explains. An inadequate blood supply leads to a low-oxygen environment, which stimulates the production of adenosine, a molecule that helps to suppress the immune system so that it doesn't recognize the tumor. And even if it does, the immune system's killing mechanisms are inactivated.

As reported in the March 4 issue of the journal *Science Translational Medicine*, Jackson, Sitkovsky, and colleagues discovered this by studying mice with breast cancer, melanoma, and a connective-tissue cancer called fibrosarcoma, giving them air with 40 to 60 percent oxygen (ordinary air is only about 21 percent). The team found that the increased oxygen levels caused the tumors in some mice to either decrease in size or disappear altogether. Jackson notes that the technique would likely work on any solid tumor regardless of the location in the body.

But oxygen alone isn't the trick to shrinking tumors in people, Jackson says. The idea is to combine oxygen with existing treatments, such as immunotherapy, to make them more effective. "We have a lot of work to do, but we have a very strong direction," he adds.

Jackson and Sitkovsky's next steps: identify all the adenosine-like molecules in a tumor—chemicals that are collectively known as the purine metabolome—then learn how much of each compound exists. Then they'll determine their effects on the immune system. "We want to look at the purine metabolome in cell culture, then in animals, and then see if we can reprogram it from an immunosuppressive setting to one that encourages immune cells to move in," says Jackson.

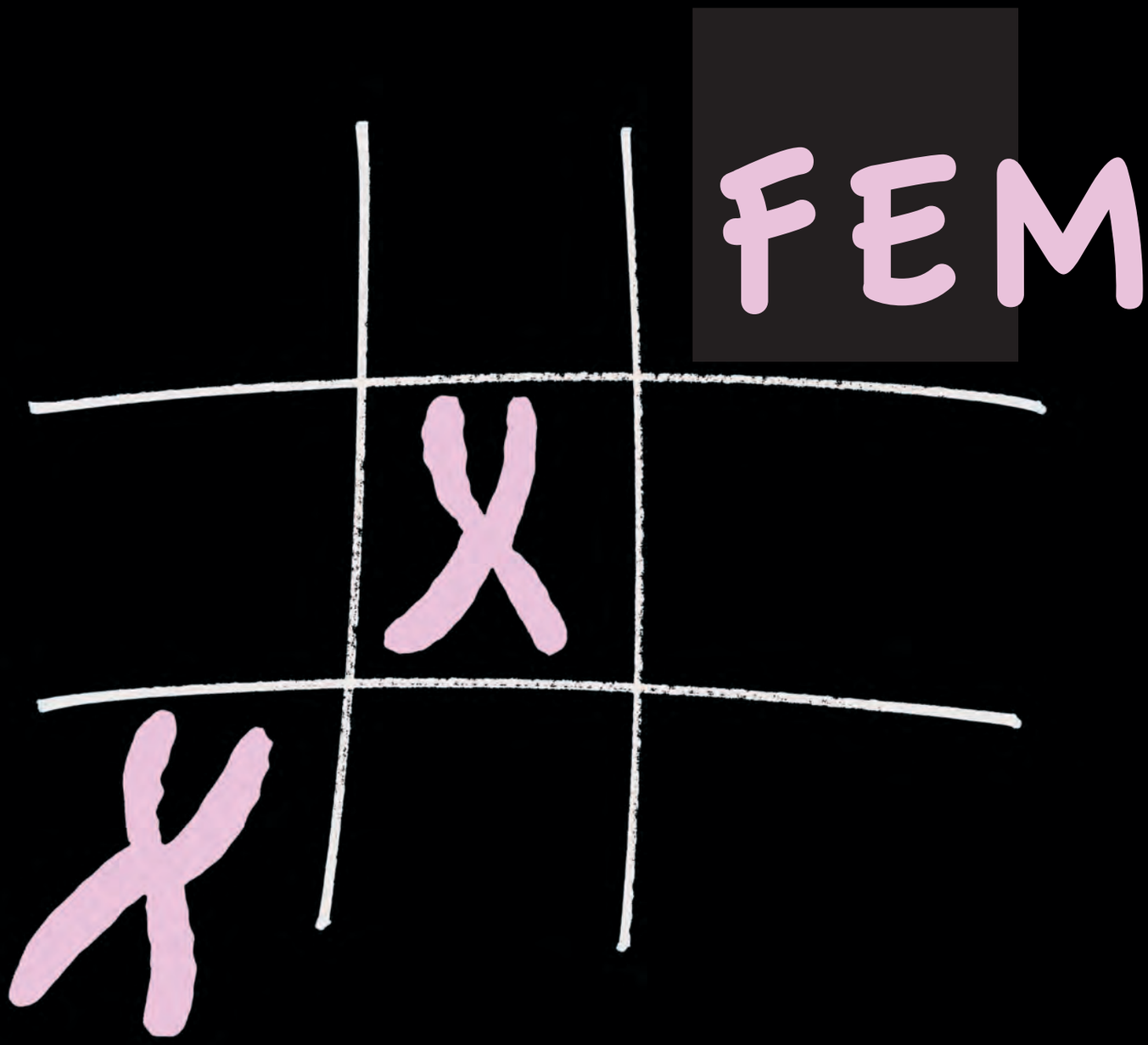
He and Theresa Whiteside, a PhD professor of pathology, immunology, and otolaryngology at Pitt, are collaborating to investigate how immunosuppressive regulatory T cells and regulatory B cells protect tumors against immune attack, and whether and how adenosine is involved in these processes.

"I think we could get clinical trials going in the next year," says Jackson. "As with any technology, I think as we learn more at the basic level, we can fine-tune clinical trials."

Oxygen therapy has been tried before. The reason it hasn't worked, says Jackson, is because it wasn't administered correctly. His team's recipe: inhaled oxygen at 40 to 60 percent (depending on the patient's tolerance for oxygen), 24 hours a day, for several weeks—and, importantly, beginning the oxygen therapy at the same time as the start of a course of immunotherapy.

Challenges lie ahead, such as determining exactly how many weeks oxygen therapy should be used, developing a simple, patient-friendly device for it, and optimizing it by combining it with adenosine receptor blockers.

"The nice thing is that oxygen is available everywhere," Jackson says. ■


FEM

A PROGRAM SPARKS RESEARCH ON WOMEN'S HEALTH | BY ALLA KATSNELSON

FELLOWS

Junior faculty at Pitt come together to probe the sorely understudied field of women's health. A National Institutes of Health program supports their efforts.

The first time Steven Abramowitch met with Pamela Moalli in her office at Magee-Womens Research Institute, he was a little embarrassed by all the talk of vaginas. It just wasn't a topic he was used to discussing in a professional setting.

Then a graduate student in biomechanical engineering, Abramowitch was less than a year away from defending his PhD thesis about another body part—the knee and the injuries it sustains in elite sports. His work was moving along well, and he had a bit of time to spare, so he had volunteered to also work with Moalli, an MD/PhD associate professor of obstetrics, gynecology, and reproductive sciences at the University of Pittsburgh, who had recently sought out a collaboration with his supervisor, Savio Woo, founder and director of Pitt's Musculoskeletal Research Center and a PhD, DSc, DEng Distinguished University Professor of Bioengineering. Moalli studies pelvic organ prolapse, a disorder in which the muscles charged with keeping the bladder, uterus, vagina, and other organs in place begin to droop, which can lead to a protruding vaginal wall.

Melissa McNeil

XX ILLUSTRATION | PHILADELPHIA INQUIRER
PORTRAIT PHOTOGRAPHY | CAMI MESA

Pamela Moalli (left) and Steven Abramowitch

She wanted Abramowitch to do some preliminary cell and animal studies on how hormone levels affect these pelvic floor muscles; this would help them understand the structural mechanics of the problem. But the more Abramowitch asked about the underlying biology of the condition—which affects perhaps 35 percent of women older than 40, often in connection with childbirth, hysterectomy, or menopause—the more it stunned him that the answer to most of his questions was, "Nobody knows, exactly."

The same basic parameters of functional anatomy were so well understood in the knee, he realized, that he took the existence of such information for granted. It wasn't until a month or two later, however, that the importance of Moalli's work really struck him. While shadowing her in the clinic one day, he watched her examine a woman in her 40s. As soon as Moalli asked the patient to apply some pressure to her abdomen, Abramowitch could see the insides slouch out of her vagina as a sharp stream of urine shot out, almost hitting Moalli in the face. A moment later, the woman's despair came tumbling out, as well.

Her condition made her feel terribly disconnected from her family, she reported, sobbing: She couldn't be intimate with her husband. She couldn't pick up her three young children to give them hugs or play with them the way they wanted to play. Her children would ask why she was pushing them away, but she was too embarrassed to explain, and she felt they were too young to understand.

"That was 2004," says Abramowitch. "I still get emotional thinking about that woman more than a decade later." The scene sent a lightning bolt through Abramowitch's career plans. Here was a biomechanical problem that was prevalent and could have devastating effects on those who experienced it, yet it was understudied.

When Moalli was awarded the grant that he had helped her submit, Abramowitch convinced his department to take him on as a research assistant professor; he planned to jointly pursue his old and his new interests. But he felt constantly short on time, money, and lab support for his urogynecological research; and after a couple of years, the prospect of steering his work in that direction began to seem tenuous. Luckily, that's when he ran across a call for applicants for the BIRCWH fellowship program.

BIRCWH, which stands for Building Interdisciplinary Research Careers in Women's Health, was designed by the National Institutes of Health to attract young investigators from diverse disciplines and encourage them to bring their talents to any topic at all related to women's health.

Pitt received its first institutional BIRCWH grant in 2002 and has awarded fellowships to 18 junior scholars so far. The program, underwritten by a training grant called a K12, funds 75 percent of fellows' total work time, allowing them the freedom to pursue their chosen research projects; just as importantly, fellows receive intense and coordinated mentorship on every possible challenge an early career investigator might face, from designing experiments to achieving work-life balance.

Says Abramowitch, the award "came at a perfect time for me, and I definitely credit it with the ability to transition my research successfully." Today, he is an associate professor of bioengineering, as well as of obstetrics, gynecology, and reproductive sciences; his lab still collaborates closely with Moalli's, and he now serves as a mentor in the BIRCWH program himself.

The influx of talent BIRCWH fellows have brought to the table has been a huge boon to a field that has not traditionally been at the forefront of priorities in biomedical research, says Melissa McNeil (MD '80, Res '83, MPH '93), a professor of medicine who is program director for Pitt's BIRCWH program and also heads Pitt's Comprehensive Women's Health Program and its women's health fellowship.

"Where there's funding, people will go," she says. "I firmly believe that the program has expanded the profile of investigators seeking to answer questions in the area of women's health, not only by attracting people with a long-standing interest in the topic, but also by encouraging investigators from other fields to think about how their research could be adapted to it."

"So many research questions were only being addressed in the 70-kilogram man."

The last two decades of the 20th century were a time of awakening for women's health on a national scale. After an eternity of systematic exclusion of women from clinical trials and an approach to health research that ignored biological differences between women and men, health officials began to admit that this outlook was leading to health disparities in women.

"So many research questions were only being addressed in the 70-kilogram man," says McNeil.

NIH guidelines adopted in 1986 urged the inclusion of women in clinical research; yet for years, little seemed to change in practice. On the plus side, this prompted the establishment of the Office of Research on Women's Health (ORWH) in 1990, but even a 1993 congressional mandate to include women in NIH-funded

Yoel Sadovsky (below), Bryan Brown, and Heather McCauley

clinical studies did little to nudge the status quo. Multiple government reviews repeatedly deemed that clinical studies still weren't analyzing the role of sex differences on the efficacy of therapies. In an effort to build up research on women's health that was poised for translation into clinical practice, ORWH started the BIRCWH program in 1999. Meanwhile, Magee-Womens Hospital established the Magee-Womens Research Institute in 1990. By the mid-1990s, MWRI had expanded to 25 basic scientists and 15 clinical, behavioral, and epidemiological researchers, who collectively held more than $18 million of NIH funding. The MWRI's first director, James Roberts, an MD, brought in the BIRCWH grant in 2002. When the grant came up for renewal three years ago, Yoel Sadovsky, Roberts' successor as director, took the reins. (Sadovsky is also the Elsie Hilliard Hillman Professor of Women's and Infants' Health Research and a professor of obstetrics, gynecology, and reproductive sciences, as well as of microbiology and molecular genetics.)

Pitt's current crop of four fellows hails from bioengineering, public health, pharmaceutical, and ob/gyn backgrounds. Boosting the program's diversity by recruiting applicants from basic research and translational fields has taken considerable effort, says Sadovsky, and it is one of the program's major strengths.

"I think it provides a level of education and training that far exceeds what they would individually acquire," he says. One component of that is simply having the much-needed protected time—and money—to develop research projects. At its core, the program serves as a kind of bridge funding until fellows can amass enough data to secure a major funding source for their work. But beyond financial support, BIRCWH's value lies in an extensive web of mentoring. Each fellow selects up to four mentors. Every couple of months, Sadovsky corrals all the fellows and mentors at a venue where two of the fellows present their work and receive feedback from the whole crew.

Overall, the level of involvement and support from senior faculty that BIRCWH provides is almost unheard of for young researchers today, says Harvey Borovetz, a PhD professor of bioengineering and a BIRCWH mentor.

"I just can't say enough about it and the opportunities it offers for young people to grow professionally," he says.

Borovetz's mentee Bryan Brown, a research assistant professor in the same department, agrees. "[Borovetz] serves on tenure committees, he's been the department chair, so he knows how things work," Brown says.

Moalli piqued Brown's interest in applying his research to women's health much like she had Abramowitch's—by reaching out to suggest a collaboration. That was back in 2011, when Brown—who had done his PhD at Pitt on immune responses to surgically implanted biomaterials—returned to Pittsburgh to start his own lab after a postdoc at Cornell.

Moalli's team was studying why a widely used treatment for pelvic organ prolapse—inserting plastic mesh into women's vaginas—turned out to be so fraught with serious side effects. (To date, some 70,000 women have filed lawsuits against mesh manufacturers.) She wanted Brown to examine the basic biological properties of the host response to the material, and he was happy to comply.

"It gave me an opportunity to expand into a direction in which few researchers are working presently, and it helped bring some funding and independence to my research program," Brown says. Shortly thereafter, Abramowitch pointed him toward the BIRCWH application; and when Brown received the award the following year, Moalli and Abramowitch joined Brown's mentorship crew.

That research thread has remained a major focus of Brown's work. His lab now examines whether the host response to an implanted material like mesh is different in young individuals compared to older ones; and indeed, Brown's animal studies suggest a strong distinction. "If you think about the types of surgical implants that are out there—for hernias, pelvic organ prolapse, hip implants—those are used in aging populations," he says. And yet nobody had explored the question in older animals. Although his research on biomaterials has always had clinical applications, aligning his work so closely with Moalli's feedback has helped him home in on design problems he would not have previously considered, Brown says. For example, his lab is

Francesca Facco and Haitao Yang

also working on an immunomodulatory collagen coating that could smother the body's damaging inflammatory response against vaginal mesh; after discussions with Moalli, he is considering what might encourage or discourage physicians from embracing such a product. No matter how well it works in new iterations that Brown's lab might develop, coating mesh with collagen will probably yield hesitation, because in the past that approach didn't work, Moalli advised him. "The first thing clinicians are going to think is that collagen mesh from five years ago made things worse," he says.

Another fellow, Heather McCauley, an ScD assistant professor of pediatrics and a social epidemiologist, focuses on the interpersonal dimensions of women's health. Her BIRCWH-funded project, which she began last year, explores support systems for young women in foster care—particularly mentorship by adult role models who aren't their parents. The hope, McCauley says, is to identify ways that "this relationship could be strengthened and bolstered to impact pregnancy risk among this particularly vulnerable group of women."

At a group presentation of her work a few months ago, in which McCauley described the experiences of some of the women she recruited into her study, McNeil asked McCauley about the young women *without* mentors—that is, the ones likely to be the most vulnerable. After mulling it over, McCauley applied for an internal grant to expand her research to include their experiences. "It helped me to identify the holes in the project and expand its intellectual scope," she says.

Along with the guidance she receives here at Pitt, McCauley says she appreciates the access she and her fellow scholars receive to a kind of national networking superhighway of BIRCWH scholars. Even before she became a fellow, her mentor Elizabeth Miller began introducing her to researchers associated with the program. (Miller is an MD/PhD professor of pediatrics and chief of the Division of Adolescent Medicine at the University and at Children's Hospital of Pittsburgh of UPMC; shes' also a former BIRCWH fellow.)

Each month, McNeil brings all Pitt BIRCWH fellows together at a little Middle Eastern lunch spot near campus, where they've gotten to know the owners. At a recent gathering over hummus and gyros, McNeil kicked off the conversation by checking in with one fellow who has a new baby and another whose spouse lives in another state. That's always how it starts, says McCauley—with the personal.

Then the conversation moves on to topics of recent BIRCWH group presentations, with McNeil providing feedback and guiding each fellow in strategizing what to do next. "Dr. McNeil finds a way to connect each one of us to one another—using the struggles or successes of one BIRCWH scholar as an example to help another BIRCWH scholar," says McCauley.

"What's been the most wonderful to see," says McNeil, "is, despite the field of origin, despite the gender of our scholars, despite differences in research interests, the program seems to generate a camaraderie and a peer support system that is really unique. That's been true of each and every iteration of scholars."

And Pitt's BIRCWH fellows are starting to see their hard work pay off.

Francesca Facco, an assistant professor of obstetrics, gynecology, and reproductive sciences recently stepped down from the program when she was awarded an R01, the holy grail of NIH project grants for a young investigator. Facco came to Pitt in 2013 with a plan to build research into her clinical career; she examines how sleep disorders might affect maternal and fetal health.

Facco turned to her mentors for help primarily with questions of study design, ethics protocols, budgets, and other elements of assembling a grant. With her new grant, she recently began a study examining whether treating mild forms of sleep apnea in pregnant women improves the outcomes of their pregnancies.

Catherine Chappell, an assistant professor of obstetrics, gynecology, and reproductive sciences, was just made a BIRCWH fellow. Chappell will investigate hepatitis C virus treatment during pregnancy. Chappell is (like Facco was) the only one of the four BIRCWH fellows with an MD.

Brown isn't quite at the BIRCWH finish line yet, but he's coming close.

"Now I feel like we're approaching the point where I can submit grants as a principal investigator, or submit coinvestigator grants with Dr. Moalli," he says.

"I came into the fellowship as a research assistant professor, and now I'm moving into a tenure-track position, which is a great step for me."

Haitao Yang is a PhD assistant professor of pharmaceutical sciences in the School of Pharmacy whose BIRCWH project involves using nanoparticle technology to develop drug delivery systems for HIV prevention. He says, "Speaking with the other fellows, I learn a lot of things I would never think about."

Yang and Brown have lit upon a prospect for a joint project using Yang's drug delivery techniques to target macrophages, inflammatory cells that Brown studies. Yang says it's just one of the ways that the program has opened up his research horizons:

"These things that other fellows are studying—like sleeping problems in pregnant women—I never really thought about them as health problems before." ■

"ONE MORE TIME!"

BY EM DEMARCO

"THE BUDGET WAS $8," SAYS GWEN MILLER, LAUGHING AS SHE RECALLED HOW HER LATE HUSBAND, **FELIX H. "BEBE" MILLER** (MD '55), DESCRIBED THE FIRST **SCOPE AND SCALPEL** PRODUCTION IN 1955. "BEBE USED TO SAY IT GREW INTO THIS MAMMOTH PRODUCTION. BUT IN THE ORIGINAL SHOW, THE BUDGET WAS $8, FOR PRETZELS."

THE CLASS OF '15'S BUDGET OF $15,000 DWARFS THAT OF THE 1955 SHOW, **PMS IV**. BUT **LITTLE ELSE** HAS CHANGED. LIKE ITS PREDECESSORS, THIS YEAR'S PRODUCTION OF **MODERN FAMILY MEDICINE** WILL BE RIDDLED WITH **BAWDY HUMOR** AND **INSIDE JOKES** ABOUT THE UNIVERSITY OF PITTSBURGH SCHOOL OF MEDICINE. WITH A FEW EXCEPTIONS, EVERY ASPECT OF THE SHOW -- THE SCRIPT, COSTUMES, MUSIC, DIRECTION, ACTING, SETS, CHOREOGRAPHY, FUNDRAISING -- IS DONE BY FOURTH-YEAR MED STUDENTS.

THIS YEAR MARKS THE 60TH ANNIVERSARY OF PITT MED STUDENTS HAMMING IT UP ON STAGE, WHERE THEY POKE FUN AT THEIR PROFESSORS, THEIR PROFESSION, AND THEMSELVES. OF COURSE, NOT EVERYONE HAS SPENT TIME **UNDER THE LIGHTS**. YET DOZENS OF STUDENTS WILL BE LEARNING LINES, LYRICS, AND DANCE MOVES. THESE MOMENTS WILL BECOME SOME OF THEIR **LAST SHARED EXPERIENCES** BEFORE THE CLASSMATES PART WAYS TO BEGIN THEIR RESIDENCIES.

WITH MATCH DAY OVER, THEY HAVE LESS THAN TWO MONTHS TO PREPARE. THE COUNTDOWN UNTIL SHOWTIME -- AND GRADUATION -- HAS BEGUN.


TONIGHT IS THE FIRST READ-THROUGH OF THE SCRIPT FOR THE 2015 PERFORMANCE OF SCOPE AND SCALPEL.
I HAVE THE LAST FIVE PAGES OF SOMEBODY'S SCRIPT. CAN YOU GUYS ALL MAKE SURE THAT YOURS ENDS ON PAGE 120?
120!
I HAVE 123!
119!
SARAH COHEN, ASST. DIRECTOR, WRITING COMMITTEE, ETC. (DUKE UNIVERSITY MEDICAL CENTER, INTERNAL MEDICINE - PEDIATRICS)
THE SCRIPT IS MASSIVE. IN FACT, THE ENTIRE SHOW IS A HUGE UNDERTAKING. AND THE PRESSURE OF HONORING THIS DECADES-LONG TRADITION IS LOOMING ...
THIS STAPLE IS BARELY HOLDING EVERYTHING IN PLACE.
14 SCENES!
Scope and Scalpel 2015: Modern Family Medicine
SINGING! DANCING! ... INCLUDING A BOLLYWOOD NUMBER!
PROPS! COSTUMES!
SATAN PLACE
GOLDFINGER
SPRING TONIC
1956
1957
MEDIC HAIR
HOW TO STOP THINKING AND LOVE MEDICAL SCHOOL
1974
SLIPPED DISCO
THE SOUND OF MUCUS
*FOUR YEARS OF MED SCHOOL GON' SHOW DAD THAT I'M NO FOOL!
FOUR YEARS, LEARNED MEDICINE NO SLEEPIN' IN STRAIGHT AUSCULTATIN'!
PALPATE FEELS GREAT CARING FOR FOLKS IN THE CITY!
GOT SCRUBS UNDER MY WHITE COAT, MIGHT ADMIT MYSELF I'M SO PRETTY! YINZ AT?
PITT MED!
HA HA HA!
CLAP CLAP
*SUNG TO THE TUNE OF "UPTOWN FUNK," BY MARK RONSON.
AS THE FIRST REHEARSAL ENDS, ONE THING IS CERTAIN ...
OOH, CHOCOLATES! WHO BROUGHT THOSE?
I DON'T KNOW ...
... BUT IT'S THE BIGGEST BOX OF CHOCOLATES I'VE SEEN IN A LONG TIME!
TORY STEEN, ORCHESTRA CODIRECTOR, CAST. (BRIGHAM & WOMEN'S HOSPITAL/HARVARD UNIVERSITY, ANESTHESIOLOGY)
LEO CHEN, CAST INCLUDING A PORTRAYAL OF DEAN ARTHUR S. LEVINE. (MATCHED AT STANFORD UNIVERSITY, UROLOGICAL SURGERY)
'86 MIAMI SLICE
1985 LOST in SCAIFE
1997 BEDPAN WALKING
Soprandols
QUANTUM BEEP
the HANGOVERDOSE
2015 Modern Family Medicine
... THERE WILL BE SNACKS EVERY STEP OF THE WAY.


THE FIRST DANCE REHEARSAL -- IN ONE OF THE LECTURE HALLS IN SCAIFE. TONIGHT THEY WILL BE LEARNING THE CHOREOGRAPHY FOR "GUNNER," A PARODY OF MICHAEL JACKSON'S "THRILLER."
IS EVERYBODY FEELING LIMBER?
IT'S THEIR FIRST TIME LEARNING THESE STEPS ...
GUNNER??
EM DEMARCO (YOUR REPORTER)
Gunner: A student who focuses on earning a high score at the expense of his or her fellow students ... Recent usage has come to mean, "Anyone who is studying when you don't want to be, and thus makes you feel guilty."
Modern Family Medicine Program 2015
WHICH WAY ARE WE TURNING? LEFT OR RIGHT?
TWO?
WAIT ... GUNNER IS ON FOUR!!
SO, IT'S ON 'NER'?
THE SECOND 'NER'?
GUNNER, ONE-TWO! TURN ON THE TWO!
... AND IT'S KIND OF A WRECK ...
AS LONG AS YOU'RE THROWING YOUR ARMS AND YOUR BODY, YOU'LL LOOK GOOD!
HA! HA!
JONATHAN BLACKWOOD, HEAD CHOREOGRAPHER, CAST. (NIMH RESEARCH FELLOW)
BUT WITHIN THE HOUR ...
ONE TWO!
STOMP!
YOU GUYS ARE DOING GREAT!

"I'VE NEVER REALLY **DANCED** ... I MEAN, I'VE DANCED IN THE **CLUB** BEFORE!"

"AT THE BEGINNING I THOUGHT I WAS TOTALLY **HOPELESS**. BUT NOW, I THINK I CAN GET IT WITH **PRACTICE** ... I'M EXCITED, BECAUSE I WAS ONE OF THE HEAD WRITERS, SO SEEING IT **COME TOGETHER** IS REALLY COOL."

ADAM COHEN, A HEAD WRITER, CAST, ETC. (CHILDREN'S NATIONAL MEDICAL CENTER/ GEORGE WASHINGTON UNIVERSITY, PEDIATRICS)

ARE YOU NERVOUS?

I'M NERVOUS-EXCITED. THERE ARE A COUPLE OF SONGS THAT I'M SINGING WITH SOME OTHER SOLOISTS, AND WE'RE DOING COOL HARMONIES ... THAT WILL BE FUN TO DO **LIVE ON STAGE**.

SO, IS THERE **ANYTHING** THAT MAKES YOU NERVOUS, IN LIFE?

EVER? **ANYTHING** IN FRONT OF PEOPLE IS A LITTLE **NERVE RACKING**!

WHAT MAKES ME NERVOUS? ... I'M NERVOUS ABOUT BEING A DOCTOR IN THREE MONTHS. I THINK I SPEAK FOR **ALL OF US** WHEN I SAY THAT.

ANJALI RAO, VOCAL DIRECTOR, WRITING COMMITTEE, ETC. (UPMC/UNIVERSITY OF PITTSBURGH, INTERNAL MEDICINE)

REHEARSAL CONTINUES WITH **"FAKE A COUGH,"** A RENDITION OF THE POP SONG, **"SHAKE IT OFF."**

KYLE DUFF, CAST, WRITING COMMITTEE. (WASHINGTON HOSPITAL, FAMILY MEDICINE)

MUNCH MUNCH

SESAME CHICKEN

SCRUB NURSES GOIN' **CRAY CRAY CRAY CRAY**

WHEN I TOUCH THE MAYO **TRAY TRAY TRAY TRAY**

AND I'VE HAD ENOUGH TO-**DAY DAY DAY DAY**

SO I **FAKE A COUGH**, FAKE A COUGH!

IT'S PAST 9 P.M. PRACTICE ENDS, BUT THERE'S STILL WORK TO DO **TONIGHT** ...

IF YOU CAN STICK AROUND FOR **JUST A FEW MINUTES**, AND PUT THEM IN THE LECTURE HALL ... STUDENT LOUNGE ... BULLETIN BOARDS.

I'LL HANG POSTERS, IF YOU PROVIDE THE **RIDE HOME**.

ABSOLUTELY!

SARAH SEVERANCE, PRODUCER, ASST. CHOREOGRAPHER, ETC. (INDIANA UNIVERSITY, GENERAL SURGERY)

POSTERS FOR THIS YEAR'S SHOW!

SARAH COHEN JUST HAD HER **WISDOM TEETH** REMOVED.

DEAN MCELLROY GAVE THE GREEN LIGHT TO THE **FIRST** SCOPE AND SCALPEL PRODUCTION IN 1955, TITLED **PMS IV**.

WILLIAM S. MCELLROY (MD '16) DEAN OF THE SCHOOL OF MEDICINE, 1938 - 1958.

AS THE **ORIGIN STORY** GOES, THE IDEA TO DO A **COMEDIC PLAY** ABOUT LIFE AT **PITT MED** WAS COOKED UP OVER DRINKS AT A LOCAL BAR.

HA! HA!

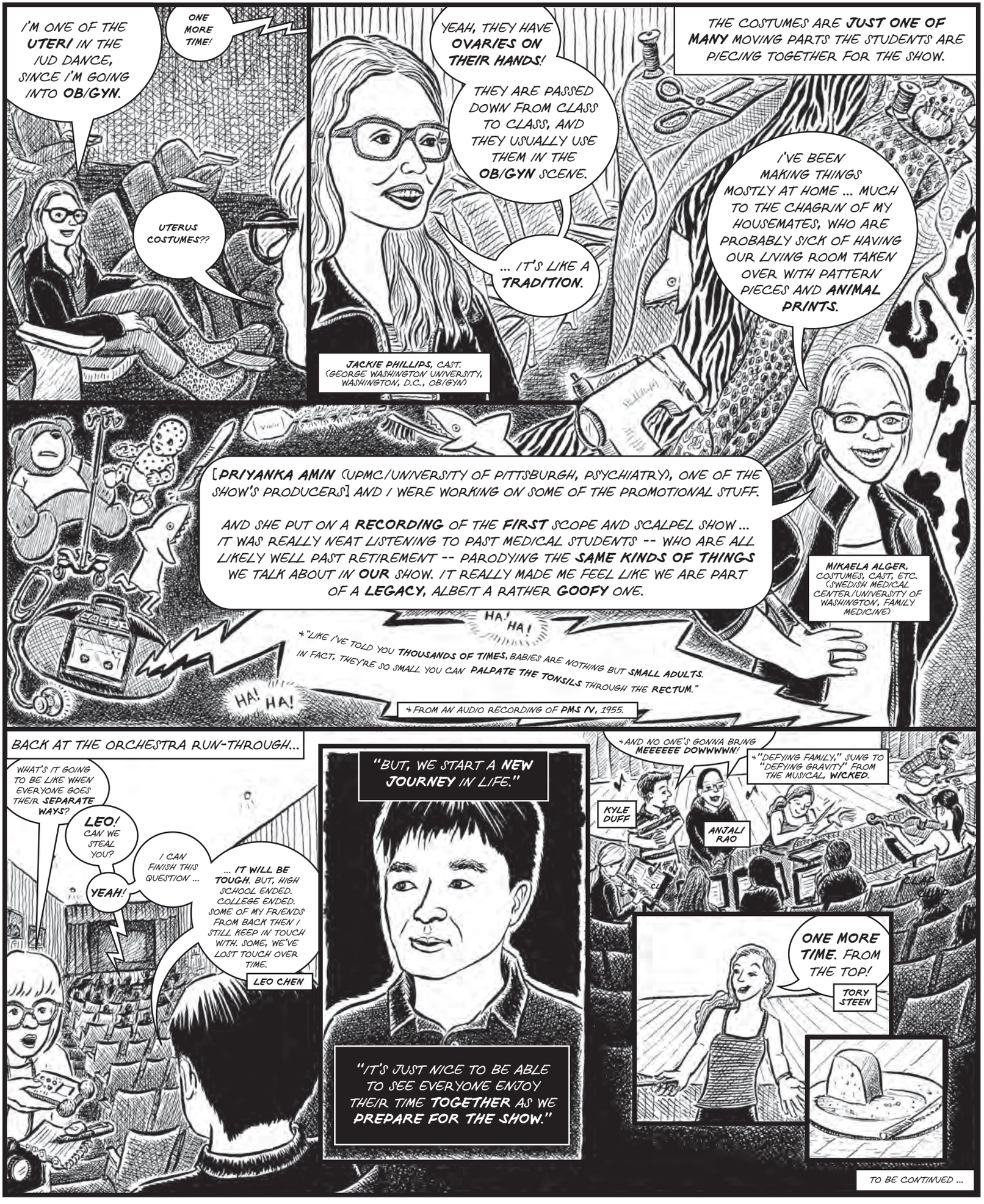
WHY NOT ACT OUT THEIR GRUMBLINGS ON STAGE, WITH SONG AND DANCE?

SAMUEL B. ARONSON II

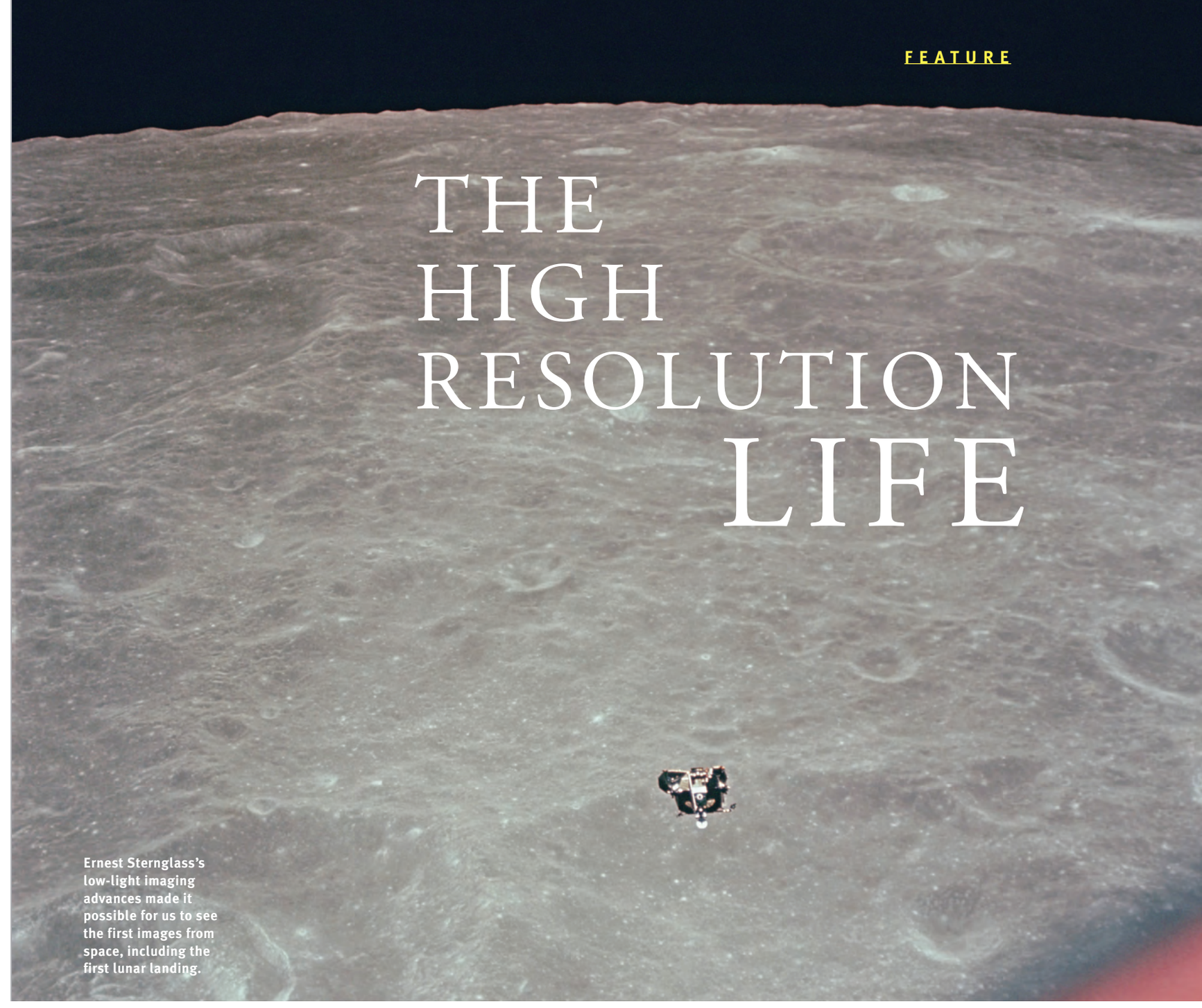
PROFESSOR FRANK DIXON

WITH THE SUPPORT OF DEAN MCELLROY, WHO APPOINTED **PROFESSOR ROSS MUSGRAVE** (MD '43) AS THE FACULTY ADVISOR, THE LEGACY OF SCOPE AND SCALPEL WAS **ON ITS WAY**.


FOR WEEKS, THERE IS A REHEARSAL NEARLY EVERY NIGHT.
TONIGHT IS THE FIRST TIME THE CAST WILL BE SINGING WITH THE ORCHESTRA,* DOING A FULL RUN-THROUGH OF THE SHOW'S MUSICAL NUMBERS ...
KEEP THE TALK DOWN. WE'RE TUNING ... THANK YOU!
BRAPPP! CLANG! POP! PFFT! BLAH BLAH BLAH BLAH BLAH BLAH BLAH TWEEP! TOOT! SHHUNG!
... OPENING NIGHT IS ABOUT TWO WEEKS AWAY.
*THE ORCHESTRA INCLUDES STUDENTS FROM ALL YEARS.
AND THE LAST ANNOUNCEMENT IS ... I HAVE CAKE!
TORY STEEN
ALL RIGHT, ARE WE ALL READY?
BORN READY!
GAB LANGMANN, ORCHESTRA, CAST, ETC. (UPMC/UNIVERSITY OF PITTSBURGH, INTERNAL MEDICINE - PEDIATRICS)
*FROM THE DAY I ARRIVED ON THIS PLANET,
DAD THOUGHT I WOULD FOLLOW HIS DREAMS!
SNAP! SNAP!
MADE ME SUTURE BY TWO,
WORK A BOVIE BY THREE,
WE REMOVED ALL MY GUINEA PIGS' SPLEENS!
*SUNG TO "THE CIRCLE OF LIFE" FROM DISNEY'S THE LION KING.
SOOO ... THE TEMPO?
ANJALI RAO
IT WILL COME TOGETHER.
KYLE DUFF
WE WILL DO IT AGAIN.
IN THE WORST-CASE SCENARIO ... FOLLOW THE DRUMS, OK?
TORY STEEN
TORY WILL CATCH UP!
GAB LANGMANN
ORCHESTRA? ORCHESTRA?
TORY? TORY?
AGAIN, WE NEED TO PLAY IT ALL TOGETHER!
HA! HA!
SORRY MOM!
OOH, THERE'S PIZZA?
MUNCH MUNCH
KENE UKEJE, CAST. (WALTER REED NATIONAL MILITARY MEDICAL CENTER, TRANSITIONAL MEDICINE AND ANESTHESIOLOGY)
KYLE DUFF
DURING "GUNNER," VINCENT PRICE'S OMINOUS MONOLOGUE IN "THRILLER" IS SWAPPED WITH A RECORDING OF DR. SCHUMANN, THEIR ANATOMY PROFESSOR ... BUT THE TIMING IS ROUGH.
WE'VE TAGGED EACH ARTERY, VEIN, AND NERVE, TO TERROR/IZE THE GRADING CURVE! AND THOUGH YOU FIGHT TO STAY AFLOAT, YOUR VERTEBRAE START TO SHUDDER! FOR NO MERE FIRST YEAR CAN RESIST, THE HUNGER OF THE GUNNER!! MMUHHAHAHHAAAAAAHHHH!!!
PRESS!
JORDAN KNOX, DIRECTOR, CAST, ETC. (UNIVERSITY OF UTAH AFFILIATED HOSPITALS, FAMILY MEDICINE)
I'M PLAYING WITH THE VIDEO?
I'M TRYING TO CUE YOU, BUT NOT CUE JORDAN.
SO, I'LL GIVE A LITTLE CUE FOR YOU, AND A BIGGER CUE FOR JORDAN.
TORY STEEN
JAY WANG, ORCHESTRA. (FIRST-YEAR MED STUDENT)
THANK-CUE!
JORDAN KNOX


I'M ONE OF THE UTERI IN THE IUD DANCE, SINCE I'M GOING INTO OB/GYN.
ONE MORE TIME!
UTERUS COSTUMES??
YEAH, THEY HAVE OVARIES ON THEIR HANDS!
THEY ARE PASSED DOWN FROM CLASS TO CLASS, AND THEY USUALLY USE THEM IN THE OB/GYN SCENE.
... IT'S LIKE A TRADITION.
JACKIE PHILLIPS, CAST. (GEORGE WASHINGTON UNIVERSITY, WASHINGTON, D.C., OB/GYN)
THE COSTUMES ARE JUST ONE OF MANY MOVING PARTS THE STUDENTS ARE PIECING TOGETHER FOR THE SHOW.
I'VE BEEN MAKING THINGS MOSTLY AT HOME ... MUCH TO THE CHAGRIN OF MY HOUSEMATES, WHO ARE PROBABLY SICK OF HAVING OUR LIVING ROOM TAKEN OVER WITH PATTERN PIECES AND ANIMAL PRINTS.
[PRIYANKA AMIN (UPMC/UNIVERSITY OF PITTSBURGH, PSYCHIATRY), ONE OF THE SHOW'S PRODUCERS] AND I WERE WORKING ON SOME OF THE PROMOTIONAL STUFF.
AND SHE PUT ON A RECORDING OF THE FIRST SCOPE AND SCALPEL SHOW ... IT WAS REALLY NEAT LISTENING TO PAST MEDICAL STUDENTS -- WHO ARE ALL LIKELY WELL PAST RETIREMENT -- PARODYING THE SAME KINDS OF THINGS WE TALK ABOUT IN OUR SHOW. IT REALLY MADE ME FEEL LIKE WE ARE PART OF A LEGACY, ALBEIT A RATHER GOOFY ONE.
MIKAELA ALGER, COSTUMES, CAST, ETC. (SWEDISH MEDICAL CENTER/UNIVERSITY OF WASHINGTON, FAMILY MEDICINE)
HA! HA!
HA! HA!
* "LIKE I'VE TOLD YOU THOUSANDS OF TIMES, BABIES ARE NOTHING BUT SMALL ADULTS. IN FACT, THEY'RE SO SMALL YOU CAN PALPATE THE TONSILS THROUGH THE RECTUM."
* FROM AN AUDIO RECORDING OF PMS IV, 1955.
BACK AT THE ORCHESTRA RUN-THROUGH...
WHAT'S IT GOING TO BE LIKE WHEN EVERYONE GOES THEIR SEPARATE WAYS?
LEO! CAN WE STEAL YOU?
YEAH!
I CAN FINISH THIS QUESTION ...
... IT WILL BE TOUGH. BUT, HIGH SCHOOL ENDED. COLLEGE ENDED. SOME OF MY FRIENDS FROM BACK THEN I STILL KEEP IN TOUCH WITH. SOME, WE'VE LOST TOUCH OVER TIME.
LEO CHEN
"BUT, WE START A NEW JOURNEY IN LIFE."
"IT'S JUST NICE TO BE ABLE TO SEE EVERYONE ENJOY THEIR TIME TOGETHER AS WE PREPARE FOR THE SHOW."
* AND NO ONE'S GONNA BRING MEEEEEE DOWWWWN!
* "DEFYING FAMILY," SUNG TO "DEFYING GRAVITY" FROM THE MUSICAL, WICKED.
KYLE DUFF
ANJALI RAO
ONE MORE TIME. FROM THE TOP!
TORY STEEN
TO BE CONTINUED ...

THE HIGH RESOLUTION LIFE



Ernest Sternglass's low-light imaging advances made it possible for us to see the first images from space, including the first lunar landing.

ERNEST STERNGLASS, NUCLEAR REDUCTIONIST

BY MICHAEL FITZGERALD

PHOTO | NASA

Most people don't really shoot the moon, but Ernest Sternglass made sure we could send images from it. The iconic photos and feeds from the first lunar landing are etched in our collective memory. The contributions of this radiation physicist and inventor were far-reaching (beyond those 240,000-some miles). He helped create digital X-rays, ban atmospheric atomic bomb testing, and then some. In both his radiology career and his public health activism, Sternglass, who spent 30 years as member of the University of Pittsburgh

School of Medicine faculty and died February 12 at the age of 91, was a nuclear reductionist.

THEORETICIANS AND COBBLERS

For Sternglass's career path, we have Albert Einstein, as well as Sternglass's parents, to thank.

Sternglass's family had fled Germany in 1938, when he was 14. Sternglass finished high school in New York City when he was 16. The young man's early passion was theoretical physics, but his mother, who was a physician (as was his father), thought a physics degree would make him unemployable. So Sternglass instead enrolled in electrical engineering at Cornell University. After he finished his degree in 1944, he volunteered for the navy. World War II ended just before he was due to ship out, and he wound up working at the Naval Ordnance Laboratory. Results from his studies there on secondary electron emission were applied in night vision systems.

That work suggested to him that the accepted theory of secondary electron emission might be wrong. Einstein's description of the photoelectric effect, in which beams of ultraviolet light dislodge an electron from a metal, opened the field of quantum physics and won him the 1921 Nobel Prize in Physics. Secondary electron emission is a related phenomenon to the photoelectric effect, when an additional electron or electrons are emitted.

Sternglass wrote to Einstein about his observations. To his surprise, Einstein wrote back and invited him to come to Princeton.

Sternglass later noted in his memoirs how remarkable it was that, as a young man with no advanced degree in physics, he would be asked to meet with the most important physicist since Newton to hash out his theories.

Sternglass spent five hours with Einstein. The esteemed scientist wore baggy gray pants and slippers, hair seemingly electrified by his brainpower, just as Sternglass had seen in pictures. The two talked in German on the back porch and walked in the garden. Einstein took Sternglass to his study, where Einstein showed him some of his work toward a grand unified theory of physics, combining quantum and classical mechanics. Einstein bemoaned that he would never know if this work mattered. They also discussed the atomic bomb and Einstein's fears of it being used again.

In a 2013 story, the science publication *Nautilus* recounted that meeting and how Sternglass suggested that in secondary electron emission, every electron should be considered, not just the outermost ones (as is the case in Einstein's description of the photoelectric effect). Einstein reportedly said, "That sounds reasonable to me." Sternglass would probe this question for years. He was right.

They also spoke of neutrons, the transmutation of these nuclear particles, and the nature of matter. (Sternglass had his own theories.)

During their 1947 meeting, Einstein asked if Sternglass planned to go to graduate school in physics. Sternglass had been seriously considering this (against his mother's wishes), and said yes. Einstein admonished him. "Don't go back to school. They will try to crush every bit of originality out of you."

He then told Sternglass, "Always have a cobbler's job. Always have a job where you can get up in the morning, face yourself, that you're doing something useful for humanity. Because nobody can be a genius every day. Don't make that kind of mistake."

Sternglass said he came away from that meeting a changed man. He did go on to graduate school in physics at Cornell, but his PhD would be in applied and engineering physics.

The two would continue their conversation through letters in the years to come. For the most part, Sternglass wrote in English, and Einstein replied in German.

Nautilus called their correspondence "one of the 20th century's most important disregarded pieces of science . . . at least a generation ahead of its time." The magazine had Einstein's letters to Sternglass translated and described how Sternglass's experimental data from work at Cornell and later suggested a path to creating a sustainable energy source, using low-energy physics. It was known that a proton could absorb an electron and become a neutron, but Sternglass observed this happening at far lower energy than expected.

Sternglass knew that what he was doing was not explained by conventional physics. (And he would later be unable to replicate his experiments, though a colleague did.) Einstein proposed that Sternglass was seeing electrons act collectively to produce a neutron in a low-energy nuclear reaction. This idea was unprovable at the time, but recent research suggests it is possible.

The year Sternglass met Einstein and began this exchange of ideas, 1947, was pivotal for another reason: Sternglass and his first wife had a baby. In the child's first year, he began having developmental issues, like being unable to sit up. Sternglass's first thought was that it was a genetic condition, caused by radiation damage. His father was a dermatologist. In the 1920s, X-rays were often used to treat skin conditions like acne, but his father never wore a lead apron. It nagged at Sternglass that his dad had possibly damaged a gene and passed that on to Sternglass, who had passed it on to his child. The baby turned out to have Tay–Sachs disease and would die at 2 and a half. The tragedy presaged Sternglass's shadow life as an anti-nuclear activist. More immediately though, he continued his scientific life examing the atomic.

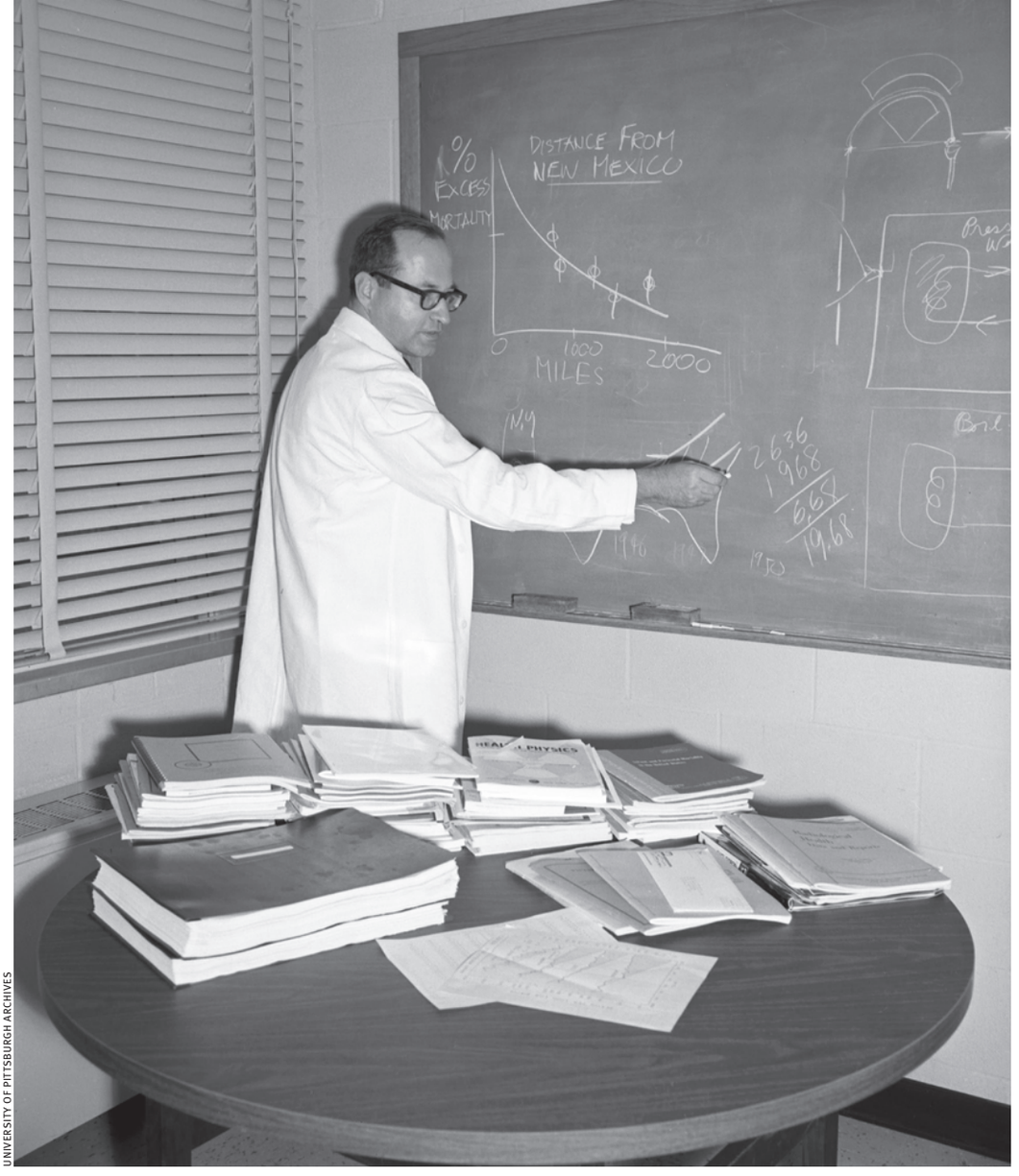
SHOOT THE MOON

The year before Sternglass finished his PhD at Cornell, Westinghouse's Research Division hired him to research nuclear instrumentation and investigate secondary electron emission and its applications in low-light imaging and other areas. The job meant moving to Pittsburgh, a city he would grow to love.

At Westinghouse, he also kept Einstein up to date on his experiments with secondary electrons. Einstein's last letter to him was in 1954, 13 months before Einstein's death.

In 1958, Sternglass—who had divorced and remarried—was honeymooning in Paris. While there, he took in an exhibition on the Peaceful Atom, the concept that the splitting of the atom could be used for things other than war. Yet Sternglass, like many others then, could not avoid thinking about the specter of nuclear war; and he began reading about fallout shelters, those hard symbols of Cold War hope. He decided they were useless since survivors who'd emerge would be contaminated and die as well.

By the '60s, Sternglass had become concerned about the public health effects of radiation—including low-level exposure. Other researchers, among them MDs, had concluded that low-levels of X-rays administered to pregnant women were significantly



UNIVERSITY OF PITTSBURGH ARCHIVES

The late Ernest Sternglass was known for his studies in low-light imaging, radiology, theoretical physics, and the dangers of radiation exposure to infants and others. His congressional testimony helped ban nuclear bomb testing.

increasing the rate of childhood leukemia and infant mortality. Studies showed that the exposure of the public from atmospheric bomb testing resulted in a similar level of exposure.

In 1963, Sternglass published a paper in *Science* on disease rates for children exposed to radiation while in the womb, some of the first epidemiological work on the impact of fallout from nuclear-bomb testing. He testified in front of the Congressional Joint Committee on Atomic Energy in favor of a treaty banning testing aboveground, underwater, and in outer space; the treaty was ratified. Sternglass felt that this was one of the major contributions of his life, according to his son, Daniel Sternglass.

Exciting things were happening at Westinghouse, too. A low-light imaging system based on his work went up on an early satellite and broadcast images back from space in 1963. Daniel Sternglass was roughly 5 at the time; he remembers his father jumping up and down in excitement when the images aired on their black-and-white television.

The technology was key to imaging several missions, including Apollo 11. During that first moon landing in 1969, Daniel Sternglass notes, NASA mission control commented to the command module astronaut in lunar orbit, Michael Collins, "I guess you're about the only person around that doesn't have TV coverage of the feed."

His work at Westinghouse resulted in nine patents. By the 1970s, several applications—including heat and radiation sensors and image intensifiers—would be developed from secondary electron emission tube work.

In the late '60s, space-related budgets were feeling cuts to NASA funds. So after a six-month sabbatical working with Nobel laureate Robert Hofstadter at Stanford University, Sternglass moved to the University of Pittsburgh School of Medicine to develop electronic imaging in medicine. He became a professor of radiology and director of radiation physics; the University also made him a professor of radiological physics in the Graduate School of Public Health.

Sternglass worked with a number of scientists at Pitt, including Donald Sashin, who was finishing a PhD in medium-energy physics at Carnegie Mellon University when Sternglass brought him into his lab. "He was [already] a very senior person, a very famous inventor," Sashin recalls. "The stuff he did at Westinghouse was brilliant."

They started with a laboratory in Presbyterian University Hospital. Later, they would add a second lab in Scaife Hall. Sashin, who's now an associate professor of radiology, called him "Dr. Sternglass," and Sternglass called Sashin "Don."

Ultimately, Sternglass led the group that developed advanced X-ray imaging at Pitt. This new approach used sensors, rather than film, and operated like a modern digital camera.

"A lot of people at that time were concerned about the effects of radiation on people," Sashin says. "He wanted to do something that would reduce radiation and still give good-quality pictures." Not only did their approach reduce the X-ray dose, it made it possible to process the images to highlight details, "much like Photoshop does today," notes Daniel Sternglass. The result gave cardiologists and oncologists the ability to see the true extent of a tumor's growth or other problems, one *Diagnostic Imaging* paper notes.

Sternglass and Sashin predicted in 1983 that digital systems would replace film. The advance was inevitable, they said, and would mean "radiology likely will be performed at the ultimate theoretical limit dictated by the quantum nature of X-rays, where every photon penetrating the patient is utilized to produce the highest quality radiographs at the lowest possible dose."

Carl Fuhrman (MD '79, Res '83), a Pitt professor of radiology, considered Sternglass

a visionary: "He was certainly a pioneer in digital imaging and its potential for reducing doses of radiation, at a time when most thought that X-ray film would never be replaced."

The Sternglass-Sashin partnership lasted for nearly 30 years, well into Sternglass's "retirement," even after his wife took a job at Indiana University. (Marilyn Sternglass would develop a model for teaching writing; it's based on having students write about their own lives.) The Sternglasses moved to Bloomington, Ind., but the retiree continued to come back to the Pitt lab to work. In all, Sashin and Sternglass earned five patents for their research together, the last of which included David Gur, an ScD Pitt professor of radiology.

Sternglass had many interests. He took great pleasure in sailing—being out on the water in nature and being driven by the elements. He was able to enjoy the pastime on his son's boat in Ithaca until very late in life. His children remember him as involved with their lives.

When Daniel Sternglass was young, they built large model airplanes and rockets and entered them into competitions. He had Daniel help him with small projects around the house.

Once, he even let Daniel take apart the family television to see if he could figure out why it stopped working. Daniel had parts spread all over the living room. He realized which vacuum tube had stopped working, and that he had the same tube in the basement. He raced downstairs, retrieved the tube, and got the television back together and running. Daniel went on to become an engineer and technology entrepreneur.

Daniel's sister, Susan Sternglass Noble, remembers the sabbaticals and other travel, especially their time in Israel and in Palo Alto (where their backyard had a lemon tree in it). Her love of learning languages and travel led her into global money management; she has lived in London for 25 years and will soon take up a post in Hong Kong. Both children attended the Fanny Edel Falk School, Taylor Allderdice High School, and then Cornell.

IMPASSIONED ACTIVIST

Outside of radiology circles, Sternglass was better known for his activism. In 1967, Pittsburgh became ground zero in a debate over the Plowshare Program, an effort by the U.S. government to find peaceful uses for atom bombs. One was Project Ketch, a plan to use atom bombs to create an underground storage cavity for natural gas in central Pennsylvania. Sternglass wrote an op-ed column in the *Pittsburgh Post-Gazette* arguing against it. That same week, he attended a public meeting involving high-ranking officials. Henry Pierce, the *Post-Gazette*'s senior science correspondent, was given the chance to ask a question. Instead, he yielded the microphone to Sternglass, who made a statement about the risks to cow milk production and other potential issues. That sparked intense debate over the project, which was later scotched.

Sternglass also published a 1969 article in *Esquire* arguing that fallout from advanced nuclear weapon tests could have severe repercussions for infant health across the United States. The article was immensely controversial, not least because some of the sources of Sternglass's statistics voiced concerns about the way he had used their numbers. His critics could be intense, his son Daniel Sternglass remembers. "I was maybe in seventh grade, and I said to him, 'Don't these personal attacks bother you after a while?'" And he said to me, 'Sometimes you have to judge a person by their enemies.'"

He clashed regularly with U.S. government and industry officials about issues pertaining to nuclear fallout and what levels of emissions from nuclear power plants were safe.

Sternglass and Pitt physicist Bernard Cohen engaged in a heated debate about whether fallout from a Chinese nuclear bomb test might affect Pennsylvanians. As reported by Pierce in the *Post-Gazette*, Sternglass and another Pitt faculty member, biologist Frederick Gottlieb, expressed concern about the impact of contaminated fresh milk on pregnant and breast-feeding women and their children; Cohen said he was not "personally alarmed" at the risks. Sternglass said, sarcastically, "Are you pregnant?" And under his breath he snorted, "Personally alarmed! Humph!"

The two continued butting heads over the years. As recently as 2008, Cohen wrote a rebuttal to a Sternglass op-ed in which Sternglass suggested that two Pennsylvania nuclear plants should be converted to run on natural gas.

Sternglass was afforded the academic freedom at Pitt to pursue issues and ideas he felt were important, beyond medical imaging. At times, the University stood up for him when government officials were unhappy with his often controversial positions on the health effects of living in a nuclear age, including preparations for war and low-level radiation exposure. And for this he was very grateful, his son and daughter say.

Einstein told Sternglass, "Always have a cobbler's job. Always have a job where you can get up in the morning, face yourself, that you're doing something useful for humanity. Because nobody can be a genius every day. Don't make that kind of mistake."

In 1997, Sternglass published a memoir (*Before the Big Bang*), in which he takes the reader through a long list of eminent physicists he got to know through his work and training, including Nobel laureates Louis de Broglie, Richard Feynman, and others. He also outlines his ideas about the origins of the universe and particle physics. Sternglass's theoretical models of the universe's creation predict that the Higgs boson particle would not exist. He later believed that Higgs boson was a highly excited electron-positron state, and that it was unclear what the final resolution of the structure of an elementary particle might be.

Sternglass once told an interviewer that his ideas might not be validated until long after he was dead. That, he said, was all right. "You have to take the long view." ■

December 5, 1950

Mr. Ernest J. Sternglass
518 Dryden Rd.
Ithaca, N.Y.

Dear Mr. Sternglass:

Your results concerning the photoelectric effect argue convincingly for your hypothesis. Your investigation of the concept of time appears to me to be reasonable in some respects. In particular the discussion about Kant is very worthwhile reading. I believe however that you are overstating Kant's contributions, even as important as they are. Surely it is true that the space-time concepts cannot be derived through a process of logic from experiences, as some empiricists have believed and some still believe. But this does not apply just to space, time and causality, but to all concepts, to everything communicable through language. On the other hand, it is not correct that there are concepts a priori in the sense that thinking were impossible without these concepts. It is true only that thinking is a work with concepts, that therefore without concepts thinking is impossible. About the nature of these concepts, nothing can be known a priori. Under the influence of the contemporary knowledge, Kant was doctrinal in this respect, which is quite well understandable.

With kind regards to you
Your
Albert Einstein.

After meeting with Albert Einstein in 1947, Ernest Sternglass continued their conversation about theoretical physics (and, at times, philosophy) through letters. Typically, Sternglass wrote in English, and Einstein responded in German. These letters were translated in 2013 by Hans Jochen Trost for *Nautilus* magazine.

August 30, 1951

Mr. Ernest Sternglass
518 Dryden Rd.
Ithaca, N.Y.

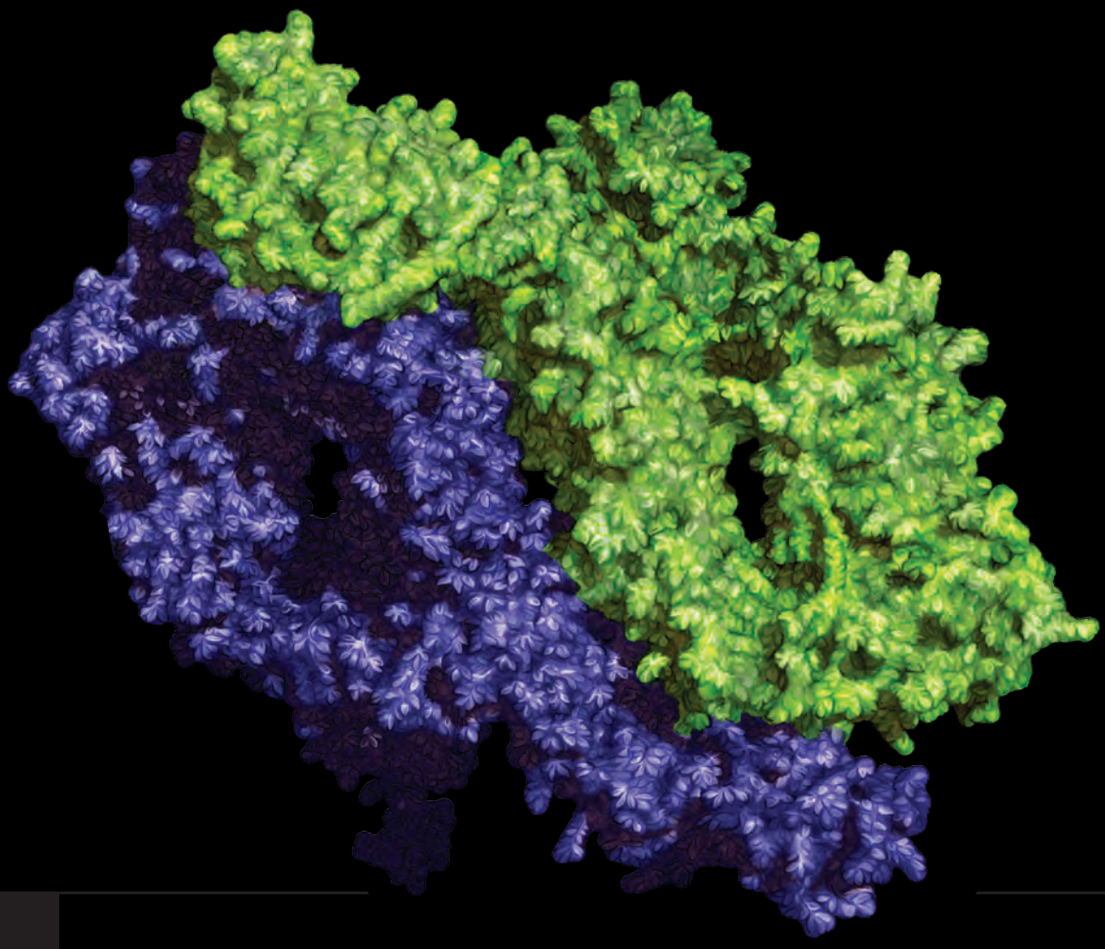
Dear Mr. Sternglass:

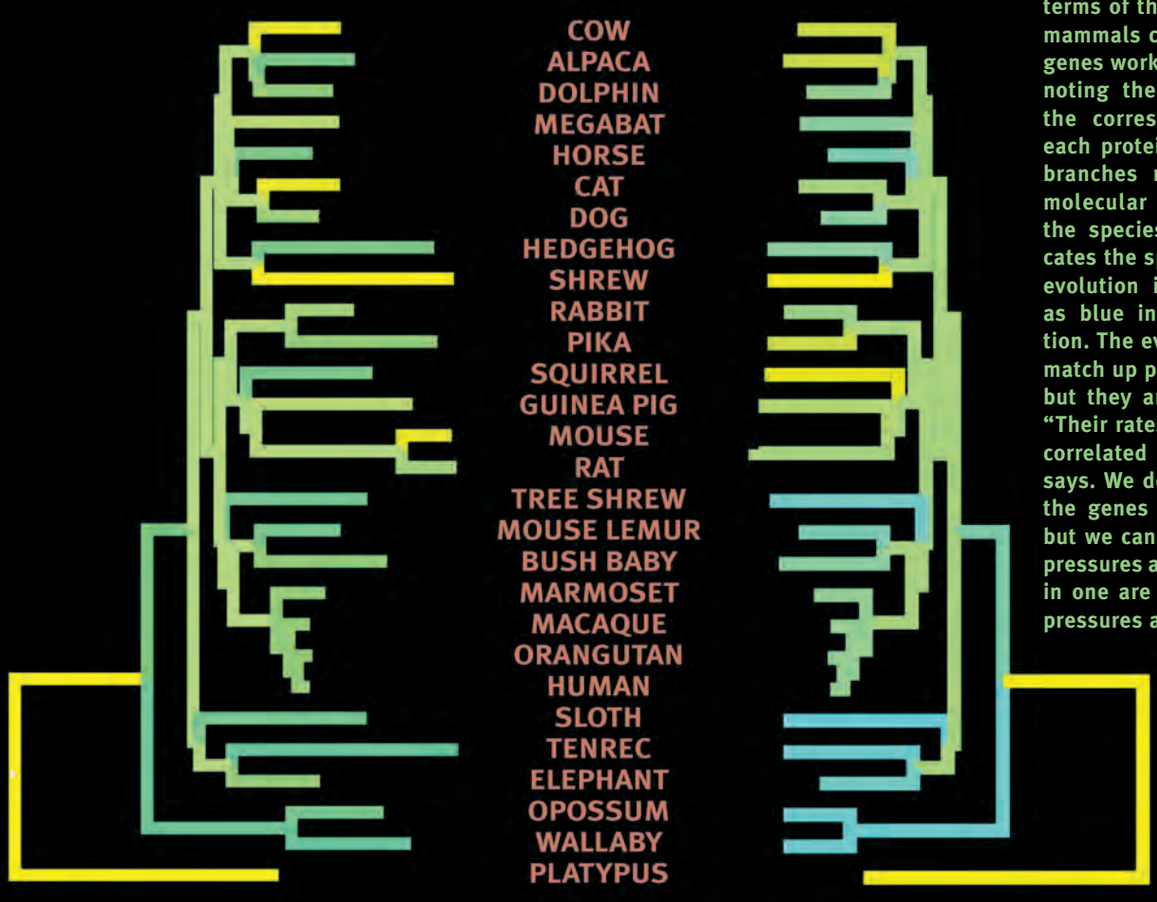
In order to form a neutron, an electron is needed that has passed through 7.8×10^5 Volt in order to provide the required additive energy. I can hardly imagine that electrons of such high voltage are formed in your tubes.

Perhaps reactions occur in which multiple electrons simultaneously transfer energy to one proton. According to quantum theory, this is somewhat conceivable, although not probable.

In any case, your result is important and further pursuit of the method is necessary. Might it not be advantageous to use homogeneous cathode rays and have them impinge onto something like solid paraffin, in order to gain better control of the kinetic energy of the electron?

With kind regards to you
Your
Albert Einstein.





SEE THE PRESSURE

Here you can see two proteins involved in DNA repair. Through modeling, we know that these proteins interact with each other physically, and through Nathan Clark's ERC (or evolutionary rate covariation) scores, we can see how closely related they are in terms of their co-evolution in the mammals compared here. "These genes work together," says Clark, noting the many similarities in the corresponding trees below each protein. The lengths of the branches represent the typical molecular divergence between the species. Bright yellow indicates the species that show rapid evolution in each gene, whereas blue indicates slower evolution. The evolutionary rates don't match up perfectly for each gene, but they are remarkably similar. "Their rates of evolution are very correlated with each other," he says. We don't know exactly why the genes should be so similar, but we can deduce that whatever pressures are triggering evolution in one are likely to be the same pressures acting upon the other.

UNDERSTANDING HOW GENES CO-EVOLVE IN ANIMALS COULD REVEAL LINKS BETWEEN HUMAN DISEASES | BY JASON BITTEL

CO-EVOLUTION'S WITNESS

It all begins with a mutation.

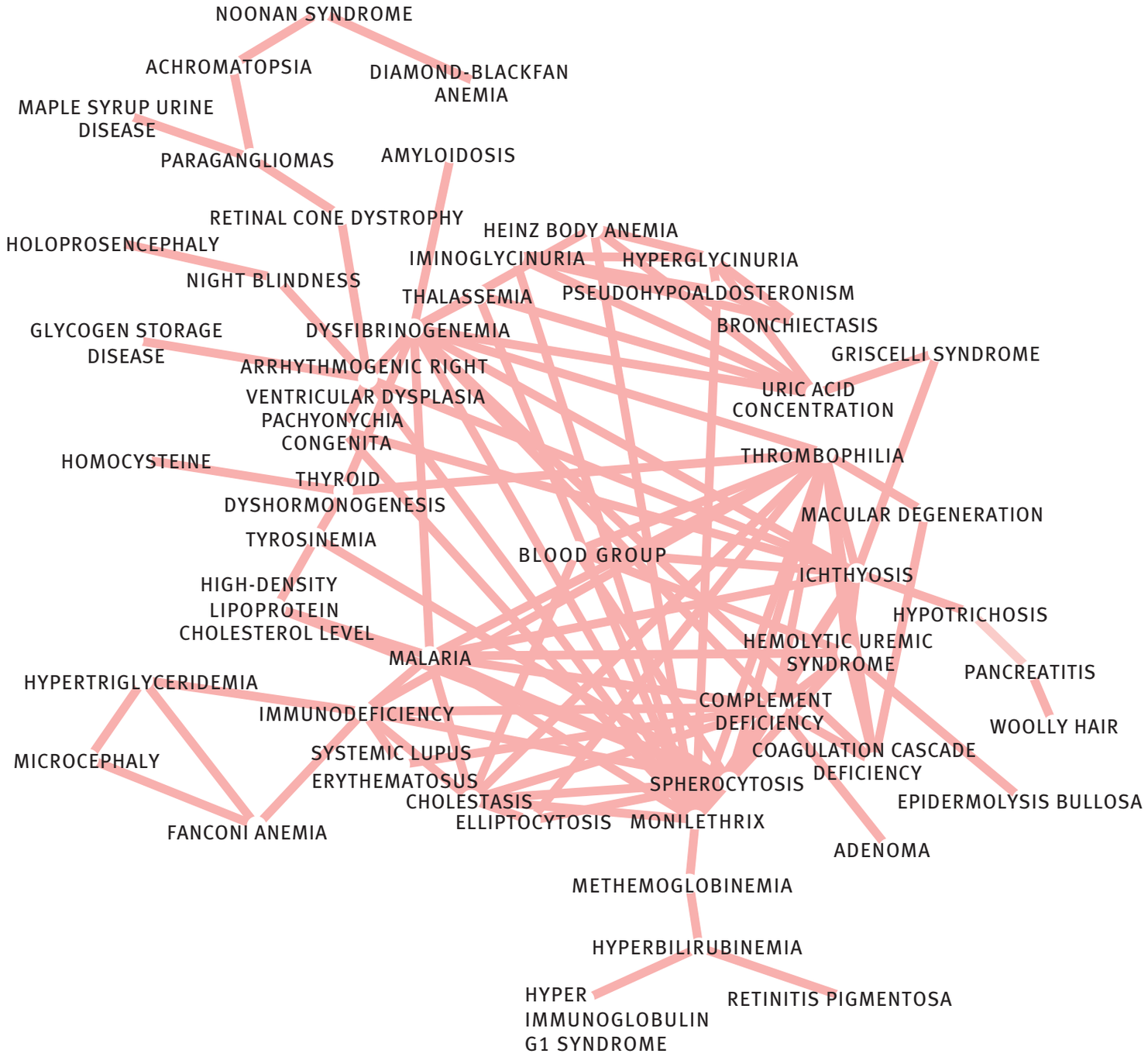
A butterfly emerges from its chrysalis with a feature unlike that of any other butterfly, like perhaps a slightly lighter wing. If this new morphology helps the insect in some way—say, allowing the butterfly to gather more nectar or more effectively evade predators—then the chances of this lighter-wing gene getting passed on increase.

This is one of the simplest demonstrations of evolution at work: tiny, incremental changes caused by chance and passed down through generations at a nearly imperceptible pace.

But what if I told you we can see evolution at work in even smaller, more mysterious ways? Indeed, what if I told you scientists are learning how to track the path of evolution in our very cells, genes, and proteins?

The cabbage white butterfly (*Pieris rapae*) is considered a crop pest in the United States, but it may prove useful for scientists studying how organs evolve.

PAGE 28 GRAPHIC: COURTESY NATHAN CLARK AND NOLAN PRIEDIGKEIT
PROTEIN AND BUTTERFLY ILLUSTRATIONS: MICHELLE LEVEILLE



"Proteins have their own traits," says Nathan Clark, PhD assistant professor of computational and systems biology at the University of Pittsburgh School of Medicine.

"It's not morphology we're used to looking at, like the wing. But proteins have ways of sticking to each other, transporting things (like ions and amino acids) through their middles, and physically attacking each other."

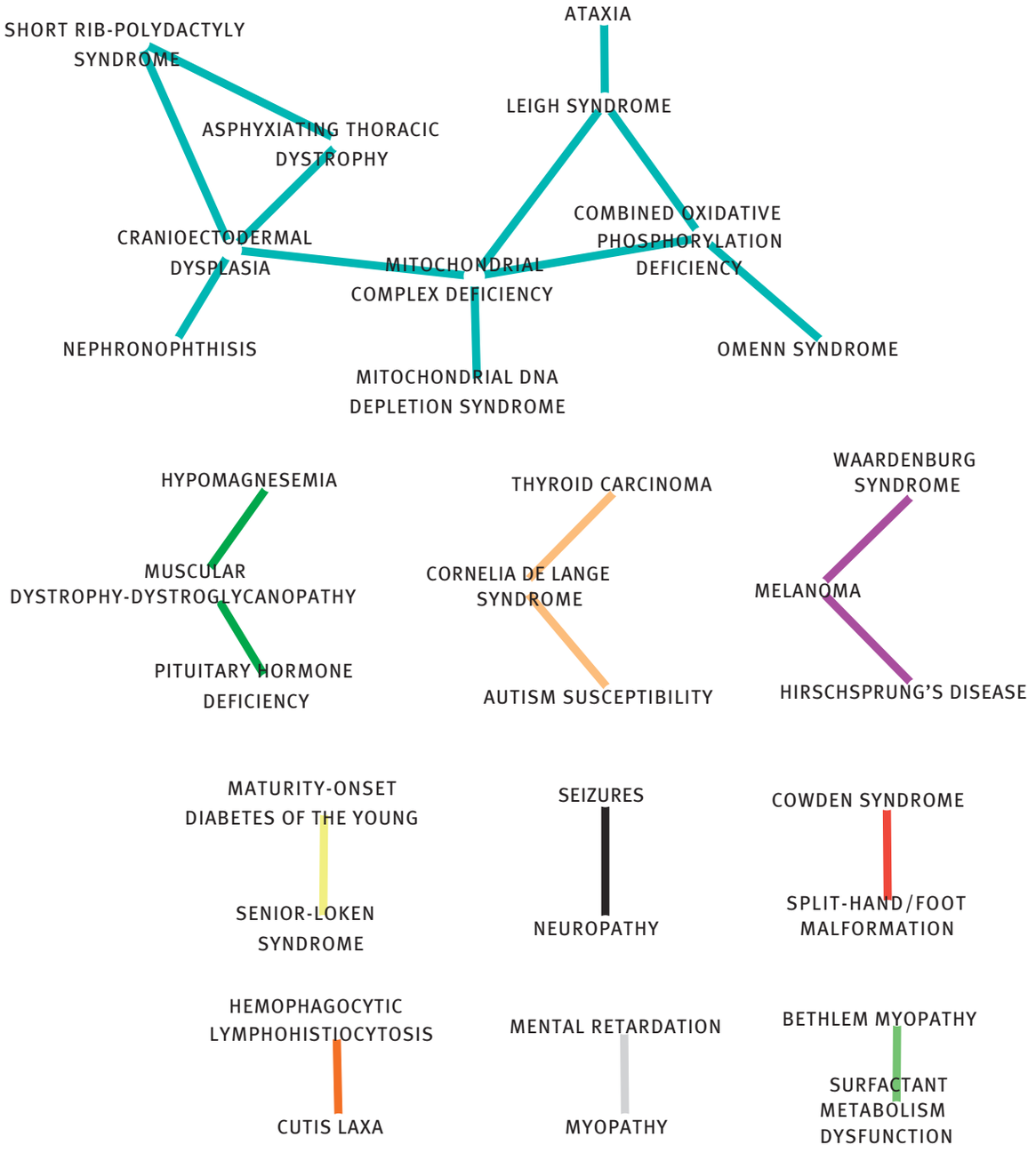
You could almost compare it to all the little critters in a drop of pond water, he says. Each cell is jam-packed with tiny actors, all of them trying to impose their evolutionary will on the others.

But while molecular biologists and structural biologists would look at what these components are doing presently, Clark is learning how proteins get their individual traits by looking into the past.

By analyzing present-day genomic sequences through their relations to one another—in 33 different mammals, from elephants to platypuses to humans—Clark can infer the historical picture and pinpoint areas where genes show signs of rapid evolution. The degree to which these hot spots match across the animal kingdom is measured using something called ERC, or the "evolutionary rate covariation."

For instance, if genes related to a particular function, say, color vision, are evolving at a similar rate between two species, then their ERC score would be quite high. Likewise, a high ERC score across a collection of related animals implies that they are all responding to a similar evolutionary pressure.

It may seem counterintuitive that species that are seemingly so different from us might provide insight into human diseases, but it is easy to forget how similar we are on the molecular level. "The genes that form a retina in a mouse are the same as the ones that form a retina in a kangaroo," reminds Clark. And by evaluating the

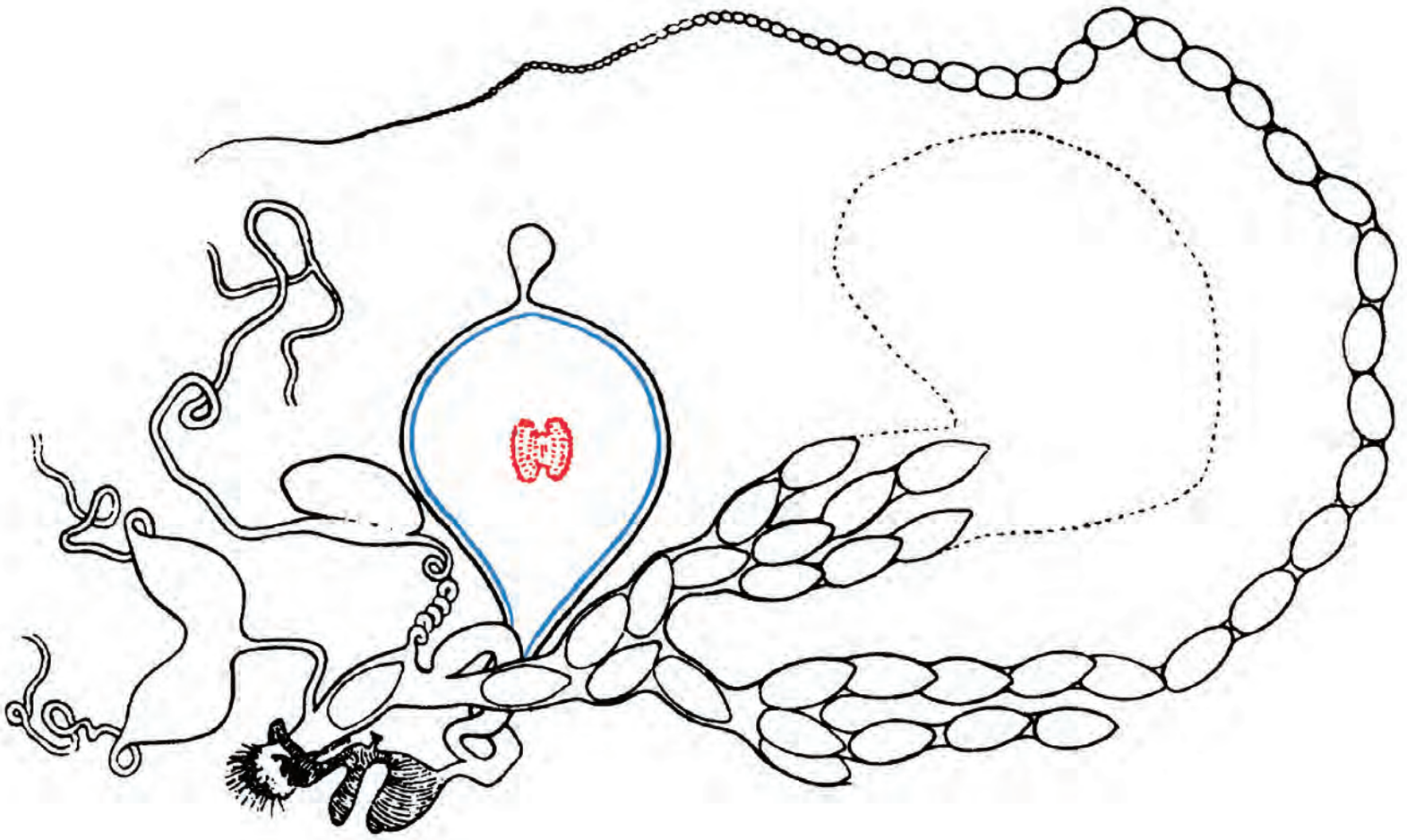


WHAT IS LIKE THE OTHER?

Waardenburg syndrome, Leigh syndrome, thyroid dyshormonogenesis—these are words you hope to never hear in a doctor's office. These graphics include a veritable Who's Who of diseases ranging from the unfortunate to the life-threatening. Even Clark admits he'd never heard of some of them before their ERC scores caused them to bubble up to the top of his list of correlations. (The ERC scores, you may recall, measure rates of evolutionary change at the genetic level.) On this page, each line drawn between items reflects a correlation between ERC scores. The big red spiderweb on the opposite page represents diseases, biological processes, and traits, many of which could be broadly classified as having something to do with our blood and skin. On the upper right of this page in light blue are diseases representing ciliopathies (in which cilia don't work properly) and their association with mitochondrial disorders—a connection scientists had only guessed at before. In dark green, we see heterogeneous disorders with similar symptomologies and then a bevy of one-to-one links. Although Clark says this page's graphic represents the strongest connections found out of the 48,205 disorder pairings he studied, he makes no bones about them being correlations—links suggested after rigorous data analysis. They are not reflective of shared genes, per se, or definitive associations.

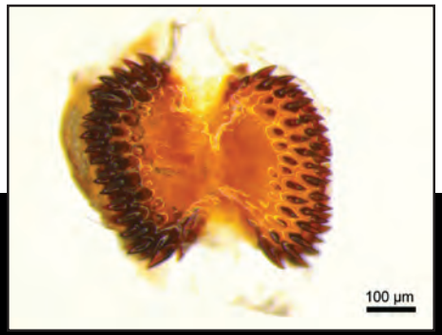
SEPARATED AT BIRTH?

Perhaps it isn't so surprising that Clark's research should find what appear to be patterns of evolutionary connections between the genes responsible for different blood disorders. What is surprising, however, is the connection his data suggested between other disease pairs, such as Hirschsprung's disease and melanoma. In case you're not familiar with it, Hirschsprung's is a congenital condition in which a baby is born without the proper assortment of nerve cells that govern the colon. Melanoma, on the other hand, is a deadly serious skin cancer. There's nothing in the medical literature that would indicate an overlap between these two afflictions—except for one single observational note published by a doctor who noticed that families with Hirschsprung's disease also seemed to suffer from melanoma. Clark thought this was interesting, so he went digging for more information. "It turns out that melanocytes, which form our pigment and are of course important in melanoma, come from the exact same progenitor tissue as nerves." This means that while diseases of the colonic nerves and skin may appear disconnected, when you look at the way they manifest in a fully formed human, they would have once been intimately related in the much smaller world of the developing embryo. Realizing this connection may not lead to the cure of either disease any time soon, says Clark, but it could at least encourage families with Hirschsprung's disease to get vigilant with the sunblock.



THIS PAGE: PEN AND INK ILLUSTRATION OF THE PIERIS RAPAE FEMALE REPRODUCTIVE TRACT WITH SPERMATOPHORE AND SIGNA (LORKOVIC, Z. 1985 [82]). INSET BURSA: COURTESY NATHAN MOREHOUSE AND MELISSA PLAKKE. OPPOSITE PAGE: BUTTERFLIES/MICHELLE LEVEILLE.

What looks like a sea monster from the deep is actually the reproductive tract of the female butterfly. The round, blue-ringed bulb at the center is the bursa copulatrix, the reproductive organ Nathan Clark and Nathan Morehouse are investigating. In the bottom right is the signum, a toothed structure within the bursa that "chews" open the spermatophore.



co-evolutionary signatures of genes related to these areas, we might be able to zero in on the individual genes or groups of genes that contribute to, say, retinal disease. But it gets even more interesting.

In a paper published in the February issue of *PLOS Genetics*, Clark and MD/PhD student Nolan Priedigkeit used these signatures to show that there are some surprising evolutionary connections between what we think of as separate diseases.

"When you look at diseases affecting someone's retina," he says, "it actually turns out that similar genes are causing problems in people's kidneys."

The link? Something called ciliopathy, or a malfunction of cilia (a cellular structure found in both retinas and kidneys). Scientists had suspected a link between these disparate diseases, but Clark's technique of finding correlations between ERC scores revealed the specific genes that are functionally related between the two diseases.

"If we can discover unforeseen connections between diseases, then that might lead to innovations in how we treat those diseases," says Clark. "For instance, if a treatment works at the molecular level of one disease, it might work for the other disease, as well." He adds that another way this approach could have therapeutic potential is drug repurposing—that is, taking a drug that's already approved for the treatment of one disease and discovering its usefulness in treating another.

Systems-biology approaches to health, like this sleuthing out of molecular-level relationships between seemingly unrelated diseases or conditions, are revealing all sorts of interesting avenues for scientists like Clark to investigate. However, he warns that it's no silver bullet for discovering the origins of disease. Instead, he envisions this method being just one layer in a larger, integrated network of approaches biologists can tap into.

In the meantime, Clark keeps at it, getting glimpses of the past to pull out all sorts of secrets about life.

It all starts with a mutation. ■

THE NEW ORGAN ON THE BLOCK

Clark says that four areas of the genome always tend to stick out when he's looking for rapidly and adaptively evolving genes: those related to olfaction, immune system function, detoxification, and sexual reproduction. Recently, Clark teamed up with Nathan Morehouse, an assistant professor in the Department of Biological Sciences, for a project investigating the evolutionary origins of a reproductive organ found in butterflies.

"In the same way that the genes involved in diseases affect the evolution of other genes, male and female butterflies have a very similar kind of relationship," Clark says. For instance, genes from viruses and the hosts they infiltrate are perpetually upping their armaments in attempts to best each other. In butterflies, this push-pull relationship can be seen during mating. Males give the females a spermatophore, or a packet full of sperm and nutrients. But the gift isn't free—it comes covered in a hard shell that takes three days to digest, during which time the female cannot mate again. In response, the females of the species *Pieris rapae*, or the cabbage white butterfly, have developed an organ known as a bursa copulatrix to digest the spermatophore more efficiently, allowing the females the freedom to mate again.

"Most organs were formed hundreds of millions of years ago, so we don't have a chance to see how they must have come about. The stomach has been there since we were worms," says Clark. "But here's this new organ that pops up." (Quick note: "New" is a relative term when you're talking about evolution. The bursa is likely millions of years old.) The hope is that if they can sequence enough species of butterfly, then Clark can use the same techniques he did with his disease study to pull back the curtain of history on the co-evolution of cabbage butterflies. "We have [the sequences of] most species in hand and will produce the others within the year."

STEWARDSHIP IS LOCAL

20-SOME FOUNDATION-BUILDING MOMENTS FROM THE 20TH CENTURY | BY ROBYN K. COGGINS

Schools of medicine are in the business of looking forward—to the possibilities of Big Data, increasingly precise medicine, regenerating body parts . . . The list of palpable ways to enhance human health goes on.

Given all that 21st-century-and-beyond speculating, we thought we'd pause for a moment to take a look back. As the saying goes, hindsight is 20/20, and it's in the rearview mirror that we can really see how far this med school has come.

Unlike some of its peer institutions, the University of Pittsburgh School of Medicine did not come of age with a large endowment. It has owed much of its development in the past century to the stewardship and periodic gifts of locals, especially foundations. Turns out, foundation donations are a very Pittsburgh way of giving. Hundreds of foundations—both local and national—support the school. Those funds amounted to $21 million in the 2013/14 fiscal year.

Clearly, numerous industry partners, alumni, and other donors provide invaluable support to the school, as well. There are so many gifts to Pitt med, in fact, that we can't possibly list even just the foundations that have donated throughout the years. But today, we're highlighting some of our neighbors who have helped Pitt med write history. (We bet you'll recognize a lot of these names, as they've helped shape Pittsburgh's legacy, too.)

Before we focus on local foundation gifts, it's worth mentioning another grant that greatly influenced this school and the way physicians are trained in this country. Abraham Flexner, funded by the Carnegie Foundation for the Advancement of Teaching, visited 155 American and Canadian medical schools between 1908 and 1910 to evaluate the state of medical education (which was fairly dismal then). He audited dozens of schools, eventually producing *The Flexner Report*, in which he championed the need for professionalism, research, updated facilities, and higher standards and expectations all around. Flexner deemed Pitt's medical school (then the Western Pennsylvania Medical College) one of the few laudable schools he visited. He suggested schools merge with local universities and that local philanthropy would be the road to solvency (many schools were in precarious financial situations). Here we note 20-some ways Pittsburgh foundations rose to the challenge and shaped this medical school in the past century.

1920s **As the medical school professionalized, the cost of education and research skyrocketed. The school went from the most solvent part of the early University to deeply in debt by the 1920s. Thankfully, in 1929, the Maurice and Laura Falk Foundation stepped in with annual $5,000 grants to help keep the school afloat, plus occasional bonus funds at the foundation's discretion.**

1930s **The newly founded Buhl Foundation made a three-year gift of $30,600 to Pitt med to support gynecology's Harold A. Miller in his research on eclampsia and other complications of pregnancy.**

Additionally, the Maurice and Laura Falk Foundation donated $2.1 million to the School of Medicine and $900,000 to the Falk Clinic.

In 1938, the Carnegie Foundation gave $3,500 to support anatomist Davenport Hooker's research into fetal responses.

That same year, the G.N. Stewart Fund donated $10,700 for endocrinology studies of pathologist Julius M. Rogoff and, as the nation further ramped up to a manufacturing boom, the Sarah Mellon Scaife Foundation funded industrial medicine research at the new Addison H. Gibson Laboratory.

According to Barbara Paull's *A Century of Medical Excellence: The History of the University of Pittsburgh School of Medicine*, these gifts, combined with others from individuals, signaled a kind of watershed moment for research efforts in the school. Dean William S. McEllroy, who foresaw Pitt med becoming a research powerhouse, considered these monies indicative of a trend of giving.

It seems McEllroy was right—much of what Pitt med is now known for came about after generous midcentury funding:

1940s **The Buhl Foundation helped establish the Division of Research, ensuring a core faculty who had no teaching or departmental obligations so they could focus on the bench.**

In 1947, the Renziehausen Foundation gave $500,000 for a diabetic ward named after their family, and Children's Hospital of Pittsburgh was able to recruit physician-scientist Thaddeus Danowski and two associates to study childhood diabetes.

That same year, the Addison Gibson Foundation donated $100,000 for animal research quarters, with the Scaife family and others committing $25,000 to expand and complete the Addison H. Gibson Laboratory.

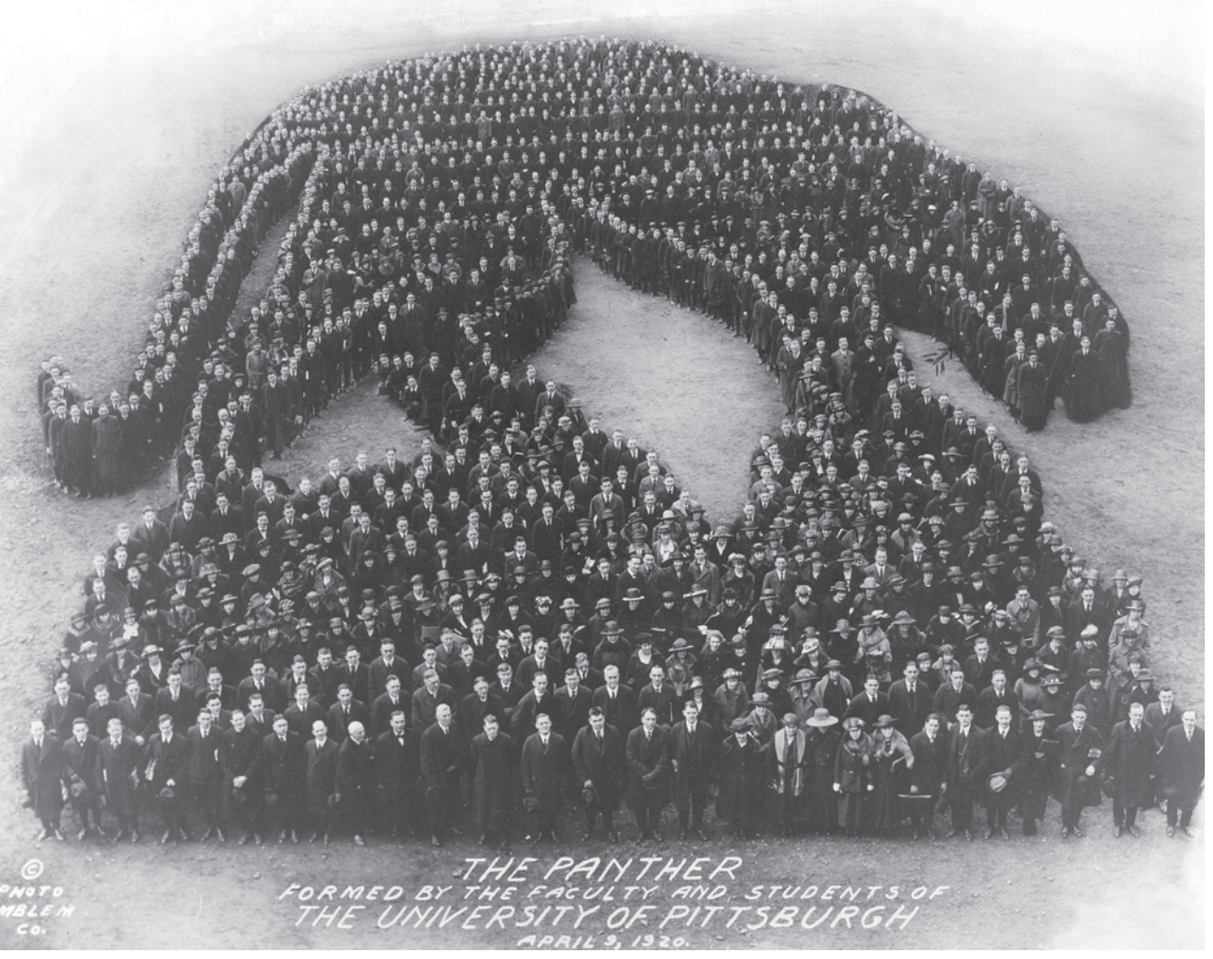
And it's hard to imagine where psychiatry—both at Pitt and the field itself—would be without the Richard King Mellon Foundation's early goal of creating a "first-rate health center in Pittsburgh." Their cash infusions in 1947 led to new recruits in psychiatry. You may have heard of them: Henry Brosin, who directed the Western Psychiatric Institute and Clinic (WPIC); Arthur Mirsky; and Benjamin Spock, who established a childhood development clinic with Margaret McFarland (mentor to Fred Rogers) and brought on eminent psychologist Erik Erikson to lecture monthly at Pitt.

In 1949, the Falk Foundation endowed a medical library with a $300,000 grant, which prompted an anonymous donor to give an additional $3 million in matching funds. We now know the fruits of those donations as the Falk Library of the Health Sciences.

1950s **Three big-name foundations donated millions as part of a five-year promise to build the School of Medicine's endowment: A. W. Mellon Educational and Charitable Trust ($5 million), the Richard King**

UNIVERSITY OF PITTSBURGH, 1920.

NOTE: Grants have not been converted to current U.S. dollar values. Curious about what those would be? See 1.usa.gov/1T3WpcY.



Time and time again, Pittsburghers have come together to support the creation of a premier medical school.

Mellon Foundation ($1.25 million with more than $3.8 million from Richard King Mellon), and the Sarah Mellon Scaife Foundation ($5 million). Scaife Hall opened in 1956.

1960s The Richard King Mellon Foundation gave more than $1 million to support the Department of Physiology, which hired Ernst Knobil—his research on reproductive endocrinology helped bring about hormonal contraceptives. A $4 million gift from the foundation enabled Pitt to recruit surgery chair Henry Bahnson and upgrade the surgery department. (Bahnson would be instrumental to attracting Thomas E. Starzl to Pitt decades later.) An additional 1969 donation endowed the chair of psychiatry.

A $1 million donation from the Maurice and Laura Falk Foundation in 1964 helped expand and renovate their eponymous clinic.

In 1966, Pitt became a member of the Commonwealth of Pennsylvania's system.

That same year, the Richard King Mellon Charitable Trust granted $3.23 million to establish the Department of Neurology.

On the heels of that gift, Sarah Mellon Scaife Foundation gave $375,000 to expand the Department of Pharmacology, which the foundation had helped launch with a $220,000 grant in 1963. Gerhard Werner, head of the program, applied the money to training facilities and research in neurobiology and psychopharmacology.

Freedom House Ambulance Service, instigated with a grant from the Maurice Falk Medical Fund in 1967, innovated modern prehospital care, as did Pitt emergency medicine and critical care docs, notably Nancy Caroline and Peter Safar.

1970s After some exhilarating Super Bowl wins, the 1970s would become a challenging time for Pittsburgh: Toward the end of the decade, the steel industry began to collapse, and funding for many projects dwindled. The grant records for the University are scattered from these times. But we know that Thomas Detre, recruited in 1973, was building a psychiatry powerhouse. Pitt would never be the same. The Mellon foundations buttressed these efforts. Their support helped position Pitt psychiatry, which would rank third in National Institute of Mental Health funding by 1983. (Pitt has remained among the top NIMH funding recipients since then.)

1980s The Claude Worthington Benedum Foundation helped fund the clinical program in geriatric medicine with a $1 million grant. Those efforts would later become the UPMC Senior Care-Benedum Geriatric Center in UPMC Montefiore—then one of the largest clinical geriatrics programs in the United States. Today, the University's research portfolio on aging is broad and deep, encompassing faculty efforts at 16 schools.

The Staunton Farm Foundation gave $1.5 million to create the Staunton Professor of Pediatrics and Psychiatry, which is now held by Beatriz Luna, whose laboratory focuses on the brain basis of adolescent behavior.

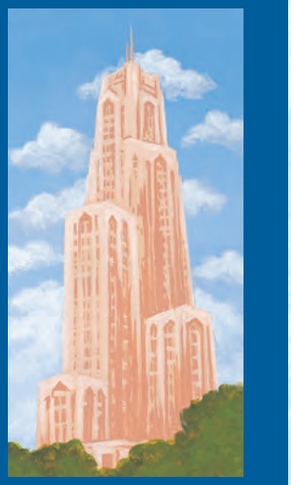
The Richard King Mellon Foundation made a series of multimillion-dollar gifts throughout the next few years to go toward a new research-based cancer center that would be run by new recruit Ronald Herberman. Like geriatrics, this was envisioned as a huge interdisciplinary program (well before being interdisciplinary was fashionable) by Thomas Detre, who had just become the University's senior vice chancellor for health sciences. Detre would go on to create an elite academic medical center here out of Pitt affiliated hospitals.

1990s A 1999 $2 million pledge from the Heinz Endowments, matched by the Richard King Mellon Foundation and Chicago's William G. McGowan Charitable Fund, went toward a new Southside facility for Pitt and UPMC's McGowan Institute for Regenerative Medicine.

Rounding out that last year of the century, the Henry L. Hillman Foundation, the Hillman Foundation, and Henry L. Hillman himself donated $10 million to establish the Hillman Cancer Center in Shadyside. It is now a National Cancer Institute–designated comprehensive cancer center and home to the University of Pittsburgh Cancer Institute.

Additionally, the Scaife Family Foundation and the DSF Charitable Foundation contributed $10 million to establish the Pittsburgh Institute for Neurodegenerative Diseases.

This medical school has had some extraordinary, and prescient, neighbors. ■



CLASS NOTES

'60s

Bertram Lubin (MD '64) is well known for his research in sickle cell anemia, his public health initiatives regarding screening newborns for hemoglobin disorders, and his success in starting one of the first national cord blood banking programs for families whose children have blood disorders. Lubin, president and CEO of UCSF Benioff Children's Hospital Oakland, Calif., one of the top 10 NIH-funded children's hospital programs in basic, clinical, and translational research, received Pitt's Hench Award in 2007. He's now focused on political advocacy for underserved populations and building a bridge between the technology sector and medicine. Lubin, who serves on the UC Berkeley Engineering Advisory Board, says that engineering innovations can help distribute health care more broadly and address income and health disparities.

Lubin

He once thought he might become a jazz drummer instead of a doctor. In Pittsburgh, he played jazz clubs in the Hill District; now he still breaks out the kit on occasion to drum up support for a worthy cause.

'70s

Sheila Efron Taube (Microbiology PhD '70) spent most of her career at the National Cancer Institute, where she rose to director of the Cancer Diagnosis Program. Her team worked "to bring the value from the human genome program into molecular diagnostics, make sure that there was an appropriate method to evaluate diagnostics, and ensure that they were clinically relevant," Taube explains. They established large collections of human tumor samples that were used in several pivotal studies, one of which substantiated the Oncotype DX Breast Cancer Assay test that significantly changed treatment for breast cancer. Her work has also influenced her children's view of science, she reports. Her daughter is a PhD in materials science. Years ago, when her son learned that a man who was a family friend was a neuroscientist, the boy exclaimed, "Oh, boys can be scientists, too?!"

'80s

Stephen Haines (Neurological Surgery Resident '81), professor and chair of neurosurgery at the University of Minnesota, has been recognized as a top doc again and again (included in Best Doctors in America since 2000, among other nods). But what he's even more passionate about is pushing clinical research forward in his field. Last November he coauthored a paper in *Neurosurgery* challenging the idea that certain age-old treatments are so obviously effective that no evaluation is required—or even possible. Back in 2002, the journal had run an op-ed that scoffed at the idea—it was a satire on the effectiveness of parachute use (lots of luck recruiting for your double-blind trials!). But Haines's recent paper concluded that even old-faithful practices can and should be scrutinized—using historical data. He demonstrated as much with careful analyses of an old-faithful intervention (treating acute epidural hematomas) ... as well as of parachute use itself. (For the curious: Mortality rate for this kind of hematoma averages 98.54 percent without treatment, 12.9 with. Mortality for skydiving with a dud parachute is 74 percent; with a good one, it's between 0.0011 and 0.0017 percent.)

Throughout the past 23 years, **Jim Withers** (MD '84) has fueled a movement. As founder and medical director of Pittsburgh's Operation Safety Net, which provides medical outreach to people who are experiencing homelessness, as well as of the International Street Medicine Institute, he has helped doctors and medical students around the world create their own street medicine programs. Withers continues to walk the streets of Pittsburgh with volunteers, including Pitt med students. "I find the closer you get to people, the more hope you get, and the more solutions you can find by working with them," he says. "And I find that really satisfying." Withers was recently featured on *CNN Heroes*.

Withers with a friend

'90s

"More people in the world have cell phones than have toilets," says **Elizabeth McGovern** (MD '97)—a fact that, ironically, is aiding in the success of her most recent global health project. As founder and executive director of the NGO WEEMA International, she works with local communities in southwestern Ethiopia to provide clean water, education, economic opportunity, and health care. Recently, WEEMA and collaborators began supplying health care providers with smartphone applications that will enable them to communicate with supervisors and other colleagues in the field, create medical records, and keep track of pharmaceutical supplies. "I've volunteered abroad as a doctor [previously], and it felt like a Band-Aid solution. You go in and dispense medication for a couple of weeks, then leave. I'd prefer to offer solutions that strengthen the existing infrastructure." When not in Ethiopia (she makes the trip about three times a year), McGovern works as a family physician in urgent care at a community health center in Lynn, Mass.

McGovern

'00s

A study that ran in *Pediatrics* in January showed that strict rest after a concussion had no added benefit. One of its authors, **Danny Thomas** (Pediatrics Resident '05, Pediatric Emergency Medicine Fellow '08), says that since the study, "I don't focus on the symptoms. I focus on the rehabilitation. I want them to recover safely and get back to school." Thomas is an assistant professor of pediatric emergency medicine and a physician at Children's Hospital of Wisconsin. He became interested in treating concussions and head trauma in Pittsburgh, caring for patients with shaken baby syndrome as a resident and evaluating head injuries as a fellow. In the emergency department, Thomas strives to make children feel more comfortable and often uses humor or distraction to ease anxiety. "There is literature that tells us you can reframe an experience [by changing] what's happening around the time you are experiencing pain." He's a big believer in the power of comic relief. "I always wear red Chuck Taylors. It reminds me of clown shoes and makes me more approachable. I'm also really big on bubbles."

Thomas

'10s

By the time we're 90, we have a 50/50 chance of having Alzheimer's, **Christin Glorioso** (Neurobiology PhD '10, MD '11) notes. But if she has her way, those odds will improve. A postdoc in the Paul F. Glenn Center for the Science of Aging Research at MIT, she mines data to find smart ways to identify genes that determine our brain's health. Examining tissue from human brains of all ages, Glorioso looks at genes and their levels of expression to identify master regulators. "People's brains age at different rates—a person may be 45 but be 40 at the molecular level. If we can determine what governs brain aging rates, we can take steps to prevent age-related neurological diseases."

Glorioso

—Kristin Bundy, Lori Ferguson, and Susan Wiedel

THE WAY WE ARE

CLASS OF '90

The Class of 1990 produced so many leaders in academic medicine that one may wonder what was in the special sauce. **John Mahoney** (MD '90) says he'd love to find out.

Mahoney took to teaching naturally. In fact, he started teaching an elective in emergency medicine on his first day as a Pitt med faculty member in 1994. "In retrospect, what were they thinking?" says Mahoney, now the associate dean for medical education. "Though apparently it's worked out, 'cause I'm here now." Academic medicine was not always part of Mahoney's plan; he wanted to be a physician in an emergency medicine department. But after he finished his emergency medicine residency at George Washington Hospital, he reconsidered. "I could be individually impactful as a clinical physician, or I could teach future doctors a better way to treat patients."

Leon Haley (MD '90), who also specializes in emergency medicine, shared Mahoney's realization. Among many titles, Haley is Emory School of Medicine's executive associate dean of clinical services for Grady Memorial Hospital—in other words, the chief liaison between the med school and its clinical home base. "I feel like I have the ability to impact health care at not just a one-person level but at a population level." A native of Pittsburgh, Haley credits Pitt for giving him broad exposure to his field and the opportunity to understand leadership in health care. "I'm very grateful for that."


Mahoney


Brunett


Haley


Currier


Leone

Patrick Brunett (MD '90) also chose emergency medicine and medical education—a combination he believes just works. "Emergency physicians interface with every other specialty, making the ED a good place to build relationships in academics," he says. Brunett, associate dean of graduate medical education at the Oregon Health & Science University, isn't surprised that so many of his classmates are leaders at med schools across the country. "Leadership is the highest calling for a physician, and Pitt breeds excellence."

After working as a student in the Diagnostic Evaluation Center at Western Psychiatric Institute and Clinic, **Glenn Currier** (MD '90) knew he had found his niche: psychiatry in the emergency setting. "I found people's stories fascinating," he says, "and I wanted to be able to help them in both the clinical and research settings, so I knew early on I wanted to be in academic medicine." In July, Currier began a new position as the chair of psychiatry and behavioral neurosciences at the University of South Florida. One of Currier's areas of expertise is mental health care for veterans at risk of suicide. "My family has lots of veterans, so my interest naturally grew."

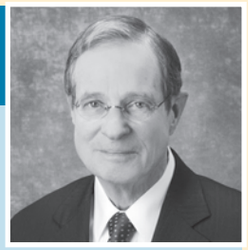
For **Frank Leone** (MD '90), the academic life became a necessity in order to pursue the subject he fell in love with: tobacco dependence. "Because it's tobacco, it can't just be a clinical interest or a research interest or an administrative interest or a policy interest; it almost has to be all of them," he says. In addition to his position as associate professor of medicine at the University of Pennsylvania, Leone is the founding director of Penn's Comprehensive Smoking Treatment Program; he studies how tobacco creates dependence, the clinical manifestations of dependence, and the most appropriate treatments of tobacco dependence. In 2005, Leone and Mahoney completed a project with Pennsylvania's Department of Health to implement and evaluate novel instructional methods about tobacco dependence treatment.

Mahoney, who describes Leone as one of his best friends in med school, says, "It was a treat to work with Frank after all those years."

—SW

MARSHALL WEBSTER

BETTER CARE DELIVERY FOR VETS


Webster

After a serving in a number of senior posts for the University of Pittsburgh and UPMC (most recently as interim chair of anesthesiology), Marshall Webster (General and Thoracic Surgery Resident '70), a Distinguished Service Professor of Surgery and senior vice president of UPMC, is preparing to take on an ambitious new assignment. As a member of the 15-person Commission on Care established by Congress, he'll examine how best to deliver health care to the nation's veterans.

Webster is no stranger to the Veterans Health Administration. He served two years of active duty in the U.S. Navy and has also had an ongoing professional relationship with the VA Pittsburgh Healthcare System since 1973. "I initially worked part-time as a surgeon at the VA while also serving as a faculty member at Pitt and a surgeon at UPMC Presbyterian," he says. Webster is also a former member of a committee that oversees collaborations between UPMC and the VA.

The relationship between the academic medical center and the VA is strong and stretches back decades, Webster explains. UPMC uses the VA Pittsburgh Healthcare System hospital in Oakland as a site for graduate medical education, many Pitt faculty members are on staff there, and many full-time VA physicians have School of Medicine faculty appointments. In the past year or so, there has also been an uptick in the number of veterans receiving treatment at UPMC Presbyterian when the wait time for appointments at the VA exceeds authorized limits. "We're assisting the VA with patients in a variety of different specialties," Webster says. "Orthopaedics and women's health are two large areas in which demand is currently outstripping resources."

Webster is honored to have received his new appointment. "I always enjoy a challenge," he says. "And," he concludes with delight, "I've got two granddaughters living inside the Beltway, so I'll never miss a chance to visit D.C." *—LF*

TANYA J. HAGEN

APRIL 25, 1970–JUNE 11, 2015

After Tanya Hagen (Res '01, Fel '02) was in a car accident her senior year of high school, a head injury left her with memory loss and blindness. Although her sight later returned, most of what she'd learned in her coursework did not. So she studied for hundreds of hours.

Hagen

Fifteen years later, as a Georgetown School of Medicine graduate and University of Pittsburgh–trained orthopaedist, Hagen became an assistant professor and the first female sports medicine specialist in Pitt's Department of Orthopaedic Surgery. For the last decade, she directed the sports medicine fellowship program, of which she is an alumna. Freddie Fu (MD '77, Fel '79, Res '82), department chair and director of sports medicine who hired her, describes Hagen as "a warm, compassionate, wonderful person, and the doctor I trusted with my own kids." Hagen died in June.

Her professional and volunteer accomplishments hint at her passion for sports medicine: 10 years as a Pittsburgh Steelers' consultant and training physician; two as team physician for the Pittsburgh Penguins; 13 as the head team physician for the Pittsburgh Passion Professional Women's Football Team; 11 as head team physician for all athletics at Robert Morris University. Mike Vittorino, head athletic trainer at RMU, recalls Hagen's caring nature. "Tanya … treated the person, not just the injury." She worked on holidays so she could celebrate with her patients. She gave her patients her cell phone number and told them to call whenever they needed her. Jerry Abrams, Hagen's father-in-law, says, "She just gave, and gave, and gave." He adds that Hagen's sons—Cal, 10, and Cash, 7—were "her world." —*Susan Wiedel*

MICHAEL KRAK

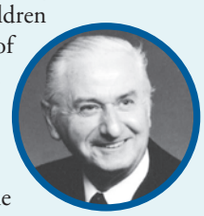
FEB. 20, 1922–JUNE 27, 2015

At the start of his career, Michael Krak (MD '49, Res '50, '54) aided Jonas Salk in conducting clinical research on the polio vaccine. And throughout his decades of private practice in Munhall, Krak, a gifted diagnostician, taught and mentored Pitt residents and fellows as an associate professor of pediatrics.

Krak died in June in his Mt. Lebanon residence at age 93.

Lawrence Adler (MD '57, Res '60), a former colleague at Homestead Hospital, describes Krak as an "outstanding" physician and human being. Krak's daughter Edith Lowe remembers him as a doctor whose devotion to his patients went beyond his shifts; he was known to remain with patients overnight to watch over them, and he treated them in their homes. Many of the families he cared for depended on the steel mills for income, and if patients could not pay for treatment, Krak saw them at no cost.

In 1997 Krak was awarded the Howard A. Mermelstein Award for Excellence in Pediatrics, given to physicians who are highly regarded by the Pittsburgh community and are committed to the health of children and their families. After 44 years of practice, Krak retired in 1999 and was appointed associate professor emeritus. Krak was also a member of the Alpha Omega Alpha Honor Medical Society and cochair of the Class of '49 reunions. —*SW*



Krak

MEYER SONIS

JAN. 29, 1919–APRIL 26, 2015

When describing his work, Meyer "Mike" Sonis liked to tell the story of a boy he'd once met. This boy was perhaps psychotic, perhaps not; he talked to everyone about an airplane he said he'd built. Most people dismissed him as "crazy," but Sonis wasn't sold. So he made a house call. And lo and behold, in the boy's home was an airplane he'd made himself—out of cardboard.

Sonis

Sonis realized his passion for child psychiatry under the wing of the internationally renowned Frederick H. Allen at what is now Drexel University. In 1961, Sonis came to Pitt as chief of child and adolescent psychiatry and director of the Pittsburgh Child Guidance Clinic. He went on to become instrumental in establishing child and adolescent psychiatry as an academic field as the first director of the Western Psychiatric Institute and Clinic's Office of Education and Regional Programming, where he developed programs for continuing education of mental health specialists. Toward the end of his career, Sonis was appointed assistant vice president for the health sciences at Pitt. He retired from Pitt as professor emeritus in 1987.

What many remember most about Sonis is his genuine enthusiasm for children.

"For my dad, helping kids wasn't a career, it was an inextricable part of him," says his son William Sonis (MD '74), who is also a child psychiatrist. "He put himself at risk for children because his own life as a child was difficult. He was a wounded healer."

—*SW*

IN MEMORIAM

'40s

ROBERT HAROLD YOCKEY
MD '40
APRIL 3, 2015

WILLIAM K. SIEBER
MD '41
MAY 4, 2015

MILTON BILDER
MD '44
JUNE 2, 2015

HARRY G. BENZ
MD '48
MAY 20, 2015

ROBERT N. RICKETTS
MD '48
MAY 28, 2015

'50s

ANGELO S. RUNCO
MD '50, RES '54
MAY 21, 2015

JAMES F. O'KEEFE JR.
MD '53
MAY 16, 2015

JOHN L. BRASUK
MD '57
FEB. 12, 2015

WALTER NELSON ZUCK
MD '59
JUNE 11, 2015

'60s

JOHN BARON
RES '63, '65
MAY 22, 2015

GERALD L. LOGUE
MD '66
JUNE 7, 2015

'90s

MATTHEW F. SEVCIK
RES '97
MAY 17, 2015

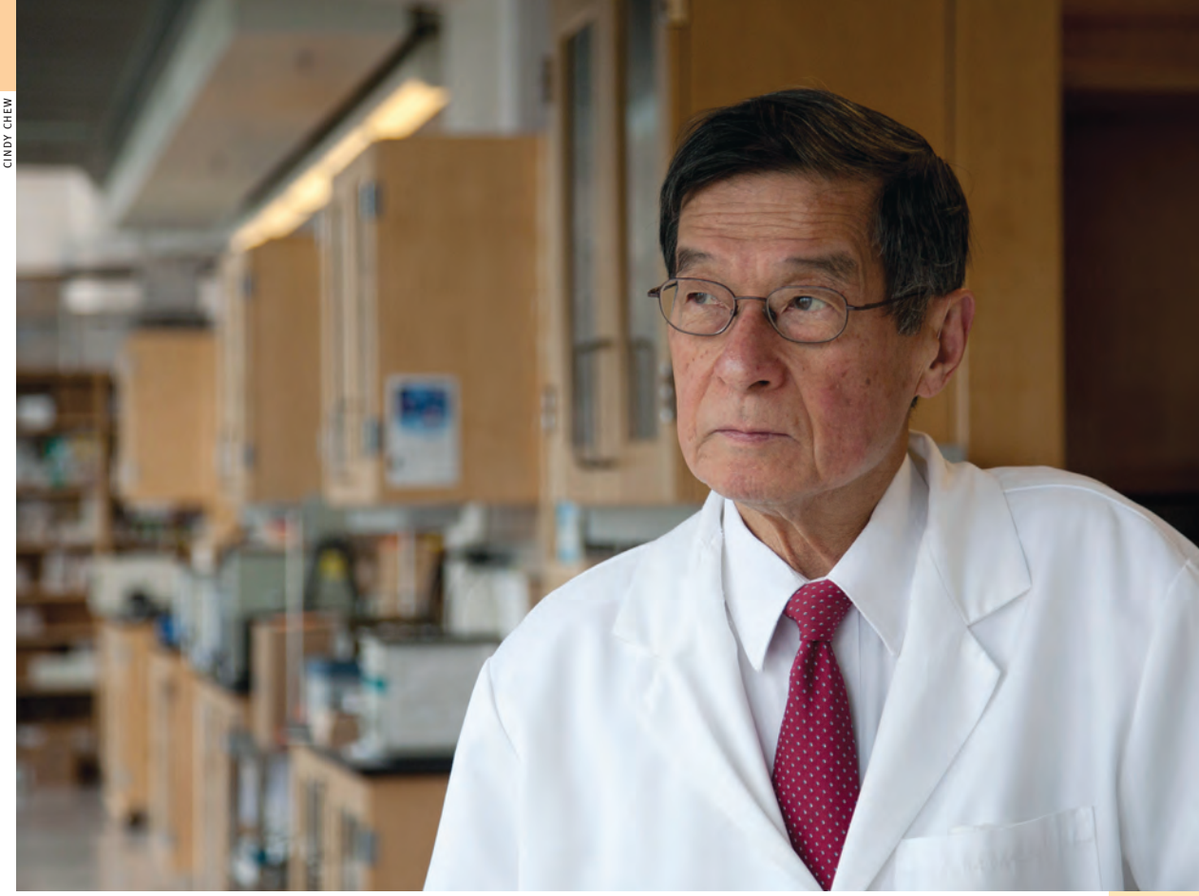
'00s

JASON A. CILLO
RES '03
JUNE 4, 2015

YUET WAI KAN WANTS TO REPROGRAM BLOOD

BY JASON BITTEL

CINDY CHEW



Kan, considered a legend in hematology circles, was the first to diagnose a disease using DNA.

Doctors have learned a great deal about sickle cell disease in the past century. We now know what causes the disorder, and we have some treatments that can give its sufferers longer and more comfortable lives.

But Yuet Wai Kan (Res '63), the Louis K. Diamond Professor of Hematology at the University of California, San Francisco, wants to do more than just treat the disease.

"Our aim now is to try to cure sickle cell disease," he says. "There are some drugs and treatments now that are very helpful, but our aim is to try to cure it, so you don't need to take any more medicine."

Sickle cell disease is a genetic condition in which the body produces abnormally shaped red blood cells. Whereas normal red blood cells look like a donut without a hole, sickle cells resemble a crescent roll. Because of their shape, sickle cells can get trapped in the body's circuitry and cause blockages. These cells also die much more quickly than normal blood cells, so the body is always struggling to keep up with production.

Sickle cell disease affects about 100,000 Americans and millions worldwide, primarily in sub-Saharan Africa, the Mediterranean, the Middle East, and Asia. Sickle cell disease and a closely related blood disorder called thalassemia account for the most common genetic diseases on Earth.

To unravel these life-threatening diseases, Kan is spearheading a five-year, $6.7 million study supported by the National Institute of Diabetes and Digestive and Kidney Diseases.

Today, the only cure available is a bone marrow transplant, which is both costly and difficult to come by—siblings make the best donor matches, but the parents of these patients tend to have fewer children for fear of passing on the troublesome genes again. Additionally, because this procedure involves introducing DNA from another person, it carries the risk of a serious complication known as graft-versus-host disease. (Another approach using a virus to introduce a normal globin gene into the patient's genome is being tested.)

Kan's group is developing a work-around to the immunological complication of graft-versus-host disease: using the patient's own blood cells instead. From these, they will render pluripotent stem cells (they aren't from an embryo, yet they can form all adult cell types). The team will then "reprogram" these blood stem cells using a method that seamlessly corrects the mutations. Because no foreign DNA is used, no immune rejection is expected, he says.

The result: normal blood-cell factories. That's the hope.

Kan has dedicated his career to decoding these genetic disorders. After completing medical school in Hong Kong, he came to the United States and completed a residency at UPMC where he studied under the late Jack Myers.

"[Myers] was a renowned clinician, diagnostician, and teacher. He was the reason why I chose the University of Pittsburgh," Kan says.

Kan's trajectory has also included stints at MIT and Harvard as well as 27 years as a Howard Hughes Medical Institute Investigator. He is a fellow of the Royal Society, London; a member of the National Academy of Sciences, the American Philosophical Society, and the Academia Sinica; and a foreign member of the Chinese Academy of Sciences. He won the Lasker~DeBakey Award for Clinical Medical Research in 1991. In the last 50 years, he has become widely recognized for opening up the fields of genetics and hematology.

For instance, Kan was the first to prove that a single mutation in our DNA can lead to a disease, and the first to use DNA to diagnose a human disease. He discovered a phenomenon called DNA polymorphisms—the single-nucleotide sequence differences between the DNA of individuals. These differences are now widely used for gene discovery and determination of disease susceptibility.

This fall, Kan will receive Pitt's William S. McEllroy Distinguished Resident Award, an honor bestowed upon outstanding physicians who undertook residency training here.

When asked about all the things he's accomplished during his career, Kan deflects to the future, to the prospect of a cure.

"We can do these kinds of things in a lab routinely, but the question is how you translate the technique to patients. There's still a lot of work to be done." ■

WELCOME TO THE HOSPITAL **The 60th anniversary of Scope and Scalpel had us listening to a recording of the original production, *PMS IV*. In his essay chronicling the effort, Charles R. Wilson Jr. (MD '55) describes some of the people behind the scenes who made it happen, from Samuel B. Aronson II (MD '55), the producer who helped birth the idea of the student follies, to Samuel E. Tisherman (MD '55), the photographer and supplier of "free bagels and spontaneous renditions of 'My Bonnie Lies Over the Ocean.'" Included in the student-penned script was the list featured below of imagined rules for med students from a hospital that shall remain nameless.**

—Compiled by Susan Wiedel and Em DeMarco

THE RULES

Welcome to [the] hospital, boys. I'm Miss Macy. I have a few announcements to make, issued at the request of the hospital administration.

(1) Medical students must use the garbage collection entrance to this hospital. At no time may they use any other entrance.

(2) Only two students are permitted to frequent the coffee shop at any one given time. After your purchases, leave the shop immediately. Do not stand in the hall to devour your purchases. You know, it distracts from the beauty of our hospital.

(3) After the lectures, too many students congregate by the fountain near the housekeepers' room. This must stop. The noise disturbs the girls who sort the laundry.

(4) Please cut down on your fountain water consumption.

(5) Under no circumstances may the students use the stairs or the elevators. They are to use the outside fire escapes.

(6) Students must park their cars at least 10 blocks from this hospital. Any cars parked near this hospital will be tagged or towed away. Thank you.

—PMS IV, *Scope and Scalpel 1955*

CALENDAR

FOR ALUMNI & FRIENDS

WHITE COAT CEREMONY
AUGUST 9
3 p.m.
Scaife Hall, Lecture Rooms 5 and 6
Reception to follow
Petersen Events Center Lobby
For information:
Andre Burton at 412-648-9090
aab86@pitt.edu

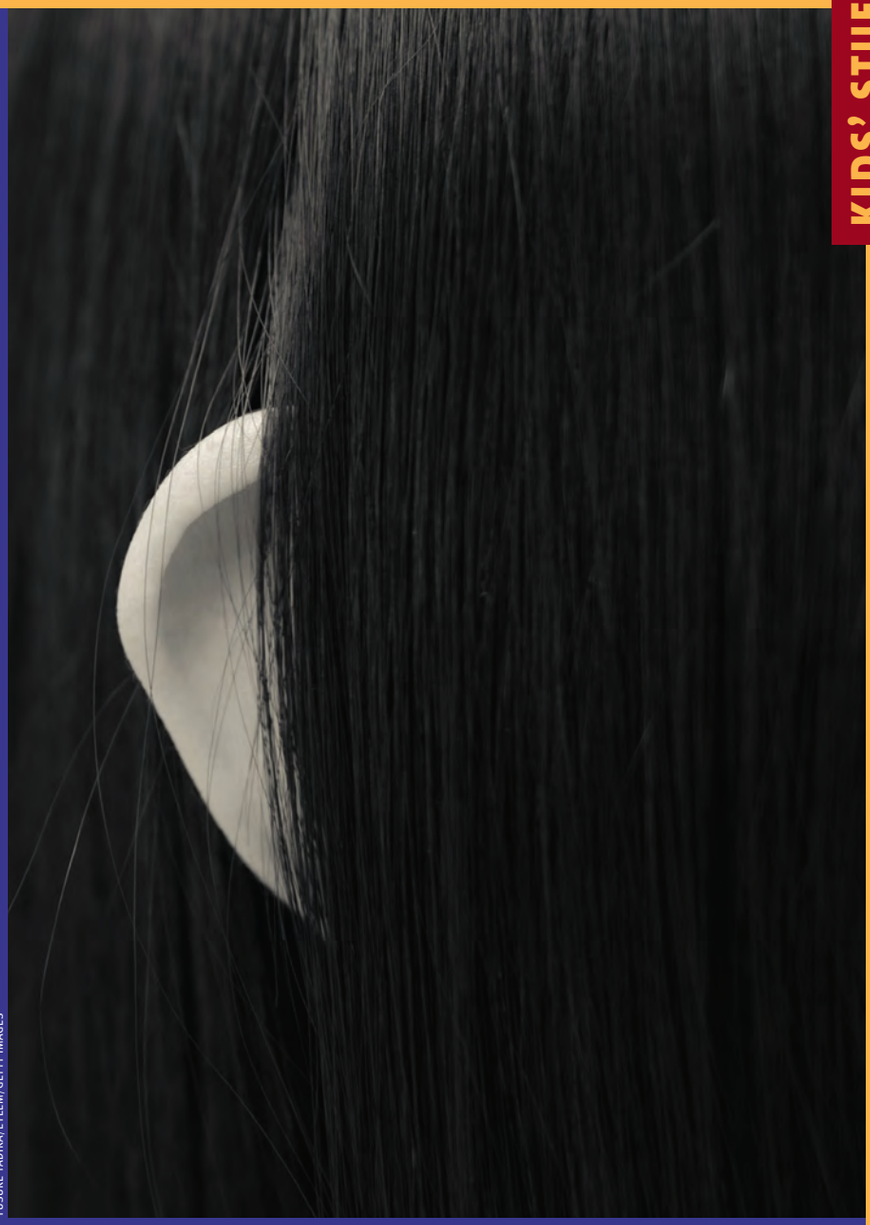
PHILIP S. HENCH DISTINGUISHED ALUMNUS AWARD DINNER
AUGUST 9
6 p.m.
Recipient—Eric A. Klein (MD '81)
University Club, 123 University Place
For information:
Jen Gabler at 412-647-3792
jag188@pitt.edu

MEDICAL ALUMNI ASSOCIATION EXECUTIVE COMMITTEE BOARD MEETING
AUGUST 26
6 p.m.
For information:
Jen Gabler at 412-647-3792
jag188@pitt.edu

WASHINGTON, D.C., ALUMNI RECEPTION
SEPTEMBER 10
6-8:30 p.m.
The Hay-Adams, 800 16th St. NW
RSVP to Rachel Edman at 412-864-1957
rge6@pitt.edu

MEDICAL ALUMNI ASSOCIATION HOMECOMING TAILGATE
OCTOBER 10
Three hours before kick-off
Heinz Field, Lot Red 5A
For information:
Ashley Knoch at 412-648-9059
akk57@pitt.edu

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



YUSUKE TADIKA/EYEEM/GETTY IMAGES

FOR REAL! TWEEN SCIENCE

Apparently, there is more to the ear than meets the eye. Earwax, known also as cerumen, is a combination of sweat and oily matter from glands beneath the skin of the ear canal. Doctors already knew that earwax keeps your ears healthy by preventing bugs from crawling into the ear canal and keeping bacteria and fungi from entering the ear. But now they are learning more. The type of earwax you have depends on your ethnicity: People of East Asian or Native American descent tend to have dry, flaky, whiteish earwax, while people of European and African descent have wet, sticky, yellow-brown earwax. Why? It all has to do with your genes. "It's like having thin or thick hair: Both types of earwax get the job done," says Pitt ENT doc Barry Hirsch.

And earwax composition can reveal even more about you: A syrupy smell might indicate a disease called maple syrup urine disease. Some chemists now believe earwax may be able to communicate what you eat and where you've been.

Regardless of its telltale potential, earwax helps the ear function and stay healthy. So for the love of your ears, skip the cotton swabs. *—Susan Wiedel*

Still all ears? Check out bit.ly/1OuKlAF

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THE OWL, 1973

WHERE THE THEATER USED TO BE

If you've ever gotten directions along the lines of *Turn left at the joint that's not there anymore*, you might be a Pittsburgher, or at least a Pitt alum.

And if you remember this street corner, you're old enough to benefit from a charitable gift annuity (CGA). It's a way to provide yourself and/or a loved one with a guaranteed income for life, and receive a tax deduction, while building a stronger future for Pitt. You can even designate a specific area that your gift will benefit, like the medical device researchers at the McGowan Institute for Regenerative Medicine—they've got spiffy green-design labs down on the Mon now, where LTV Steel used to be. Or the up-and-coming docs at the new Children's Hospital of Pittsburgh of UPMC in Lawrenceville—you know, where St. Francis Hospital used to be.

The examples below are based on a minimum gift of $10,000.

AGE	RATE	YEARLY INCOME	ESTIMATED DEDUCTION
55	4.0	$400	$2,327
60	4.4	$440	$2,638
65	4.7	$470	$3,282
70	5.1	$510	$3,946
75	5.8	$580	$4,468
80	6.8	$680	$4,946
85	7.8	$780	$5,615
90	9.0	$900	$6,271

Because of varying restrictions, Pitt is not able to offer gift annuities in some states.

To learn more, contact:

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