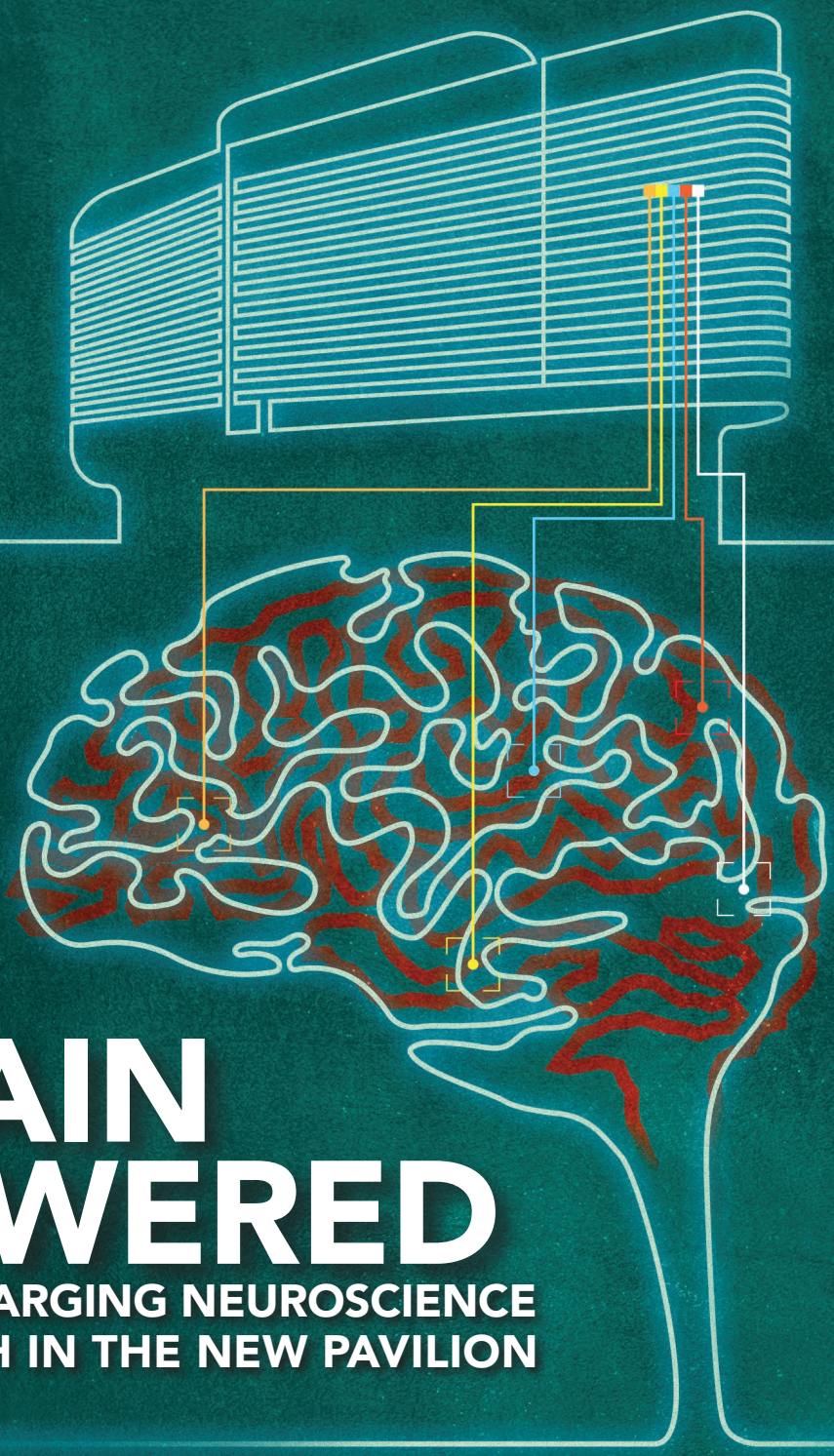
SPRING/SUMMER | 2021

PENN Medicine



BRAIN POWERED

TURBOCHARGING NEUROSCIENCE RESEARCH IN THE NEW PAVILION

Plus:

Dr. John Glick and a Half Century that Transformed Cancer

Medical Students' Pathway to Primary Care

A GLITTERING CONFLUENCE OF SCIENCE, NATURE & ART

By MaryKate Wust

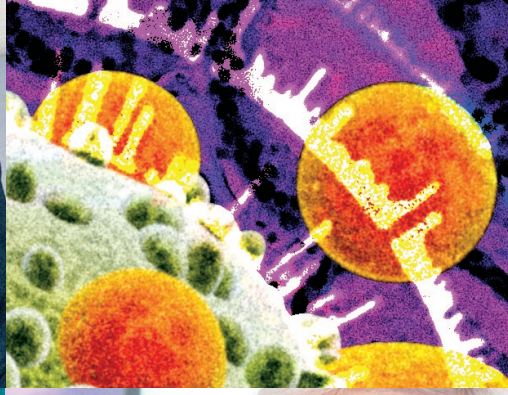
With its thousands of individually glass-blown spheres reflecting the sunlight, and its twisting steel arms calling to mind outstretched tree limbs, the structure of DNA, and the branches of the Schuylkill River, a new art installation is set to dazzle patients, visitors, and staff this fall. Created by world-renowned artist, designer, and environmental activist Maya Lin, the intricate sculpture—tentatively titled "DNA Tree of Life"—is one of many artistic features that will contribute to the welcoming and calming environment of Penn Medicine's new Pavilion.

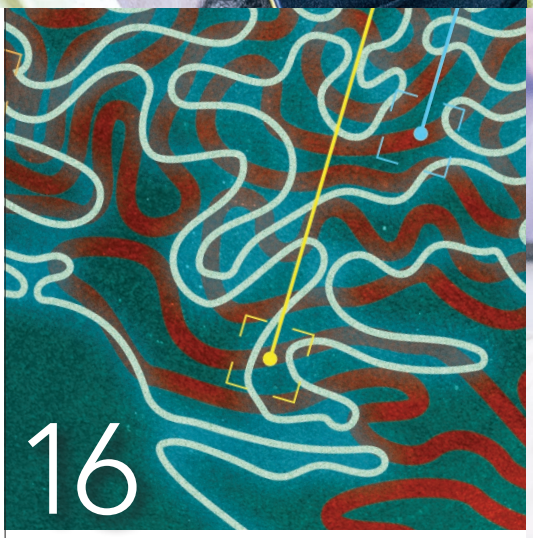
The 17-story, 1.6 million-square foot, $1.5 billion facility is the largest capital project in Penn's history and the latest addition to the Hospital of the University of Pennsylvania (HUP) campus. A key part of the design of the Pavilion has been the thoughtful integration of art and architecture elements chosen by a committee of art experts and advocates and art consultant Ivorypress, and designed by visionary artists like Lin.

Since her very first work, the Vietnam Veterans Memorial in Washington, D.C., completed in 1982, Lin has been interested in striking a balance between the natural world and sustainable design. Her latest piece will be suspended from the Pavilion's ceiling and positioned between the ground floor atrium and Connector Level, which links all of the HUP campus buildings including the Perelman Center for Advanced Medicine.

"I want to make you aware of your surroundings in the Pavilion, in this beacon of scientific advancement, connecting you to the physical and natural world around you while symbolizing the very essence of life," Lin said. By seamlessly melding medical science, nature, and art, she hopes to promote a sense of peace and hope—two fundamental pieces of the healing process. "My approach to this piece," she said, "is to create something that is uplifting, that has a sense of wonder and beauty." ▽

Read more about the Pavilion in this issue's cover story and more about the artwork online at PennMedicine.org/Maya-Lin-Pavilion





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Advanced treatment for epilepsy can offer a unique look at the human mind from inside. By bringing clinical care and neuroscience research closer together, Penn Medicine's newest inpatient facility (the Pavilion) will help to forge fundamental neuroscience discoveries and new neurotechnologies faster and better than ever.

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32 **The Cancer Fighters**
The National Cancer Act passed 50 years ago, lighting a spark that would revolutionize cancer care. In time, the University of Pennsylvania and its Abramson Cancer Center came to fuel many of the transformational changes in oncology across the landscape. John Glick, the center's longest-serving director, reflects on his lasting legacy in the extraordinary ensemble of cancer fighters he inspired through his career on the front line of that transformation.

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A Changed World

Mary Gwynn's mother was the fourth of five children born to Irish immigrants, raised by her mother alone after their father died when she was three. The first of her siblings to pursue an education past high school, Gwynn's mother, Kathleen, trained as a nurse. When President Franklin D. Roosevelt put out a call for nurses to enlist in World War II, she signed up immediately—even appearing in the Philadelphia *Evening Bulletin* as the city's first wartime volunteer nurse. She had never traveled farther from Philadelphia than visiting relatives in New Jersey until she volunteered to serve, treating injured soldiers in surgical tents in Calcutta.

Growing up, Gwynn and her six siblings would ask, "Mom, what made you do that?" Gwynn recalled. Her answer: "The adventure of helping people."

Without traveling to India, Gwynn followed in her mother's footsteps. She's also a nurse, working in long-term care. What's more, last year, at the age of 64 and in the middle of the worst pandemic of our lifetimes, she, too, volunteered for the adventure of helping people. She had seen the devastating effects of COVID-19 first-hand in her patients, those who died alone, and those with dementia who couldn't understand why their families left them there and could not visit. She felt helpless. Then she heard about the Moderna vaccine trial at Penn Medicine.

"I thought, you know what? Instead of just helping one person in your community or someone in your family, by doing this, you can change the world and help millions of people," Gwynn reflected on her trial participation in early December. At the time, the Moderna and Pfizer vaccines were on the precipice of FDA authorization. No one else she knew had yet been vaccinated—she didn't even know then if she herself had received the vaccine or placebo.

Today, we see the glimmerings of a changed world.

By Mother's Day, Gwynn could once again hug and kiss her relatives. Here at Penn Medicine, in early June, the number of hospitalized COVID patients dropped lower than that of mid-March 2020 for the first time.

Our local experience driving down infections isn't yet universal, as the global pandemic rages on, and even in our region there remain persistent gaps in vaccine access and hesitancy that we are working to address (see pp. 3-4).

But for this changed world and the hope we have for its continued expansion, we owe our thanks to vaccination. We owe our thanks to the decades of foundational research at Penn Medicine that made mRNA vaccines possible, to the many scientists who developed that technology into a COVID-19 vaccine, and to the thousands of individuals like Mary Gwynn who volunteered from a simple will to help.

Mary Gwynn

It's a pattern we can see again and again in all kinds of medical transformations and discoveries. Big, world-altering changes take a combination of discovery, investment, and collaboration.

That's the story of Luke Debevec, an attorney with epilepsy who volunteered to use his time in the hospital with electrodes embedded in his brain to help neuroscientists make more fundamental discoveries. As described in our cover story (p. 16), the big investment in the new Pavilion at the Hospital of the University of Pennsylvania will take this type of neuroscience discovery to new heights.

And it's a story we see in the history of the Abramson Cancer Center, as related in the memories shared by its longest-serving director, John H. Glick, MD (p. 32). Glick is a noteworthy figure for uniting these three principles together—making his own clinical discoveries, inspiring hundreds of millions of dollars in philanthropic investment, and bringing together and mentoring generations of brilliant cancer fighters who are all committed to helping others through their own innovation and care for patients.

To Mary, Luke, Dr. Glick, and the thousands who make their own mark in our health system and campus buildings each day—on behalf of all of us living in this changed and medically ever-changing world, thank you.

RE

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A MARQUEE ACHIEVEMENT

Half a Million Doses and Counting, Penn Medicine Reaches Out Across the Region to Extend COVID-19 Vaccine Access

"The music's going every day, so patients are dancing in their chairs, and staff are dancing right along with them," said Dan Wilson, vice president of Operations at Pennsylvania Hospital. At the hospital's vaccine clinic held at the Theatre of the Living Arts (TLA) on South Street, he said, "it has a real party atmosphere and celebratory feel. People are finally getting their vaccines, beating COVID-19, and seeing the light at the end of the tunnel."

Whether at a historic performance venue, in Black churches or neighborhood public schools, or in senior housing facilities, Penn Medicine staff helped bring COVID-19 vaccination to members of the communities most in need over the course of the first months of 2021. Penn Medicine surpassed half a million doses of COVID-19 vaccine administered by late May while continuing outreach to underserved and potentially hesitant populations.

More than 1,000 senior citizens living in public housing, as well as more than 600 homebound Penn Medicine patients, have received vaccines at home. The efforts are breaking down barriers—transportation, lack of internet access, and vaccine hesitancy—that may have prevented these Philadelphians from getting immunized. This outreach "takes a lot of time, but it's a really important supplement to the high-volume strategies," Nina O'Connor, MD, chief of Palliative Care and chief medical officer of Penn Medicine at Home, told the *Philadelphia Inquirer*.

See more on next page

Penn Medicine partnered with the Philadelphia Flyers' "Take Your Shot" campaign. Mascot Gritty revved up the excitement at Radnor High School, where Penn Medicine Radnor volunteers provided vaccines to the community in Delaware County. Penn Medicine staff also offered single-shot vaccines to fans in attendance at a Flyers game in early May.

Through partnerships with local faith communities and secular community groups, Penn Medicine vaccinated thousands in underserved neighborhoods of West and South Philadelphia in early spring, 85 percent of the whom were Black, helping to address a racial disparity in vaccination. A tailored combination of texting-based and phone-based signups helped break down technical barriers.

A Vaccine Street Team deployed paid professional door-to-door canvassers to spread the word and address vaccine hesitancy and disparities in West Philadelphia in May. The effort was staffed by members of the community. "Canvassing might be the next frontier for vaccine uptake," said Heather Klusaritz, PhD, MSW, director of Community Health Services at Penn Medicine and director of Community Engagement for the Center for Public Health Initiatives.

NAVIGATING A PATH OUT OF THE PANDEMIC

It's the variants vs. the vaccines: That alliterative phrase defined much of the public conversation about COVID-19 this spring and the U.S. saw a potential end to the pandemic in sight—while it raged on globally. As the public and health officials sought to navigate a time of uncertainty, Penn Medicine experts were seeking and sharing answers to key questions. This ongoing investigation of viral variants and immunity remains crucial to ensure that community vaccination initiatives reach their intended goals.

"The efforts to mobilize for COVID-19 vaccination across our community and to understand the impact of variants reflect every area of our mission at Penn Medicine," said J. Larry Jameson, MD, PhD, executive vice president of the University of Pennsylvania for the Health System and dean of the Perelman School of Medicine. "From protecting the health of individuals, to exploring key intricacies of immunology, to engaging deeply with community partners for public health, our collaborative efforts to pave a path out of the pandemic reflect the best of what all of us aim to be."

How immune are you if you've had COVID-19 already, and what are the implications for vaccination? People who have recovered from COVID-19 had a robust antibody and memory B cell response after the first mRNA vaccine dose, but little immune benefit after the second dose, according to research from the Perelman School of Medicine published in *Science Immunology* this spring. The study, led by E. John Wherry, PhD, chair of Systems Pharmacology and Translational Therapeutics and director of the Institute for Immunology, provides more insight on the underlying immunobiology of mRNA vaccines. Wherry's team is tracking not just the development of antibodies, but also other immune cell types, including T cells and B cells in a cohort of volunteer participants.

How long are the COVID-19 vaccines protective? The definitive answer to this question will require more time, but Wherry's finding of strong immune responses in vaccinated individuals is encouraging. "This effort to examine memory B cells is important for understanding long-term protection and the ability to respond to variants," he said. "We need to make sure people have the strongest memory B cell responses available. If circulating antibodies wane over time, our data suggests that durable memory B cells could provide a rapid source of protection against re-exposure to COVID-19, including variants."

"From protecting the health of individuals, to exploring key intricacies of immunology, to engaging deeply with community partners for public health, our collaborative efforts to pave a path out of the pandemic reflect the best of what all of us aim to be."

– J. Larry Jameson, MD, PhD
EVP, University of Pennsylvania for the Health System
Dean, Perelman School of Medicine

How will we know and respond if new or more dangerous SARS-CoV-2 variants have spread? A team led by Frederic Bushman, PhD, chair of Microbiology at the Perelman School of Medicine, has been working with the Philadelphia Department of Public Health and numerous Penn researchers to sequence samples from COVID-19 patients in an effort to uncover SARS-CoV-2 variants in the community. The team began studying hospitalized patients at the Hospital of the University of Pennsylvania at the start of the pandemic in the spring of 2020 and have regularly been analyzing samples since then. In late March 2021, they reported that more than a third of recent COVID-19 cases in the Philadelphia region were caused by concerning variants of the virus that may be more transmissible. Public health officials urged continued vaccination to protect against further transmission of these variants.

What happens if new viral variants get around the protection of COVID-19 vaccines? So far, the vaccines are highly effective against known variants. If newer variants do emerge that are more infectious among vaccinated people, Bushman noted to *WHYY* news, there would simply be a need to take a booster shot or a seasonal vaccine like the flu shot. "It's not the end of the world," he said. "If we have to do that, it's what we do."

THE NEXT GENERATION OF PRIMARY CARE

Primary care today involves much more than one-on-one outpatient visits. The Measey Primary Care Pathway Program prepares the next generation of physicians to experience what makes these specialties special.

Mariam Olujide (right) with her mother on Match Day

Promptly at noon on March 19, Mariam Olujide opened her email and screamed. The Perelman School of Medicine fourth-year saw she had matched into a pediatrics residency in Washington, D.C.—which meant she was going home.

Olujide's parents and three younger brothers cheered with excitement for the soon-to-be first doctor in their family, shaking pom poms and popping confetti cannons—items from a gift bag assembled by classmates to help make Match Day special during the celebration attended mainly virtually from students' homes.

Olujide is among the 41 percent of PSOM Class of 2021 students who matched into a primary care residency that day, and among the smaller subset of those who plan to spend their whole careers in primary care—she matched to a specific track at Children's National Hospital in primary and community health. Her interest in general pediatrics began before medical school but deepened during her participation in the Measey Primary Care Pathway Program, launched in 2019 to prepare students for careers in family medicine, general internal medicine, general pediatrics, and geriatrics. As a widely publicized primary care physician shortage persists—the Association of American Medical Colleges now predicts the U.S. will face a dearth of up to 55,200 by 2033—the Pathway offers students enhanced clinical experiences, research and mentorship opportunities, courses and workshops, and community engagement activities designed to draw them to primary care specialties.

Tending to emphasize highly specialized medicine and hospital-based clinical training, academic health institutions often leave primary care to "simply get lost," says Jennifer Kogan, MD'95, GME'98, a professor in Internal Medicine who spearheaded the Pathway's development and serves as its director. "What we're doing is validating the importance of primary care and showing students how we're innovating just as much as other specialties to transform the way we deliver care."

Early and Often

When they hear the words "primary care," Kogan says, most people envision a doctor sitting alone in an office with a patient, addressing concerns only in the context of that visit. She and Pathway co-directors Renée Betancourt, MD'11, an assistant professor of Clinical Family Medicine and Community Health, and Jane Nathanson, MD'10, a clinical assistant professor of Pediatrics who sees patients at Children's Hospital of Philadelphia's South Philadelphia outpatient office, stress that primary care is much more than that.

"Today, I am just as responsible for the health of the person who does not come to my office as the person who does," Kogan explains. "Of all my patients who have diabetes, for example, I want to identify who I have or have not seen, who needs to go to an eye doctor, whose diabetes is not well controlled. We can leverage patient outreach and

technology, having patients check their own blood pressure and sugars at home and uploading them to their own electronic health record, and use that data to determine who needs intervention or support to achieve better health across the population."

The Pathway, which during the 2020-2021 academic year comprised 31 students spanning all four class years, exposes participants to interprofessional team care and the use of tools and metrics to ensure that entire patient populations are up to date on both preventive and chronic disease care.

Pathway participants have opportunities to work in outpatient primary care settings earlier and more often than is typical in medical school. Before their core clerkships, students shadow an attending during an extended bimonthly ambulatory care experience.

"Primary care attendings are not very visible to medical students—and if they don't see positive examples of people they could envision themselves being like and working with in the future, why would they think primary care is a viable career option?" Nathanson says.

Participants can also do an outpatient primary care externship that lasts six months or more.

"Some of the wonderful aspects of primary care are difficult to fully demonstrate in episodic educational experiences," Betancourt says, emphasizing the importance of building relationships with patients over time.

Olujide felt firsthand the value of these connections. One of her favorite Pathway memories involves caring for an infant whose mother requested a follow-up appointment with Olujide, even though she was a student.

"Conversations with patients are easier the second time. You understand their chart and their history and have a stronger rapport, organically," she says. "That is often missing in medical school, which is unfortunate, because if more students had that experience, they might consider primary care a little bit more."

Sticking Together

Beyond clinical experiences, Pathway students also engage in primary care-focused research, service activities, class-specific mentoring groups, and individual mentoring sessions.

The sum of all these parts? A tightly knit PSOM community of likeminded aspiring and seasoned physicians. It's a community Olujide was thrilled to join, as she previously struggled to find peers who shared her passion for primary care.

"The Pathway brought me back to why I chose medicine to begin with: to be an advocate and focus on population health," she says. "Being surrounded by physicians who are doing this work and by students who want to do this work, despite the fact it might pay less or get you less glory than other fields, really solidified my desire to be a pediatrician."

In 2017, two years before the Pathway kicked off, Penn Medicine formalized its Primary Care Service Line, unifying a network of 90 primary care practices across the University of Pennsylvania Health System in a movement to improve quality, access, and experiences for patients. Matthew Press, MD, MSc, medical director of the service line, championed the idea of a primary care educational pathway then and continues to do so today. Kogan co-chaired the service line's education committee that proposed the pathway to PSOM with Christine Stabler, MD, vice president of Academic Affairs at Penn Medicine Lancaster General Health. Generous funding from the Measey Foundation supported the program's first three years.

"The fact that the Perelman School of Medicine has a primary care pathway is both a public and an internal statement that the institution recognizes the value of primary care and encourages our best and brightest students to choose careers in primary care. It indicates that Penn Medicine is on the forefront not only in basic science research and hyper-subspecialized care, but also in the evolving approach to primary care," Press says.

"We want students to appreciate that being a primary care doctor looks a lot different now than it used to, and the Pathway is helping us do that."

— Karen Brooks

MATCH DAY 2021

Out of 147 students in the 2021 PSOM graduating class, a total of 41 percent matched into primary care residencies—two of the top four specialties.

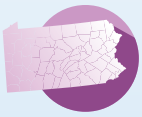
TOP 4

SPECIALTIES

Internal Medicine (32)
Pediatrics (16)
Psychiatry (14)
Emergency Medicine & General Surgery (tied at 8)

22

# of States Students Will Be Going to for Residency



39%

% of Matching Students Staying in PA (57)

32%

% of Students Matching at HUP, Pennsylvania Hospital, CHOP, or Scheie Eye (47)

'WHOLE AND WELL'

New Chair Deborah J. Culley, MD, Shares Her Vision for the Future of the Department of Anesthesiology and Critical Care

At the close of a landmark year for critical care physicians this March, Deborah J. Culley, MD, has just arrived from Boston to embark on a new role as chair of the Department of Anesthesiology and Critical Care at the Perelman School of Medicine. The internationally renowned neuroanesthesiologist has worn many hats over the past 25 years, most notably as an associate professor at Harvard Medical School, executive vice chair for the Department of Anesthesiology Perioperative and Pain Medicine at Brigham and Women's Hospital, and director and former president of the American Board of Anesthesiology (ABA). At Penn, Culley takes the helm in a role held by Lee A. Fleisher, MD, from 2004, until moving on to a position in the federal government last year as chief medical officer for the Centers for Medicare and Medicaid Services.

In early spring, though she is only weeks into the role, Culley has plenty to say about the future of Anesthesiology and Critical Care at Penn: Whether focused on its patients or physicians, she has a vision for a department that doesn't just *do* well but *is* well.

What initially sparked your interest in anesthesiology and critical care?

I had always planned to become a neurologist or a neurosurgeon because of my fascination with the brain. Anesthesiology wasn't on my radar until my third year of medical school, when I had the chance to work with a team that let me intubate and monitor anesthetic care from start to finish. I learned quickly that there is little in clinical work that is as rewarding as being an anesthesiologist, simply because you touch people at very difficult times in their life.

You've played a pivotal role in establishing links between anesthesia and postoperative cognitive dysfunction in older patients. How did you decide to take your research in this direction?

In my second year of residency, I treated a middle-aged patient who told me that after the last time he had been anesthetized, he didn't have the same cognitive function for a period of months. This encounter sparked an interest in the connection between anesthesia and post-operative delirium, cognitive dysfunction, and other long-term effects. One of my proudest professional moments was the publication of my first manuscript on the effects of anesthetics on the aged brain. It was something that hadn't really been done before, although the field has expanded tremendously since then. Surprisingly, most data from human studies suggests it's the surgical procedure, not the anesthetic, that has these negative effects. Now we're looking for biomarkers to be able to predict post-operative delirium and allow diversion of precious resources to patients at the greatest risk.

How do you view the role of new technologies in advancing patient care?

It takes many years of experience to readily identify patients with a higher risk of adverse outcomes to anesthesia and critical care. I'd like to get to the point where we use artificial intelligence (AI) and machine learning to analyze electronic medical records and gauge that risk. If we can identify these risk factors, we can ask a higher acuity physician to care for a more vulnerable patient and find ways to mitigate risk pre-operatively. Thankfully, we have experts at Penn who can help with this mission. It's a matter of combining skill sets to enhance patient care in a cost-efficient manner.

What appealed to you about the opportunity to join Penn Medicine in this new role?

It was a few things. First of all, it's Penn. It's a wonderfully integrated system where you have Wharton, the Perelman School, and all these other leading institutions in one place. As a result, Penn Medicine is a remarkably forward-thinking healthcare system. Another major factor is that Dr. Jameson and the rest of the leadership team took a holistic

approach to success. I expressed early on that one of my top priorities was having the freedom to visit my adult children and grandchildren back in Boston every other weekend. I was encouraged to do so at Penn out of the recognition that my leadership success depends on being a fulfilled person, not just a skilled professional.

How will the opening of the new Pavilion inpatient building at HUP this fall impact your department?

There are some wonderful things that will come out of our move to the Pavilion. One of the first things that comes to mind is that we will be able to keep patients in the same hospital room from intake to discharge. In most hospitals, you have a pre-op and a post-op center. Patients meet one nurse in pre-op and a different one in post-op. By removing that typical pre- and post-op divide, we expect higher levels of patient satisfaction, stronger connections between patients and staff, and more family involvement.

What are some other goals you have for your new department?

The most immediate one is to ensure a seamless transition into the Pavilion.

I also spend a lot of time thinking about ways to champion diversity—whether it's gender, race, ethnicity, sexual orientation, or background—among our faculty, residents, CRNAs, and staff in a way that makes people feel safe at work. There's a real need for more open dialogue.

Finally, I want to shine a spotlight on wellness, especially after we spent much of the past year in lockdown. I want to help the members of the department identify those things that help them stay well and take care of themselves in a holistic way. For me, that's making a trip to see my family several times a month. For someone else, that may be exercising or going out to a nice dinner more often.

The people inside this department have worked tirelessly in dangerous circumstances over the past year. They've demonstrated incredible resilience, but I want the department to be more than resilient. I want it to be whole and well.

— Interview by Ashley Rabinovitch

CEOS FOR THEIR COMMUNITIES

From central New Jersey to central Pennsylvania, Penn Medicine welcomed new chef executives this March to lead two of the health system's six hospital entities across the region. They share a commitment to community-based care with longstanding local traditions with the resources of a world-class academic medical center.

James Demetriades

CEO, Penn Medicine Princeton Health

"I have spent 17 years here because I believe it is an outstanding organization and I hope to provide the kind of strategic leadership that will continue to propel us forward. I am grateful to have a team of very knowledgeable and caring colleagues, the guidance of a highly committed board and the strength of the entire Penn Medicine system supporting our work."

A member of the Princeton Health team for 17 years, Demetriades has been a key player in some of its most important milestones over the past several years—a transformative time that included joining the University of Pennsylvania Health System. Demetriades was most recently senior vice president and chief operating officer at Penn Medicine Princeton Health. He succeeds Barry Rabner, the president and CEO since 2002, who retired in March.

Demetriades is an avid runner whose favorite activities involve his wife, their two daughters, and being outdoors, especially hiking and boating in the Poconos.

Care for the Community:

The majority of patients at Princeton Health, one of New Jersey's most comprehensive health systems, come from Mercer, Middlesex, and Somerset counties, while the service area for Princeton House Behavioral Health, a regional leader in behavioral health care, extends into South Jersey and the Jersey Shore area. Princeton Health also includes a unique community wellness program that engages 40,000 people each year.

Milestones Ahead:

Princeton Health is extending its geographic footprint in the region, developing ambulatory sites from central Somerset County to the southeastern edge of Mercer County.

John J. Herman

CEO, Lancaster General Health

"I am immensely proud to be part of the Penn Medicine Lancaster General Health family. Every employee—their abilities, passion and commitment—is what makes LG Health a strong organization that means so much to our community."

As CEO of the North Shore Region for the Ochsner Health system in New Orleans, Herman led improved quality and safety outcomes, enhanced employee engagement and built a foundation for system growth for the system's network of hospitals, multispecialty ambulatory centers and more than 110 clinics on the North Shore in Louisiana and the Mississippi Gulf Coast. He now succeeds Jan L. Bergen, president and CEO since 2015, who retired from LG Health after more than 20 years.

Also an outdoorsman, Herman grew up in rural, western New York. He enjoys camping and hiking with his family in New York's Allegany State Park, which rests on the Pennsylvania and New York state line.

Care for the Community:

Lancaster County and its environs span a wide range of community needs and health challenges—from the urban life in Lancaster City to the rural surroundings that include Amish country. Serving the diverse health needs of this community, LG Health provides a comprehensive network of care, including outpatient and urgent care services and four hospitals with a total of 786 licensed beds.

Milestones Ahead:

LG Health's Ann B. Barshinger Cancer Institute will open a proton therapy center in 2022. Read more on p. 48.

RESEARCH COUNTDOWN

49,000 COVID-19 INFECTIONS

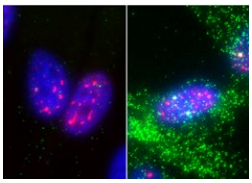
That is how many excess infections could occur in a city of 1 million people in which 1 percent of households experience eviction monthly, according to an epidemiological model published in *Nature Communications*. The researchers point out that their model supports policies to stem evictions in cities where the virus is circulating.

606 STEPS

On average, a group of diabetes patients walked this much more daily when participating in a group that asked them to compete against other participants in reaching individual step-count and weight goals, compared to a control group which simply received feedback on step counts and weight. After a year, all groups of participants experienced weight loss and a reduction of blood sugar. The study was published in *JAMA Network Open*.

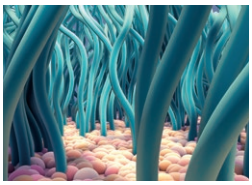
111 YEARS

That's how long ago "nuclear speckles," tiny structures within the nucleus of every mammalian cell, were first observed with a microscope in 1910. Researchers from the Perelman School of Medicine, publishing their discovery in *Molecular Cell*, have illuminated their functions for the first time, more than a century later. The speckles work in partnership with a key protein best known as a tumor suppressor, p53.



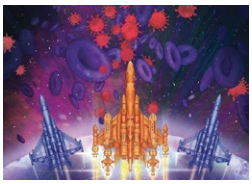
42 GENES

Roughly a third of the 122 genes tied to disorders of the cilium that were analyzed in a Perelman School of Medicine study had strong associations with diabetes, kidney failure, liver disease, and high cholesterol levels in blood samples in a large biobank. The cilum, an antenna-like structure found on the surface of most human cells, was thought to be largely vestigial, but the analysis, published in the *American Journal of Human Genetics*, suggests for the first time that it could be a target for therapies.



15 AMINO ACIDS

Snipping a relatively small number of amino acids off could help make chimeric antigen receptor (CAR) T cell therapy effective again, according to a study published in *Nature Medicine*. When researchers shortened the single-chain variable fragment—the linker that bridges the two halves of the receptor that allows CAR T cells to latch onto tumor cells and attack them—they found that helped pre-activate the CAR cells, improving the anti-cancer activity in pre-clinical studies.



10x MORE SWEAT GLANDS

Humans are the sweatiest ape, with sweat gland density tenfold greater than chimpanzees and macaques. Penn Medicine research published in the *Proceedings of the National Academy of Sciences* showed that this higher density is due largely to accumulated changes in a regulator region of DNA that drives expression of a sweat gland-building gene.

2.4%

How much does a neighborhood affect racial disparities in maternal health? Severe maternal mortality was 2.4 percent higher for each 10 percent increase in the percentage of Black or African American individuals in a Census tract, according to the epidemiological study published in *Obstetrics and Gynecology*. In the last two decades, maternal mortality has doubled in the U.S. and racial disparities for Black mothers have widened. The researchers point to the potential of neighborhood-level interventions to address health disparities likely resulting from historical and structural racism.

COPING WITH CANCER AND CULTIVATING CREATIVE CLARITY

By MaryKate Wust *Photos by Peggy Peterson*

As she cut out petal after petal, Michele Tremblay felt like she'd fallen in love. It was 2013, and the Philadelphia artist had discovered a new outlet for her creativity: paper flower sculptures. She constructed four-foot wide sunflowers, pinned delicate dogwood blooms to foam to create floating gardens, and composed intricate patterns with quilled paper strips. Her eagerness to test new designs and color combinations often kept her up at night, and though she didn't know where this new artistic venture would go, she was infatuated with the process.

Upon seeing Tremblay's work exhibited at the Philadelphia International Airport, an art consultant called her to propose a direction. The woman explained that she was in the business of curating art pieces for hospitals to promote healing and boost the patient experience. The consultant suggested that Tremblay's floral pieces, which radiate both energy and tranquility, would fit perfectly in a health care environment. Tremblay politely declined. Her parents and younger brother worked in medicine, and her older brother was a medical writer, but she had no interest in venturing into that territory. After all, wouldn't her natural work feel a bit incongruous in a sterile place?

Four years later and 28 days into chemotherapy, Tremblay reconsidered.

"Leukemia is not for the faint of heart," she said. "But being sick really focused me and helped me define where I wanted to go with my art. I wanted to pour my experiences into things and place those things in environments where they could help other people. I recognized that had an opportunity to demonstrate the power of art and the good it can do."

Long before she found joy and inspiration through her paper sculptures, flowers played a significant role in Tremblay's life—from the rhododendrons she tended as a child, to the arrangements she created for decades as a floral designer. In February 2017, newly diagnosed with acute myeloid leukemia and undergoing four weeks of intensive treatment, she found herself in a place where bouquets were banned (fresh flowers pose a bacterial risk to immu-

nocompromised patients on oncology units) and in a state of exhaustion that prevented her from raising her head off her pillow, let alone gluing together gigantic rose petals. While staring out her third-floor hospital window at a dingy concrete wall across the street, she was desperate for something to take her mind off of cancer, even for just five seconds.

"I asked to not be told any percentages," she said. "My sons spoke with the doctors and asked great questions, but I knew that knowing those numbers wouldn't help me. I needed good, healing thoughts." But even with the support of her family, friends, and care team, those thoughts were hard to come by as she got sicker: "I felt like I was going to die."

She needed light, color, and beauty—and if she needed these things, surely others in her situation did, too. As her condition slowly improved, the phone call she received years prior replayed in her head. She resolved that if she recovered and regained her strength, she would find a way to share her art with the patients who came after her, as well as the staff who not only kept her alive, but gave her hope.

Tremblay has since transitioned her care to Penn Medicine after her initial diagnosis and treatment at Thomas Jefferson University Hospital. A mutual acquaintance connected her with David L. Porter, MD, the Jodi Fisher Horowitz Professor in Leukemia Care Excellence, and she left her first appointment knowing she was in good hands. In the summer of 2017, she underwent a bone marrow transplant at Penn; because she did not have a well-matched donor, Porter's team opted to use two umbilical cord blood units. The path continued to be winding and bumpy—with several "unpleasant and not easily resolved" side effects and a relapse in 2019—but Tremblay persevered. In the summer of 2020, Porter told Tremblay that she was in remission. She celebrated by sending him a postcard with a floral collage.

For Porter, Tremblay embodies the word resilience. "Like many patients, Michele experienced complications that required prolonged hospitalizations and rehabilitation," he said. "But even though this wasn't what she was expecting or hoping for, she was able to tap into the tremendous energy and motivation she gets from her art. Having something she was so passionate about was really critical for her recovery."

"I feel very lucky and grateful to be where I am," Tremblay said, "I wish I could say that six months from now, I'll be finished with leukemia, and then I'll just check in with Dr. Porter every couple of years. I know that's not the case, though, so I've learned to be satisfied with today. I can't do everything I could do before, but I can do a lot."

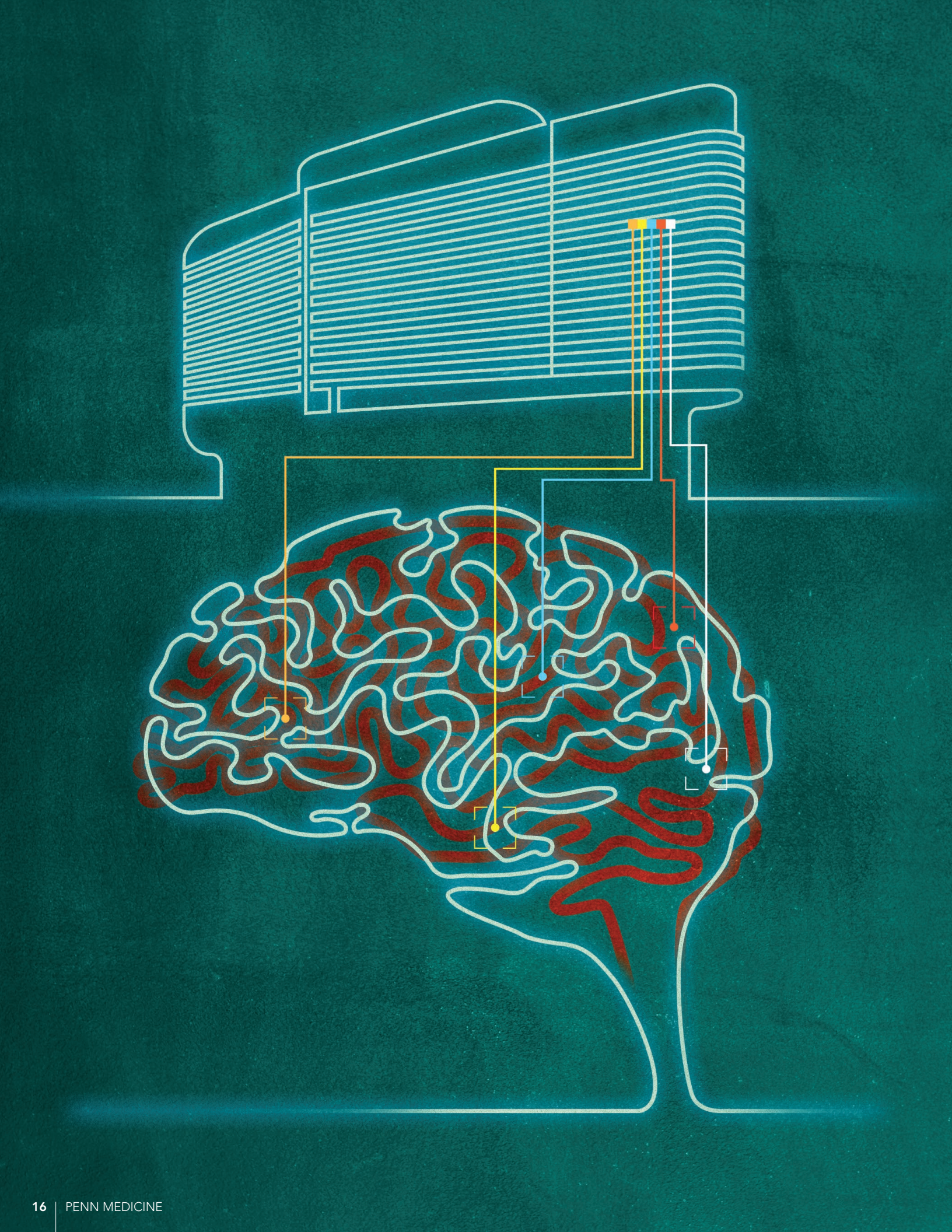
A quick glance at her studio—covered with paper flowers, Mandala paintings, and "10,000 notebooks" detailing her thoughts on color theory—proves this. Some days, she finds sufficient delight in folding half a dozen origami cranes, while other days provide enough time and energy to work on larger commissioned pieces. "Immersing myself in the process of creating art gives my mind a place to rest," she said, "but viewing it also takes you somewhere else and gives you the chance to feel something outside of the everyday—something intriguing and engaging."

It was this belief that encouraged her to take on her most ambitious project to date. Shortly after she was discharged from her month-long stay at Jefferson four years ago, Tremblay reached out to fellow Tyler School of Art and Architecture alumna Polly Apfelbaum. Together, and in partnership with the Philadelphia Mural Arts Organization, they designed a mural to cover the desolate wall across from her hospital room. A few months after Tremblay learned she was in remission, the duo finally saw their vision come to fruition in January 2021 when the mural was installed over the offending facade, bringing natural beauty to an unnatural place. Combining Tremblay's floating gardens with Apfelbaum's colorful circles, the 82-foot-long mural, titled Floating Dogwood, serves as a bright spot for the community, a cheerful thank-you for the Jefferson staff, and a source of resilience and hope for other patients and passers-by.

"Throughout this difficult journey, I saw that Michele loved working on this project," Porter said. "I always admired that the reason she gave was that she was doing it to provide a little bit of joy for the people who came after her… for people who are going through what she has been going through."

"This life-changing experience totally shifted my relationship with art, nature, and flowers, but I still feel pulled to create," Tremblay said. "Everyone struggles, and everyone feels pain, but I believe with all my heart that art can play a real role in helping people—even if they're working their way through the twists and turns of a serious illness. Art can touch people in ways they could never imagine. That's what I'm focusing on going forward."

Read this story online with related links at PennMedicine.org/magazine/cancer-creative.



BRAIN POWERED

By S.I. Rosenbaum
Photos by Dan Burke
Illustrations by Graham Perry

Advanced treatment for epilepsy can offer a unique look at the human mind from inside. By bringing clinical care and neuroscience research closer together, Penn Medicine's newest inpatient facility will help to forge fundamental neuroscience discoveries and new neurotechnologies faster and better than ever.

Luke Debevec's first epileptic seizure came when he was 32. He'd been working on a vacation day—that was typical for him, a young attorney on the cusp of making partner at an international law firm. Then something happened—a storm in his brain. His colleagues found him out cold on the floor of his office.

Four years and countless seizures later, he would find himself sitting in a hospital room at the Hospital of the University of Pennsylvania (HUP). He was plugged into the wall. Multiple electrodes nestled deep into his brain, wires extruding from tiny holes in his head.

He'd tried medication after medication, but nothing had been able to control his epilepsy. Now, doctors were examining activity from these electrodes to show where Debevec's seizures were coming from in order to plan for surgery that might cure him. But he had also volunteered to let Penn scientists use his wired-up brain as a rare and precious experimental resource.

Neuroscience researchers at Penn depend on patients like Debevec, whose treatment regimen offers a unique opportunity to look at the human mind from the inside.

"Typically patients are just fascinated by being part of the scientific process and being able to contribute to our knowledge of how the brain works," said Kathryn Davis, MD, MSTR'11, an assistant professor of Neurology at the Perelman School of Medicine and the medical director of the Epilepsy Surgical Program.

"These patients are changing the lives of people in the future by donating their data," said Timothy H. Lucas, II, MD, PhD, MHCI'19, an associate professor of Neurosurgery and co-director of the Translational Neuromodulation Lab. "And there's no other way to get that data."

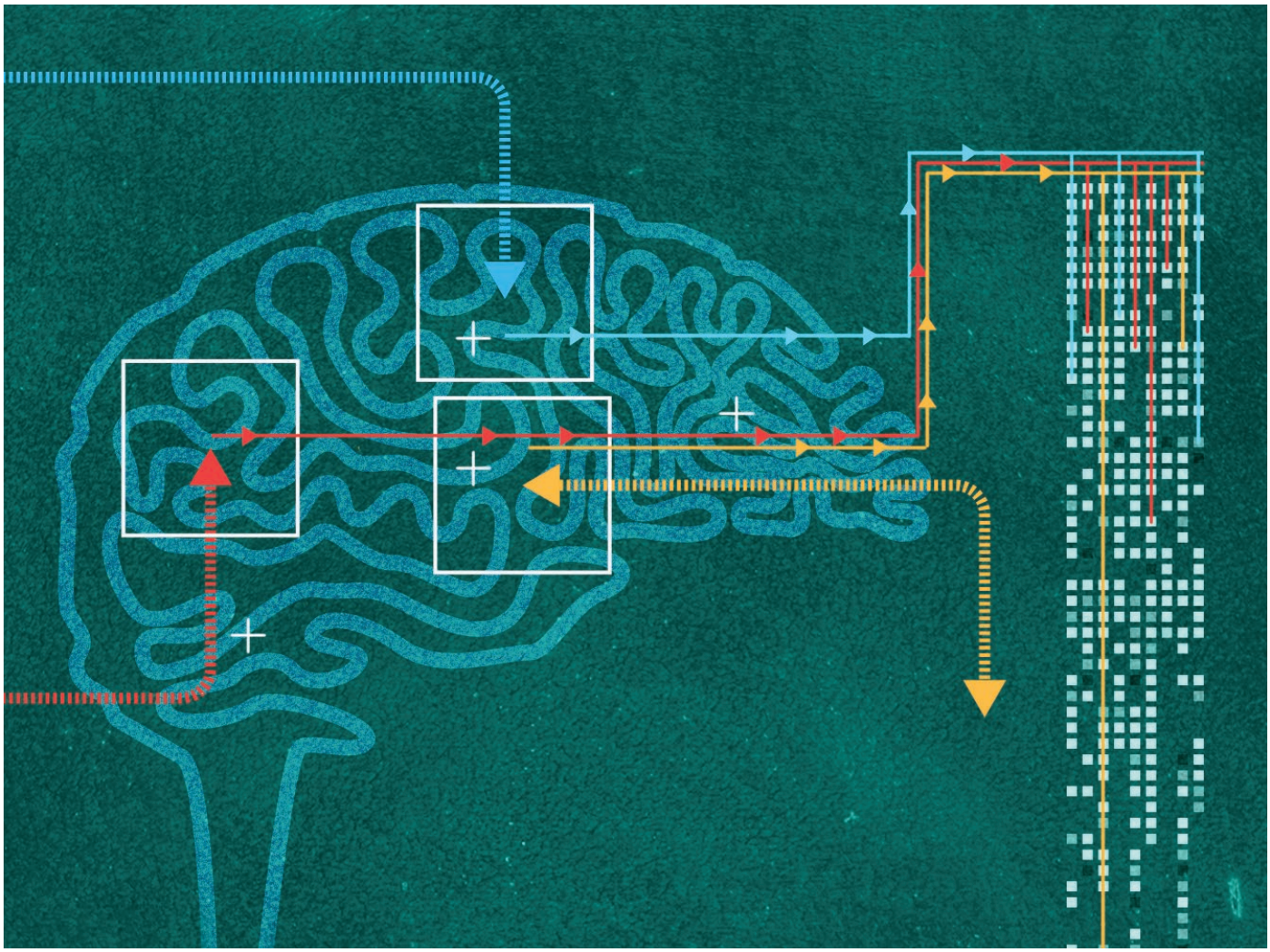
The studies these patients make possible can sound like science fiction, from defining the fundamentals of consciousness to restoring vision through signals sent directly to the brain.

Soon, research facilities at Penn Medicine's new Pavilion will bring this collaboration between research and patient care closer together—with a goal to turbocharge these discoveries with new technologies.

Trading a Cart for a Cutting-Edge Research Center

The new Epilepsy Monitoring Unit (EMU) and Human Neurophysiology Research Laboratory will be comprised of 12 patient rooms—doubling the capacity of the current EMU that Davis directs at HUP today—alongside a state-of-the-art clinical control room to monitor them. But it will also boast a dedicated lab space for investigators working

Neurologists and neurosurgeons Michael Beauchamp, PhD, Daniel Yoshor, MD, Brian Litt, MD, and Kathryn Davis, MD, tour the future home of the Epilepsy Monitoring Unit and Human Neurophysiology Research Lab in the Pavilion, with Stephen Greulich, associate vice president for large capital projects (center).



with patients, with its own suite of technology dedicated to neuromonitoring.

While neuroscientists previously had to trundle carts loaded with equipment from research labs to patient bedsides, the new center will bring investigators from many different labs to work directly with patients in a permanent setting, said Daniel Yoshor, MD, who began as chair of Neurosurgery at the Perelman School of Medicine in the summer of 2020. "There's limits to what you can do with a cart," Yoshor said.

The potential for new research will transcend those limits with the opening of the Pavilion, the new 17-story, 1.5-million-square-foot inpatient building on HUP's campus, this fall. In this location, all of the services patients with neurological illnesses may need will be co-located, including neurology, neurosurgery, neuro-critical care, and a step down unit—making it possible for a patient's clinical care journey to proceed seamlessly as their needs change. This co-location, combined with technologies such as an advanced MRI on the unit and integration with data science capabilities to inform neuro-critical care, will make Penn Medicine's services in these specialties unique in the region.

"These are some of the most technologically intensive areas of medicine," said Frances Jensen, MD, chair of Neurology. "We are delighted to be moving into a 21st century facility to practice 21st century neuroscience. And with so many different subspecialties in our department, it allows us to do a lot of interdisciplinary work with great partners including neurosurgery and radiology."

Yoshor first suggested an integrated neuroscience research and clinical center during talks to recruit him from Baylor College of Medicine. He was meeting with University of Pennsylvania Health System CEO Kevin Mahoney, who was telling him about the expanded EMU. Yoshor asked if the EMU could include a dedicated space for scientists to work alongside clinicians.

Electrodes affixed to a patient's head can give some insight into brain activity noninvasively—but to help scientists learn more about activity deep within the brain, epilepsy patients are offered the chance to volunteer for research studies while waiting for electrodes implanted deep within their brains to pinpoint where their seizures originate.

"What's so impressive about Penn is that in many institutions the hospital is separate from research, and here it is remarkably integrated," Yoshor said. Could that integration become even more advanced? Mahoney's answer was an enthusiastic yes.

"Before, it was going to be a beautiful, state-of-art epilepsy monitoring unit, as good as any in the U.S.—but we asked the team and they agreed to add on additional space, dedicated for research," Yoshor said.

"The neuroscience field is growing exponentially with translation from basic science into clinical implementation," Jensen added. "We're seeing a massive uptick in clinical trials that happen at point of care, so, broadly, integration within our new, advanced facility will allow us to expand our offerings to our inpatient population with new biomarker trials, state-of-the-art therapies, and first-in-human therapeutic trials."

In addition to providing Penn scientists access to the best commercially available equipment, the research space will also function as a testing ground for them to develop their own novel medical devices known as brain-computer interfaces. Using the power of modern computer technology, these permanent brain implants have the potential to head off seizures in epilepsy patients, restore visual function to the blind, and even cure psychiatric disorders.

"It's basically allowing our EMU not just to be at the leading edge of what's out there already, but also positioning us to be creating new leading-edge technologies," Yoshor said.

A key part of the research involves collaboration between clinicians and engineers to develop new types of electrodes that allow for long-term recording and stimulation of the human brain with high precision. This work is being led by Brian Litt, MD, a professor of Neurology and Bioengineering and director of the Penn Epilepsy Center as well as the Center for Neuroengineering and Therapeutics (CNT).

"A tremendous strength of Penn is that our clinicians work side-by-side with great engineers who are experts in computer science and material science, so that clinicians are not just poorly educated users of other people's technology. We not only avoid all sorts of pitfalls, we build great new technologies together."

The new research unit "will be one of the very best places in the country or frankly, in the world, to do this kind of science," Litt added. "I don't think I'm exaggerating."

Monitoring the Mind from Inside of It

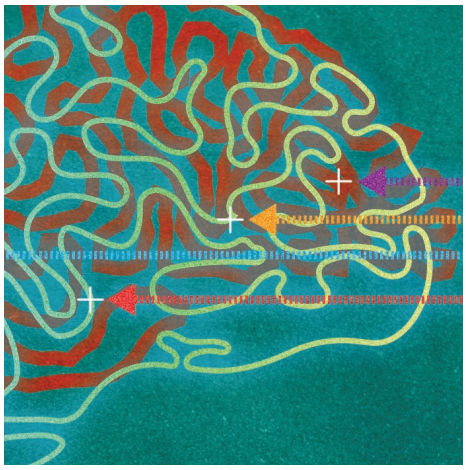
One auspicious day in 1934, Wilder Penfield bent over the open skull of an epileptic patient. The patient's brain was open to the air, but the man was awake, under local anesthetic, and able to carry on a conversation even as Penfield, a neurological pioneer, poked at different bits of his gray matter with a small electrical stimulator.

Penfield was hunting for the source of his patient's seizures, but he found much more.

By stimulating different parts of the brain and watching the patient's behavior, he could form a rough map of how different parts of the brain work. When the patient's speech dissolved into gibberish, he knew he'd interrupted part of the brain that processes language. When the patient saw stars, he knew he'd hit a location associated with sight. Stimulating other areas brought other effects—vivid memories, hallucinations, changes in mood.

In 1937, Penfield teamed up with EEG pioneer Herbert Jasper—who initially drove his EEG machines back and forth from Brown University in Rhode Island to the Montreal Neurological Institute to study Penfield's patients. It was the beginning of the long history of collaboration between people with epilepsy, neuroengineers, and neuroscientists.

"What we learn in this field of neurology is more important to man and more vast than outer space," Penfield wrote. Yet despite all he and Jasper discovered, he added: "The secrets of the brain and mind are hidden still. The interrelationship of brain and mind is perhaps something toward which scientists and doctors will always struggle."



Core Questions of Consciousness

Alex Proekt, MD, PhD, an assistant professor of Anesthesiology and Critical Care, is collaborating with Tim Lucas, Brian Litt, and Kathryn Davis, on a grant with Max B. Kelz, MD, PhD to better understand consciousness.

In its broadest sense we are attempting to understand more about how the human brain processes the world around each of us.

We are using anesthetic drugs to initially decode and ultimately predict when the brain is able to perceive its surroundings and when it dives into the unconsciousness of anesthesia. We are similarly giving sensory stimuli to patients to determine in the absence of anesthetics drugs, when the human brain will accurately process sensory stimuli during wakefulness as opposed to losing consciousness during states of natural sleep. This question is also the subject of our studies in basic science.

[We hope] to better understand how neural activity changes from the waking to the anesthetized state and the critical events that must occur to enable individuals to exit the abyss of general anesthesia and recover full cognitive capacity.

— Max B. Kelz, MD, PhD,
Professor of Anesthesiology & Critical Care

In the Pavilion, our work will be trying to understand human consciousness. We all have thoughts, feelings, and emotions that happen within our brain that no one else can hear—those things define us and our souls. Our brains are receiving all kinds of sensory information 24/7 and remarkably, our consciousness can filter out the vast majority of this and focus on just on the things it wants to focus on. If you're sitting in an office chair, you could be sitting for eight hours and not feel your butt even though you've been sitting on it all day—the brain has mechanisms to filter out exogenous information. One of our questions is, how does the human brain do that?

— Timothy H. Lucas, MD, PhD, MHCI,
Associate Professor of Neurosurgery

It's a struggle that continues today. Functional magnetic resonance imaging, or fMRI, is noninvasive, requiring no surgery. However, because it measures brain activity indirectly, it has limited resolution. It shows changes in blood oxygenation, and these occur much slower than do changes in neural activity, seconds instead of milliseconds.

To really study the brain in action, you have to go inside one, usually by implanting metal electrodes into the brain tissue. Many important advances have resulted from examining animal brains and their constituent neurons.

"It's amazing what neuroscience has done studying mouse brains and monkey brains and brain cells in tissue culture," Yoshor said. "But at a certain level, to really understand how the amazing, miraculous human brain works, you have to study human subjects, and that's hard to do. We don't often get to study awake, behaving human brains."

Because the implant procedure is risky, it can only be ethically performed in humans as part of a treatment protocol—and drug-resistant epilepsy is the only condition for which implanting electrodes throughout the brain is approved by the FDA. The protocol allows the clinical team to pinpoint the parts of the brain that generate seizures and head them off, either by removing the malfunctioning tissue (termed "resection") or short-circuiting the malfunctioning tissue with implantable devices.

After electrode implantation, epilepsy patients typically stay in the EMU for a week or so, stopping their medications and waiting for a seizure to come along so its location and behavior can be recorded. Debevec recalls his EMU stay as a "seizure vacation" — "I'm taking vacation to go hang out at the hospital and have seizures, my least fav thing in the world," he remembered. "And not just to have seizures, but to have them on purpose!"

Taking part in research experiments made the waiting a little less tedious, he recalls. "I participated in whatever I could," he said. As he was answering questions or completing tasks on the computer to pass the time, all the while the electrons flowed from the wires in his brain to record the particular activation inside.

Patients like Debevec are powerful partners in helping scientists study the most advanced and mysterious aspects of human consciousness—such as language, reasoning, or making choices. Take the study Joshua Gold, PhD, a professor of Neuroscience, and neurosurgery resident Ashwin Ramayya, MD'16, PhD'16, have been working on with Timothy Lucas. They're investigating decision making by looking at the neural activity that governs reaction time.

If you ask someone to do a simple task such as pressing a button when a light flashes, the speed of their reaction will be different every time, even if they see the flash and press the button 100 times in a row. Reaction time variability, or "mental chronometry," has been a subject of study since the mid-19th century, but it is still not well understood. A computer would complete this task at the same speed every time. Why is a human brain so variable? Why does the decision to press the button sometimes happen quickly, and other times slowly?

"There have been years and years of psychology studies as to what might be happening under the hood, but it has all been guesswork," Ramayya said. "Amazing guesswork, but there's a lot of unknowns."

To observe this phenomenon more directly, the Penn team asked implanted volunteers to complete this task and recorded the neural activity near the various electrodes in their brains. Some of the electrodes were recording groups of neurons involved in the task; others were recording neural circuits that weren't involved at all.

What they found was surprising. When patients reacted quickly, the neurons involved in the task of pressing the button were firing efficiently—as if someone had cranked a dial from 0 to 11. When they reacted slowly, those same neurons seemed to dither, like someone futzing with a dial to try different volumes before turning it all the way up.

That was to be expected. What they didn't expect was that the same pattern occurred in neurons that weren't involved in the task at all. "It was widespread," Ramayya said. If one group of neurons showed the dithering behavior, others did too.

"The brain is not just a bunch of independent parts," Ramayya said. "It's like looking at body of water—it's not one corner of the water that's turbulent, all of it is." The reason humans take a different amount of time to complete the same task might be because the efficiency of information spread in the brain varies from moment to moment—each part influencing the others in an incredibly complex

weather pattern. When the weather is calm, ships can carry messages across the sea directly, but when the weather is turbulent, they travel slowly and often take long detours. "Given the data, it's safe to think that reaction time variability is a brain-wide process," Ramayya said.

It's a fascinating observation that couldn't have been possible without epileptic volunteers.

But for researchers like Yoshor, the goal is not just to observe brain activity, it is to hack it, building a two-way link between the brain and computing devices that can help people recover lost abilities.

Engineering Sight, Sound, and Touch

Yoshor's research specialty is visual processing, specifically, creating a brain implant that will allow blind people to see.

For decades, scientists have dreamed of creating a brain "prosthetic" for blindness. By transmitting information directly to the brain's visual cortex, it should be possible to bypass eyes that have been damaged by disease or injury. Worldwide, nearly a million people wear a similar device for hearing: the cochlear implant, which delivers an auditory signal to the nerve in the ear that the brain then processes into sound—not something comparable to how we hear naturally, but enough to be useful to many people with severe hearing loss.

Creating an equivalent visual prosthetic is more challenging, in part because we take in much more information from our eyes than we do from our ears; while the optic nerve has more than a million neuronal connections between the eye and brain, the cochlear nerve has only about 50,000.

That said, it is relatively easy to understand how artificial stimulation of the optic nerve or visual cortex could work—it is something anyone can do by rubbing their closed eyes. This stimulation makes one see a bright spot, called a phosphene. The basic idea of a cortical visual prosthetic is to produce many such bright spots, using stimulation of electrodes implanted in the visual cortex.

The difficult step is linking different phosphenes to create an image, rather than just isolated spots. It's easy to assume that "individual phosphenes are analogous to pixels in a computer display and that they can be easily combined to generate a coherent image," wrote Michael S. Beauchamp, PhD, in a paper recently published in *Cell*. But "despite its intuitive appeal, there is little evidence that these assumptions are correct."

The potential to develop new brain-computer interfaces at the new Human Neurophysiology Research Lab in the Pavilion means Penn Medicine will not only be "at the leading edge of what's out there already, but also positioning us to be creating new leading-edge technologies," said Daniel Yoshor, MD, chair of Neurosurgery.

"These are some of the most technologically intensive areas of medicine. We are delighted to be moving into a 21st century facility to practice 21st century neuroscience."

— Frances Jensen, MD, Chair of Neurology

Instead, stimulating more than one part of the cortex at the same time just produces blurry blobs of light.

Beauchamp (who recently joined Penn as a professor and vice chair of Neurosurgery), Yoshor, and their colleagues came up with a workaround. Instead of stimulating different parts of the cortex all at once, they found a way to stimulate different parts *in sequence*—creating the appearance of a moving dot of light that could trace the outline of shapes and letters.

The test subjects—blind volunteers as well as sighted epilepsy patients—were able to reliably identify the shapes outlined this way, as well as tell what direction the dot of light was moving in.

It's a first step toward a viable visual prosthetic that can "put information directly into the brain," Yoshor said.

"What's happening in the neurosciences today is extraordinary—there's been tremendous advances in the past few years and there's an avalanche of innovation ahead," he said. "Our efforts are ambitious, but with the ongoing developments in neuroscience, engineering, and computer technology, it is no longer science fiction."

While Yoshor and his team investigate vision, other investigators will be using the facilities in the new Pavilion EMU to examine other human senses. Yale Cohen, PhD, a professor of Otorhinolaryngology, Neuroscience, and Bioengineering, is studying auditory processing (how we understand, differentiate and think about sounds) while Jay Gottfried, MD, PhD, a Penn Integrates Knowledge professor of Neurology and Psychology, is doing similar work on the olfactory system.

And several, like Yoshor and Beauchamp, are doing research into brain-computer interfaces. Timothy Lucas is building an implanted device to restore a person's sense of touch.

"When you have a telephone call, two people have equal measure, it's two-way communication—the same is true for moving an arm or leg. Motor signals from the brain move to the leg to make it contract, or sensory signals from your fingertips when holding a pen send a signal to the brain on how much pressure to apply and when," Lucas said. "That second connection is called sensory, and the devices we're working on tackle that side of the equation."

Many scientists have been working to develop ways to restore movement to paralyzed limbs, or to let people with paralysis operate robotic prostheses, by sending signals from the brain directly to the limb or to the prosthesis. But those advances overlook the importance of the sense of touch, Lucas believes. And experiments in delivering a sense of touch by way of neural implants depend on gauging the subjective experience of human participants.

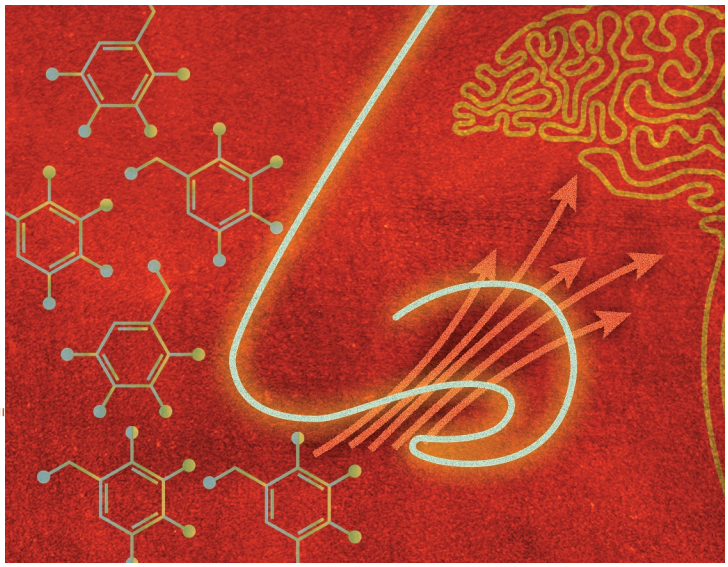
"Animal studies do not answer the question of how stimulation *feels*," Lucas wrote in a 2017 *Neurosurgery* article. "To answer these qualitative questions, we need human data."

Back to the Bedside

From new forms of computer interface for the able-bodied to radical new ways of augmenting disability, the neuroscience discoveries being made from signals in the brains of epilepsy patients at Penn Medicine could eventually lead to applications in many fields. But Penn's new Pavilion will also be home

BRAIN TEASERS

How an Odorous Molecule Connects to the Sensation of Smelling



Our research focuses on how odors at the nose are transformed into olfactory signals in the human brain. We use a multidisciplinary set of tools, including task-based functional MRI, intracranial EEG recordings in patients with medically resistant seizures, and anatomical and cellular analysis of the human olfactory system.

The new Pavilion will be instrumental in helping us advance the pace, caliber, and breadth of our intracranial EEG research in epilepsy patients. I expect these amplified resources will place the Perelman School of Medicine as the top U.S. academic medical center pushing the cutting edge of this type of research.

— Jay Gottfried, MD, PhD, Arthur H. Rubenstein Penn Integrates Knowledge Professor of Neurology and Psychology

to research that will benefit the very people who volunteer their time as test subjects.

At the EMU, Kathryn Davis is already working on ways to improve the outcomes of the patients who come in for surgery.

The reason for the electrodes implanted in their brains, after all, is to determine which parts of their brains might be causing their seizures and are good candidates for surgical removal (resection). In some cases, patients are also candidates for permanent brain-stimulating implants, which can prevent seizures by interrupting brain activity with mild electrical pulses, and the electrodes help predict where those implants should go.

Davis' lab is using machine learning, computational data science, and network theory to make this process of prediction more foolproof. One possible route is using computers to perform a virtual resection: Before any actual brain tissue is removed, a computer model predicts what the likely outcome would be. Using MRI data to augment the data from implanted electrodes can also provide a clearer picture of how seizures begin.

Concurrently, Brian Litt is working on making seizure-neutralizing implants more functional. He points out that thoughts, feelings, and behavior all have a dramatic impact on human health but implantable devices don't receive any inputs that track these factors. As he posed the question in a recent grant application, "Coupling peripheral sensors to implants might better infer our actions or thoughts, but wouldn't it be easier if the devices just asked us?"

He imagines a "new generation of autonomous neurodevices—machines that can question, record, act," that would interface with users through apps on their phones, warning them if the device registers unusual activity, and learning from the user's behavior.

For these researchers, this is just a way of giving back to the patient-collaborators on whom their work depends.

"This patient population in particular is incredibly generous with their time, and have a high level of desire to contribute to research even if it's not going to directly benefit them,"

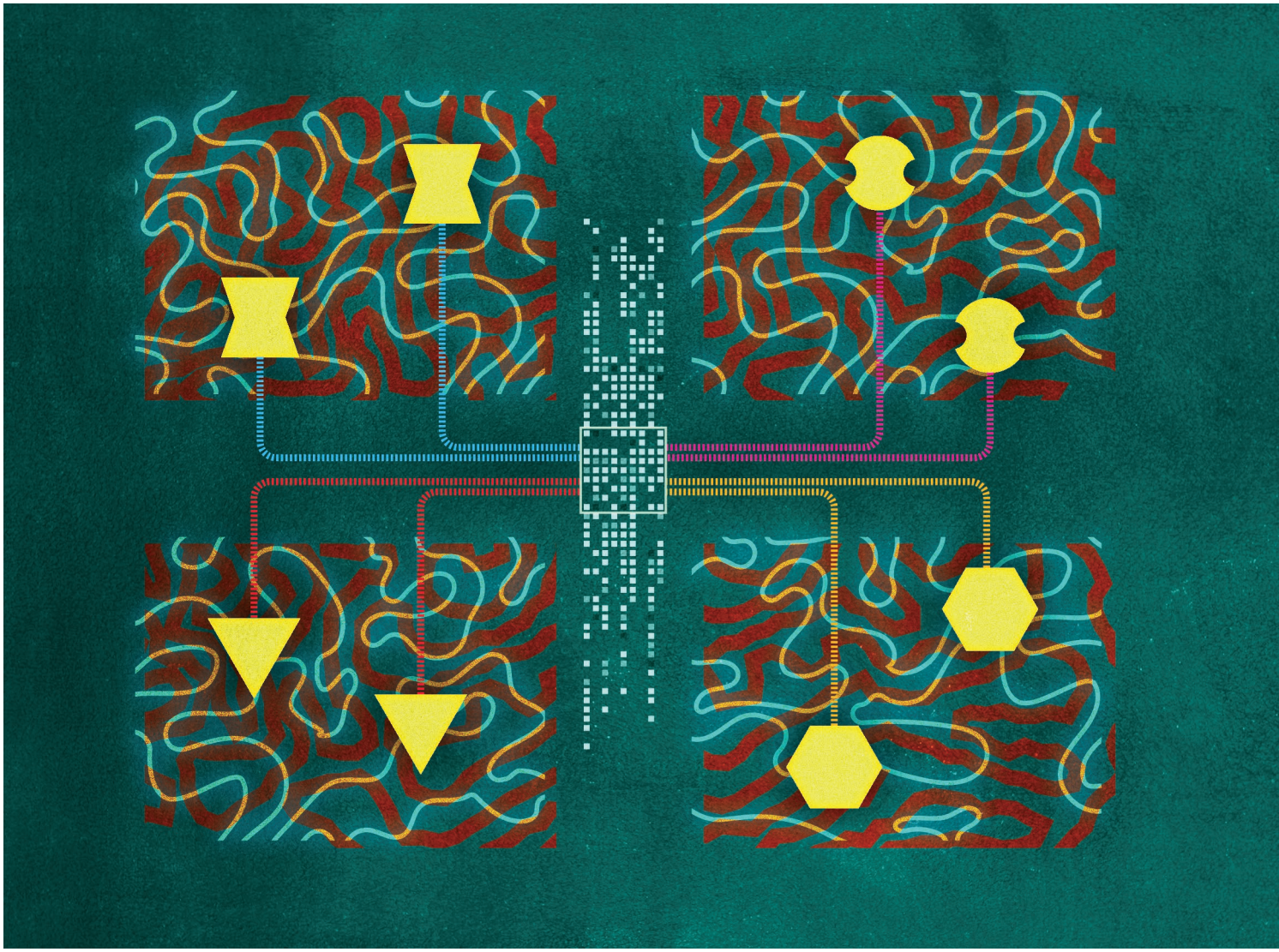
BRAIN TEASERS

Modeling How Brains Focus on a Fiddle

My lab studies how we hear. We study how the brain interprets auditory stimuli as "sounds." For example, how do we recognize that a fiddle is playing? How do we pay attention to a person's voice—or ignore it?

We study this by testing behavior and by testing brain function. At the Pavilion, we will be able to conduct more sophisticated hearing studies and be able to collect better and more data. This will facilitate our interactions with the other faculty members in the group so that we can better examine the relationship between neural activity and perception as well as developing computational brain models.

— Yale E. Cohen, PhD, Professor of Otorhinolaryngology, Neuroscience, and Bioengineering



Davis said. "They've lived through the frustration of our current knowledge base where there are many holes."

For Luke Debevec, that was certainly true. Working with Davis, he'd tried many seizure medications; many had terrible side effects, and while some were helpful, none of them stopped his seizures. He was hopeful that surgery would be the answer.

He came through the surgery safely in 2017.

Then he had a seizure. And another one. "I was really depressed," he recalls. It seemed like he'd done everything he could, and failed.

But today, it has been two years since his last seizure. He's still on medication, but much less than he had taken before. Where before it had been weeks or months from one seizure to another, now he's counting in years—an improvement he's deeply grateful for. "The fact that they can go do brain surgery and I can go back to work and have this interview and reflect about the philosophical points that rise from it—I think that is incredible," he said. "I am blown away by the whole process."

More than that, he's glad he was able to contribute some of his time as a patient to working with the scientists who studied his brain.

"I'm the beneficiary of thousands of years of collective human scientific knowledge," he said. "At the end of this process, the least I can do is make sure people can continue building on that."

Watch a conversation between Frances Jensen, MD, and Daniel Yoshor, MD, on the rapid-breakthrough environment of neuroscience at Penn, on the OPENN MED, a new series about how Penn Medicine is redefining world-class care.

THE WRITING ON THE (PAVILION) WALL: *MAKE YOUR MARK!*

Since 2016, anticipation has been steadily mounting for the completion of the Pavilion at Penn Medicine. Billed as the most ambitious construction project in the University of Pennsylvania's history, thousands of words have been penned and hundreds of photos and renderings shared that feature sneak peeks of the state-of-the-art new inpatient care facility.

In October of 2021, the Pavilion will welcome its first patients. They will join the ranks of architects, engineers, physicians, staff, and patient and family advisors that already have shaped and can claim a stake in its future. With a design informed by their insights and built to incorporate changing technologies and evolving care protocols, the Pavilion is poised to serve patients in this community and from around the world for generations.

Now is the time to make your mark in the Pavilion. When you make a naming gift, your name will be displayed in the space of your choosing according to your support. The full range of recognition opportunities touch each pillar of Penn Medicine's mission: from spacious, comfortable, and private patient rooms that enhance the care experience; to cutting-edge imaging and intervention technologies that advance translational research; and bright and airy lobbies, green spaces, and inter-campus connections that extend the healing landscape throughout Penn's medical complex.

Sample Named Space Opportunities:

- Inpatient Care Station
- Inpatient Room
- Workforce Renewal Center
- Operating Room
- Large Corner Conference Room
- Large Family Waiting Room

Pavilion gifts may be divided to support both capital (construction costs) and research or patient care, yet the total value of your gift will be counted toward recognition. And any gift may be fulfilled across one to five years.

Make your mark on Philadelphia's premier place for healing. To learn more about the Pavilion's naming opportunities, contact Kathy Rubino at krubino@upenn.edu or 215-200-3735.

"It feels like a gift to be part of building a space of healing not just for you and your family, but for people from all over the world."

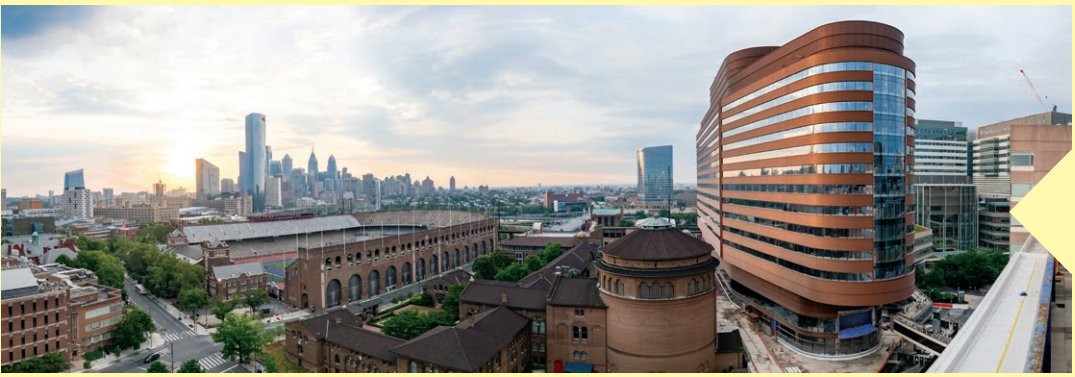
– Ethel Hofman, patient family member and Pavilion donor

"[The Pavilion] will make a difference for patients and families and clinical staff for many years to come. The whole goal of the project is about improving the human experience in health care."

– Kathy Gallagher, MS, BSN, former nurse manager and member of the Pavilion's design and construction team

Ursina Teitelbaum, MD, a professor of Hematology/Oncology, and husband Benjamin Abella, MD, a professor of Emergency Medicine, tour the Pavilion's Emergency Department with Gallagher. They look forward to collaborating on patient care in the new building.

Poppy Bass, senior project manager in Penn Medicine Information Services, demonstrates new technology to help patients stay informed about their care in the Pavilion.



Many patient, clinical, and visitor spaces will have sweeping skyline views.

The Cancer Fighters

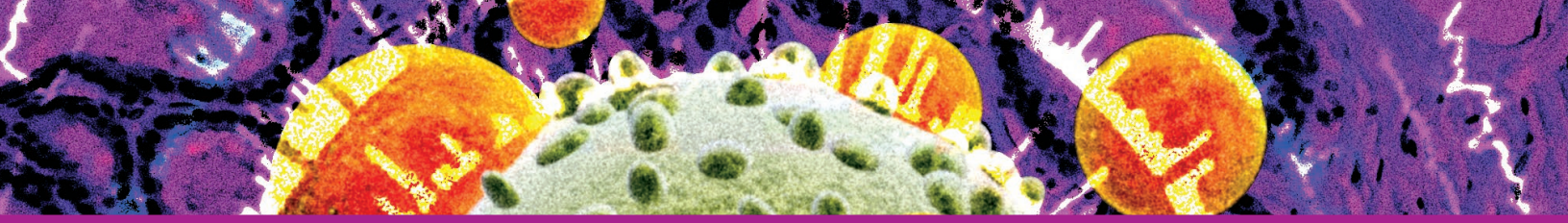
The National Cancer Act passed 50 years ago, lighting a spark that would revolutionize cancer care. In time, the University of Pennsylvania and its Abramson Cancer Center came to fuel many of the transformational changes in oncology across the landscape. In advance of his retirement, Dr. John Glick, the center's longest-serving director, reflects on his lasting legacy in the extraordinary ensemble of cancer fighters he inspired through his career on the front line of that transformation.

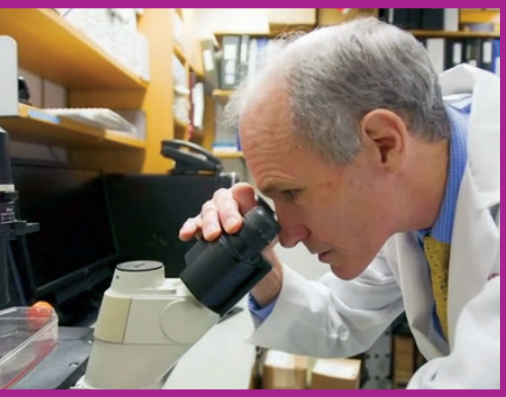
Half a century ago, the word "cancer" was hardly spoken. For patients, the options were few, painful, and rarely offered hope. Today, the notion of cancer has radically transformed. From one taboo disease, it is understood to be hundreds of unique molecular diseases with hundreds of precision treatments and many cures, some of them powered by harnessing the body's own immune system. Care for cancer patients is not only about the disease, but about the person, encompassing their psychosocial needs and other ailments. Research connects from the bench to the bedside and back. It spans the full spectrum from prevention to survivorship care.

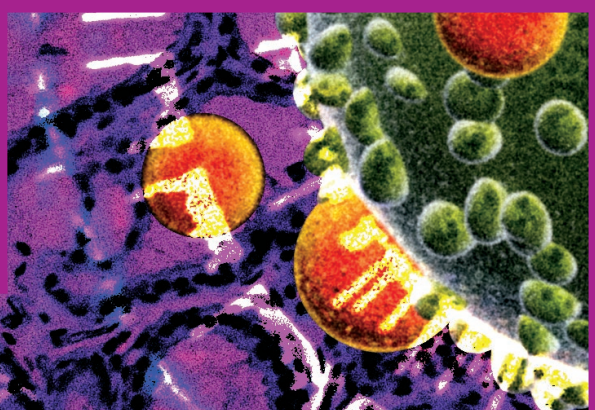
As this radical revision of the cancer world has unfolded at the University of Pennsylvania and its Abramson Cancer Center (ACC), so it has across the world—and in many notable cases, Penn has driven the revolution.

No one knows this better than John H. Glick, MD, the Madlyn and Leonard Abramson Professor of Clinical Oncology and professor of Medicine at the Perelman School of Medicine. The director of Penn's National Cancer Institute (NCI)-designated comprehensive cancer center from 1985 to 2006, Glick first came to Penn as a young clinical researcher fresh from fellowship training at Stanford and the NCI. Over his distinguished career, he has treated thousands of patients, pioneered medical treatments for breast and other cancers, and forged relationships with philanthropic supporters, including the Abramsons. He has also mentored and recruited generations of leaders. Immunotherapy pioneer and pancreatic cancer researcher Robert H. Vonderheide, MD, DPhil, currently the director of the ACC, was among these recruits in 2001.

Photos on opposite page, clockwise from top: John H. Glick, MD; Robert H. Vonderheide, MD, DPhil; Glick with Madlyn Abramson announcing the $100 million gift establishing the Abramson Family Cancer Institute in late 1997; Katherine Nathanson, MD, now deputy director of the ACC, as a Genetics fellow in the 1990s; Carl June, MD, who led development of the first engineered cell therapy approved to fight cancer. Center photo: A flash mob celebration for the FDA approval of the first CAR T therapy.








CANCER CENTER

In March, the longest-serving and current ACC directors sat down for a reflective conversation on the past five decades that have set oncology ablaze—at Penn Medicine and radiating around the world.

The Origins of an Extraordinary Cancer Center

Robert H. Vonderheide, MD, DPhil (RHV): John, you came to Penn three years after the National Cancer Act was passed by Congress and signed by President Nixon. You have a better perspective than anyone about how the field has changed and grown. Take me back to what it was like at that time.

John H. Glick, MD (JHG): In 1974, cancer was a feared disease. And cancer care was fragmented, where it existed at all. It was basically a surgical disease—and maybe the surgeons would refer a patient to a radiotherapist. It wasn't even called "radiation oncology" then. Medical oncology was in its infancy. Hematology had been around for maybe a decade, but medical oncologists were rare.

Patient care was not patient-centric. It wasn't interdisciplinary. The patients did not have hope. There was no discovery or innovation, certainly no merging of state-of-the-art cancer research with patient care.

RHV: What you described is absolutely not at all how we think of cancer care anymore. How did we get here?

JHG: It took us a long time. When I first came here in '74, I was the only medical oncologist at Penn. I saw every cancer patient in the hospital for four years. It took over a decade to begin to have the most important component of cancer care, which is great physicians. The cancer center for years was really small: the Hematology/Oncology division and the department of Pathology. In 1985, when I became director, it was still a very small cancer center—a hundred members, very few departments—not existing outside of the School of Medicine.

We started with what has become the foundation: recruitment of outstanding physicians and outstanding scientists.

RHV: The effort to grow cancer care at Penn was eventually put on a rocket ship with the transformative, $100 million gift in late 1997 from Leonard and Madlyn Abramson, who you met when she had breast cancer and was your patient. She not only survived her disease but became, for decades until her passing just last year, such an important guide for everything we do. In the late nineties, she and Leonard worked with you and thought about a vision to create an extraordinary cancer center here.

JHG: Madlyn and Leonard became my very close friends after her care. We talked about my hopes and dreams, what we wanted to accomplish at Penn, what they wanted to help us accomplish for cancer patients, cancer research, and treatment. By then, we were already an excellent matrix cancer center, designated by the National Cancer Institute as a Comprehensive Cancer Center. We were strong, but we were not exceptional. We did not have the philanthropic resources, the money to recruit the faculty and staff who would put us on track to get into that next level.

Leonard and Madlyn's gift was not for bricks and mortar, but for the recruitment of the best and brightest scientists, clinicians, social workers, psychiatrists, and nutritionists. They wanted us to take the cancer center from excellence

to eminence—to be a place where a patient with cancer said, "I'm going to Penn's Abramson Cancer Center," knowing that was where they would get the very best care. They took our cancer center to exceptional heights, and in 2002, President (Judith) Rodin and I worked with the trustees to name the Abramson Cancer Center at the University of Pennsylvania, in perpetuity. We named the Abramson Cancer Center in recognition of their transformational philosophy, philanthropy, and what they had done for patients through our research.

DEVELOPMENT MATTERS

IN GRATITUDE TO A SINGULAR CHAMPION

When John H. Glick, MD, came to Penn Medicine in 1974, he immediately saw an opportunity to build a cancer program that could serve the patients and families who inspire him every day. He also held a deep appreciation of the strategic investments that would fulfill that vision.

Here, and in the Development Matters sections on the next few pages, we celebrate Glick's visionary approach, commitment to the "big ideas," and impact.

Through his treasured partnership with Leonard and the late Madlyn Abramson and their marquee event Philly Fights Cancer, spearheaded by daughter Nancy Wolfson, Glick was able to make the Abramson Cancer Center the epicenter of translational medicine and birthplace of important new therapies and scientific breakthroughs. He also forged a strong relationship with Penn Medicine Development and Alumni Relations to establish both the Abramson Cancer Center's dedicated development program and leadership council.

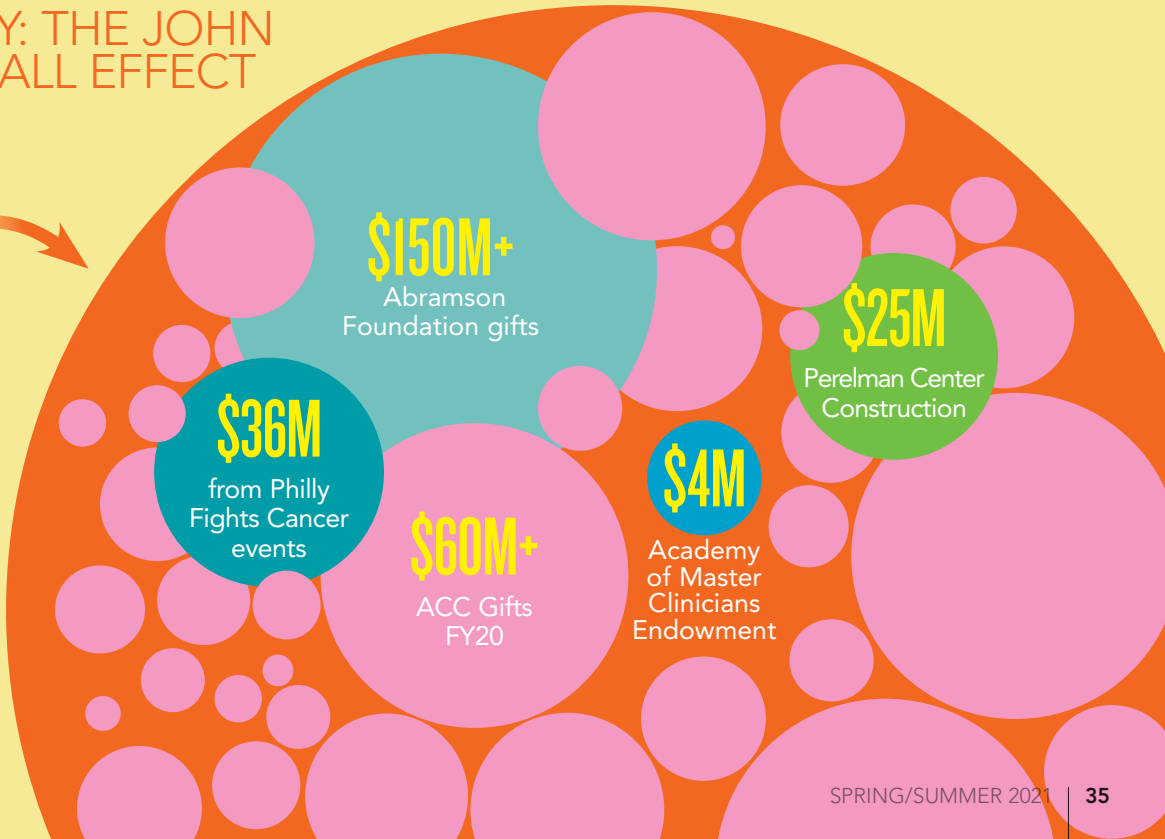
Today, the Abramson Cancer Center is the quintessential example of collaboration among schools and centers across the University of Pennsylvania's vast and interconnected campus. More than this, it speaks to the power of compassion, hope, and partnership in a relentless mission to eradicate cancer.

Glick with the Abramsons

PHILANTHROPY: THE JOHN GLICK SNOWBALL EFFECT

$600M+
for the Abramson Cancer Center and Penn Medicine (1985-present)

Abramson Cancer Center gifts each year grew from $1 million in the mid-1980s to more than $60 million in the most recent fiscal year.



Powered by Great People

Recruiting top talent has long been a major area of focus for Glick and one that has made a lasting imprint on both the ACC and Penn Medicine as a whole. Between 1999 and 2004, he recruited 90 faculty members, including Carl June, MD, who went on to develop the first FDA-approved therapy to fight cancer using the body's own engineered immune cells; Celeste Simon, PhD, the scientific director of the Abramson Family Cancer Research Institute; and Susan Domchek, MD, a world-leading expert in hereditary cancer and executive director of the Basser Center for BRCA. Glick has also chaired the search committees for half of the current clinical department chairs at the Perelman School of Medicine.

RHV: What do you look for when you're recruiting top leaders?

JHG: Leadership. I look for passion. I look for a track record. I look for integrity. And as importantly, I look with how the individual will fit into Penn's special culture. Our culture is one of collaboration, consensus, collegiality. Penn is not an institution of siloed departments. I look for people who will work with our centers and institutes and not be afraid of them.

RHV: You've touched thousands, if not hundreds of thousands, of patients through the years with all those you've mentored. What lessons do you consider the most important to impart?

JHG: You must be a role model. You have to be in the trenches. There's more to medicine than the electronic medical record or what you read in textbooks. Try and impart the art of medicine. Act as if every patient is your only patient. Every patient should be treated as you would treat a member of your own family—with dignity, compassion, hope, and caring, and meticulous care. I don't believe you can be too meticulous.

Communication is key. Even as technology has changed, patients have always had a way to contact me with questions. And you need to be responsive—understanding what worries them. For instance, patients are anxious when they have a scan and they know they're going to have an appointment a week later. I try and get the results back to them that day. I try and impart this style of practicing medicine to our students, residents, and fellows. It relieves patients' anxieties and brings them to the table as a part of their own care team.

Just as important, I try and teach mentees the value of listening. There was a study published a few years back where a doctor said, "How are you?" and they timed how long it was until the doctor interrupted the patients. It was just seconds. I try to listen to patients, not only to the words they say, but to the words behind the words they say. Finding out about their families and the children—their personal lives' impacts on how they deal with their illness. You have to look at the whole patient.

And then, making sure that every question from your patients is answered. I encourage patients to come in with a written list of questions. As a doctor, I teach that you have to answer them all. No question is unimportant.

A CHORUS OF THANKS

Notable Penn Medicine and ACC leaders share tributes to Glick's lasting impact.

If called upon to list Penn Medicine's most impactful leaders, you must include John Glick. [He is] a legendary institutional role model.

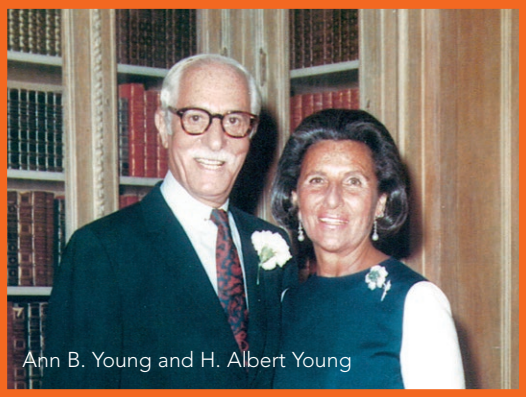
– J. Larry Jameson, MD, PhD
EVP, University of Pennsylvania for the Health System
Dean, Perelman School of Medicine

Dr. Glick's vision for the ACC was a large reason why I joined the faculty. It has been a true pleasure to watch over the last 20 years as his vision has been realized. I am so proud to be a part of the Abramson Cancer Center.

– Susan Domchek, MD
Basser Professor in Oncology
Executive Director, Basser Center for BRCA

DEVELOPMENT MATTERS

Glick mentees Kevin Fox, MD, Angela DeMichele, MD, MSCE (also pictured at left), and Lynn Schuchter, MD



Ann B. Young and H. Albert Young

Jameson, Glick, and then-UPHS CEO Ralph W. Muller upon establishing the Academy of Master Clinicians in 2013

Glick was able to shape the Abramson Cancer Center into a national model of excellence because his strategic investments extended into "human capital" recruiting, cultivating, and mentoring future faculty leaders in cancer. He arrived at Penn as part of an already historic line of cancer center directors: Peter C. Nowell, MD, whose co-discovery of the Philadelphia chromosome proved cancer was a genetic disease; and Richard "Buz" Cooper, MD, who designed the multidisciplinary model for cancer care that is standard today. To that tradition Glick brought a culture of compassionate cancer care, giving patients the most powerful medicine: confidence to get through the rigors of treatment. He was determined to provide faculty every opportunity to follow in such storied footsteps—at Penn and beyond.

Thanks to the gift establishing the Abramson Family Cancer Research Institute, Glick was able to recruit 90 new members to Penn Medicine's faculty. He was proud to be the inaugural Ann B. Young Assistant Professor in Cancer Research and so, over the decades, he would help establish 20 endowed professorships in the Division of Hematology/Oncology alone. With Glick's name as a byword for superlative cancer care and research, two endowed professorships were created in his honor: the John H. Glick, MD Professorship in Cancer Research and the John H. Glick, MD Abramson Cancer Center Director's Professorship.

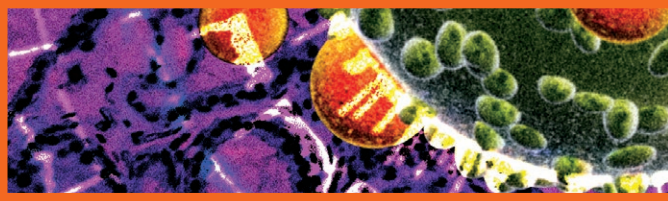
Glick's philosophy on clinical excellence would naturally spread beyond the cancer faculty, and he raised an initial $500,000 gift from Independence Blue Cross to kick start Penn Medicine's Academy of Master Clinicians—an august body of exceptional physicians counting more than 110 members. He raised an additional $4 million for the Academy's endowment, ensuring that the finest and most noble qualities of Penn Medicine clinicians would be celebrated and instilled into junior faculty for generations to come.

John Glick has done more to shape the culture and impact of the ACC than any other person in its history. John always taught us: Treat your patients as though they were family. And that philosophy has touched everything he built at Penn Medicine and at the ACC. He recruited me and so many of the faculty in the Hem/Onc division and the ACC. John's impact on our Cancer Center will be felt for generations. He is my colleague, my mentor and most importantly, one of my dearest friends.

– Lynn Schuchter, MD
Chief of Hematology/Oncology
C. Willard Robinson Professor of Hematology/Oncology; Director, Tara Miller Melanoma Center

Reviewing plans for the Perelman Center in 2004, (back) Glick, then-UPHS CEO Muller, Michael Parmacek, MD, chair of Medicine; (front) then-Dean Arthur H. Rubenstein, MBBCh, Penn President Amy Gutmann

Demolition of the Philadelphia Civic Center, now the site of the Perelman Center



Glick with Lyn (right) and the late George M. Ross at the opening of the Perelman Center

Perhaps the most clearly visible evidence of Glick's impact on cancer care—indeed, the entire Penn Medicine campus—is the Ruth and Raymond Perelman Center for Advanced Medicine (PCAM). By championing and fundraising for a patient-centered experience at Penn Medicine, Glick helped realize a clinical home for the Abramson Cancer Center that has proven to be a game-changer for its patients, physicians, and health care professionals. Here was a facility that, with multiple specialties working under the same roof, could empower the Abramson Cancer Center to provide convenient, integrated cancer care. Even more, the ACC was able to expand its offerings, including the first and longest-running adult cancer survivorship program in the United States—made possible, notably, through one of the inaugural Livestrong grants from the Lance Armstrong Foundation.

More than that, PCAM was the first critical piece of a new, comprehensive biomedical complex. Glick and Gillies McKenna first proposed the construction of a proton facility at Penn in 1994. After a generous naming gift was secured from the Roberts Family, he worked alongside leadership from Penn Medicine's Department of Radiation Oncology to build a world-class, comprehensive, and integrated proton therapy program that included the Penn-Walter Reed partnership.

Charting New Paths through Clinical Research

Improving upon and creating new treatments for cancer has been a hallmark of the past generation of oncology writ large, for the ACC, and for Glick as a clinician-scholar. Glick's own research has mapped the standard of care for blood cancers and breast cancer.

RHV: You've been involved in many landmark discoveries and clinical trial results over the years—in particular, in the year 2000, in a *New England Journal of Medicine* paper that reversed the field of breast cancer treatment in a day. You were senior author of the paper with a young fellow at the time, Ed Stadtmauer, MD'83, now a senior leader here at the ACC, in a study of 500 patients examining the role of bone marrow transplant for advanced breast cancer. Can you tell us about that and how it came to be?

JHG: In the early 1990s, there were small studies claiming incredible results in patients with metastatic breast cancer by using high-dose chemotherapy plus autologous bone marrow or stem cell transplant. They used historical controls. And because of these studies, treatment practice across the country changed. Clinicians started doing ad-hoc bone marrow transplants in patients with metastatic breast cancer. For-profit centers arose throughout the United States. It was a multibillion-dollar industry.

I'm a great believer in evidence-based medicine. I made my career in randomized clinical trials. And so we formed the Philadelphia bone marrow transplant group along with Fox Chase, Jefferson, and Hahnemann. We started the trial in Philadelphia, (got Mayo and Hopkins to join,) and then, because we needed more patients, it expanded to cooperative groups. Penn and Mayo made the decision that we were not going to transplant any patient who didn't go on the trial. The results, when they came out, showed no difference in progression-free survival, event-free survival, or overall survival for the group that got high dose chemotherapy and bone marrow or stem cell transplant when compared to conventional chemotherapy. When it published in the *New England Journal of Medicine*, transplant for such patients stopped overnight. Those for-profit centers went out of business and bone marrow transplant for metastatic breast cancer stopped being done in the United States.

RHV: And all the toxicity being delivered to these patients under what turned out to be false hope was reversed.

JHG: The cost in terms of human suffering and the financial cost to our health care industry were instantly reversed (because the transplant was extraordinarily expensive). That's one of our proudest accomplishments, and it couldn't have happened without the incredible team at Penn.

It really shows you the importance of randomized clinical trials. Penn has developed its reputation in developing new therapies and approaches, and that's how you have to do it. When the FDA approves a drug, whether it be from Penn or elsewhere, they need data that is evidence-based. If you're going to change the standard of care, you have to do it the right way, and having the data showing why is critically important.

RHV: Another modality that you played such a visionary role in is proton therapy—at the Roberts Proton Therapy Center. There was a tremendous amount of excitement about protons 15 years ago, but the effort at Penn was always focused around building the evidence base. When you were proposing the proton center here, you faced a lot of naysayers, but you persisted.

JHG: I've always felt that if you have a dream and vision and you believe in it, then when you get a "no," that's halfway to "yes." And I've done that throughout my whole career: If I believe in something, I will pursue it many times.

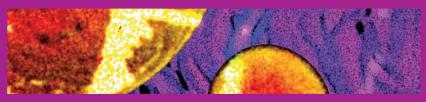
Dr. John Glick's singular commitment to delivering the very best care to each and every patient is ingrained in every care interaction at the Abramson Cancer Center—a vibrant institution that has grown to give patients and their families hope and foster a relentless quest by our faculty and staff to provide even more options to treat cancer.

– Kevin B. Mahoney
CEO, University of Pennsylvania Health System

A DEVOTED CLINICIAN

THEN

Channel 10 TV Reporter Lu Ann Cahn was just 35 years old in 1991 and the mother of a four-year-old when she invited cameras into the hospital to document her own fight with breast cancer. She hoped to inform other young women, before the internet, that early detection is life-saving. In 2020, one week after celebrating her daughter's wedding, Cahn saw her oncologist for the last time—she learned at once that she was cured and that he was retiring. Her message for cancer patients now: "Live today. Dare today. No regrets. And thank God for this man who shepherded and watched over my health to help bring me here today… John Glick. I'm forever grateful."



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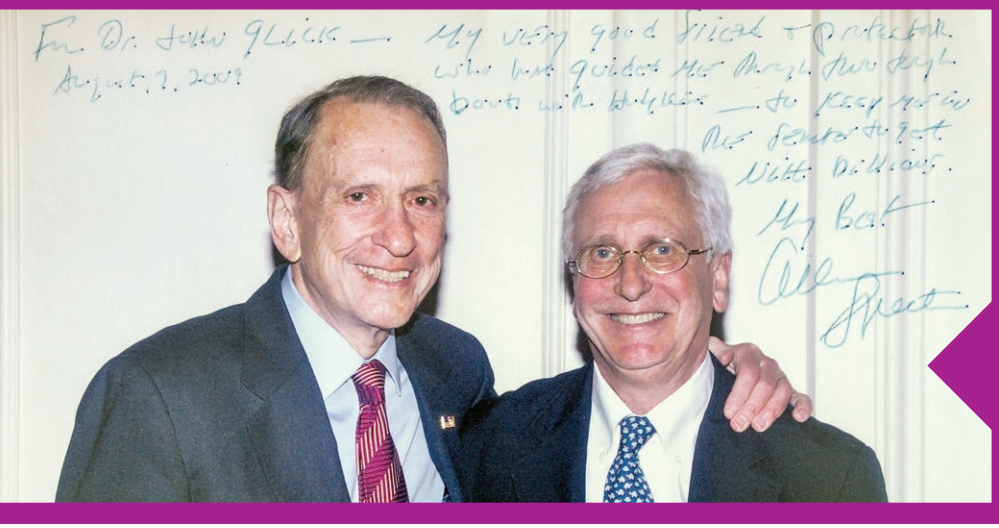


Longtime U.S. Senator Arlen Specter (1930-2012) underwent treatment for Hodgkin's lymphoma, commuting to Penn for treatment after Senate sessions ended for the week. Glick cleared his schedule to be at his side during Friday afternoon chemotherapy infusions, providing both compassion and conversation.

John Glick is a consummate physician/oncologist. His devotion to his patients is widely recognized and his care of them and their families is exemplary. Everyone knows that John is available to them 24 hours per day and 7 days per week. Patients are referred to John from all over the USA and they benefit from his remarkable clinical expertise and empathic approach to their illness.

– Arthur H. Rubenstein, MBBCh
Professor of Medicine
Former Dean of the Perelman School of Medicine (2001-2011)

RHV: Now we have the largest facility of integrated conventional radiation and proton therapy in the world. It has had a huge impact—a huge benefit for patients. Take us through that journey.

JHG: I worked very closely with Gillies McKenna, who was chair of Radiation Oncology in the early '90s. He became very interested in proton therapy, but it was hard to convince anybody at Penn that we should do this. I said to Gillies, "Let's wait. I believe in it." When Arthur Rubinstein came to Penn (as executive vice president of the University for the Health System and medical school dean, in 2001), we had an opportunity to present it again. And by then, things had changed, and our leadership thought it would be potentially very good for patients and would differentiate Penn and the ACC from other centers around the country. It would make us unique. We had a great, collaborative team converge, including (then UPHS CEO) Ralph Muller, (current UPHS CEO) Kevin Mahoney, (then chair of Radiation Oncology) Steve Hahn, and Jim Metz (current chair of Radiation Oncology).

We found the technology, and then we had to get the money to make the vision come to fruition. The Roberts family's gift was pivotal. They (Wharton alumni Ralph J. Roberts, his son Brian L. Roberts, and his wife Aileen) wanted to do something very important. Their $15 million gift really gave us the spark to go forward. We now have the largest proton therapy center in the world, and that has really made the difference in the lives of both children and adults with cancer.

RHV: That's a good point. We treat both children and adults here, for brain and spinal cord tumors, lung tumors, treatments for cancer recurrences—tumors which were not otherwise able to be safely or effectively treated with radiation, and published the seminal studies defining the best uses of the technology. And now we're taking that technology to something called flash radiation therapy, where all that energy is delivered in less than a second. It's all about better treatments with less toxicity.

Next year, Penn Medicine Lancaster General Health will open an additional proton therapy center to care for area patients closer to home. Read more about this and other ways the ACC is bringing advanced cancer care to patients across the region on p. 48.

A Dream Job and a Lasting Legacy

Glick has served as a guiding force at Penn Medicine—building the medical oncology program from its inception as a young physician, spearheading philanthropy and talent recruitment that were both essential to building the ACC as it stands today, establishing Penn Medicine's Academy of Master Clinicians to promote and perpetuate clinical excellence in all specialties, and keeping patients' lives and their needs at the heart of every goal. He has announced plans to retire at the end of the 2020-2021 academic year.

RHV: When I was thinking of applying to become the director of the ACC, I came to visit you in this office for advice, as I often had done over the years. And you simply asked me, what did I think of the prospect of being the Abramson Cancer Center director? And I said, without really thinking, "It would be my dream job," and you smiled so big. And then you gave me a big hug. I meant what I said. So my final question for you is, was being ACC director your dream job?

JHG: It was. I'm one of the very lucky people who can say that their visions and hopes have been realized, and that I've been part of accomplishments far beyond my expectations. I never wanted to be a department of Medicine chair, or a dean. I wanted to be the director of a great cancer center, a role which I saw was a way to ensure that I would never give up patient care, which has always been so important to me.

My dream job was to stay at Penn for my entire career: to expand my horizons, to take the cancer center to the best that it could under my leadership. But I knew that the directors who came after me would take the ACC to even greater heights of excellence. I'm proud of what I've done, but I'm prouder of the people who have followed me and what they have done. We continue to be about excellence, compassion, hope, innovation, and discovery.

The conversation in these page represents excerpts of the full discussion, and the statements of tribute to Glick's lasting impact are only a small sample. Read more of both online at PennMedicine.org/magazine/Glick.

César de la Fuente, PhD, a Presidential Assistant Professor in Psychiatry, Microbiology, Chemical & Biomolecular Engineering, and Bioengineering, has

been recognized with the 2021 Princess of Girona Foundation Scientific Research Award by the Princess of Girona Foundation.

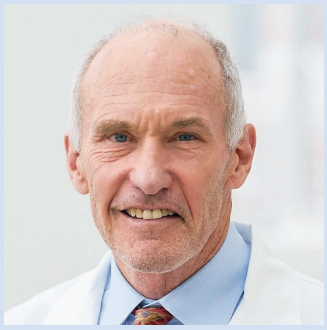
Terence P. Gade, MD, PhD, an assistant professor of Radiology and co-director of the Penn Image-Guided Interventions Laboratory, received the 2021 RRA New Investigator Award from the Association of University Radiologists.

Michael Harhay, PhD, MPH, an assistant professor of Epidemiology and Pulmonary & Critical Care Medicine, has been selected by the Assembly on Critical Care to receive the American Thoracic Society Assembly on Critical Care's Early Career Achievement Award.

Penn Medicine has been selected as one of five sites across the country to serve as a Center of Excellence for Influenza Research and Response (CEIRR), awarded nearly $7 million in funding. **Scott E. Hensley**, PhD, a professor of Microbiology, will serve as Penn's CEIRR program director.

Penn Medicine's Center for Connected Care received the national 2021 Quality and Practice Innovation Award from the Society of General Internal Medicine. The Center for Connected Care is jointly led by **Ann Huffenberger**, DBA, RN, the director of operations, and **Krisda Chaiyachati**, MD, the medical director of the Center's Penn Medicine OnDemand virtual practice.

Rajan Jain, MD, assistant professor of Medicine, received the 2021 Donald Seldin~Holly Smith Award for Pioneering Research, for his major contributions to science, mentorship, and translation of discovery to clinical impact.



Carl H. June, MD, the Richard W. Vague Professor in Immunotherapy in Pathology and Laboratory Medicine and the director of the Center for Cellular Immunotherapies in the Abramson Cancer Center, received the $1 million Sanford Lorraine Cross Award for his groundbreaking work in developing CAR T cell therapy. June has also been named as a 2021 Dan David Prize Laureate.

Bonnie Ky, MD, the Founders Associate Professor of Cardio-Oncology, Cardiovascular Medicine and Epidemiology, received the 2020 ECOG-ACRIN Young Investigator Award, the cancer research group's highest distinction.

Kara Maxwell, MD, PhD, an assistant professor of Medicine and Genetics in the Perelman School of Medicine, received the Prostate Cancer Foundation's (PCF) 2020 Gary and Allison Lieberman-PCF VAlor Young Investigator Award.

David W. Oslin, MD, a professor of Psychiatry and executive director of the Stephen A. Cohen Military Family Clinic at Penn, has been awarded the 2020 John B. Barnwell Award from the Department of Veteran Affairs Office of Research and Development (CSR&D division)—the organization's highest honor for outstanding achievement in clinical science research.

Ravi Parikh, MD, an assistant professor of Medical Ethics and Health Policy and Medicine at Penn, received the Prostate Cancer Foundations's 2020 David Yurman-PCF VAlor Young Investigator Award.

Richard E. Phillips, MD, PhD, a Presidential Assistant Professor of Neurology and member of the Penn Epigenetics Institute, was one of 17 members of Penn Medicine's staff and faculty to be featured in Cell Press's list of "1000 Inspiring Black Scientists in America," recognized for his work on the epigenetic mechanisms involved in the development of brain tumors and his commitment to serving diverse student populations. See the full list of featured Penn staff and faculty online.

Stanley Plotkin, emeritus professor of Pediatrics and Microbiology, **Sarah Tishkoff**, PhD, the David and Lyn Silfen University Professor in Genetics and Biology, and **Kenneth Zaret**, PhD, the Joseph Leidy Professor in Cell and Developmental Biology and director of Penn's Institute for Regenerative Medicine, have been elected to the American Academy of Arts & Science.

M. Celeste Simon, PhD, the Arthur H. Rubenstein, MBBCh Professor in Cell and Developmental Biology and the scientific director of the Abramson Family Cancer Research Institute, and **Marisa S. Bartolomei**, PhD, the Perelman Professor of Cell and Developmental Biology and co-Director of the Epigenetics Institute, and **Katherine A. High**, MD, an emeritus professor Pediatrics, have been elected to the National Academy of Sciences.

Katalin Susztak, MD, PhD, a professor of Renal Electrolyte and Hypertension, has been awarded the Alfred Newton Richards Award from the International Society of Nephrology for her outstanding basic research in nephrology.

Michele M. Volpe, FACHE, chief executive officer of Penn Presbyterian Medical Center, has been named the new chair of the Hospital and Healthsystem Association of Pennsylvania's Board of Directors.

Lisa Walke, MD, chief of Geriatric Medicine in the Perelman School of Medicine, has been selected for the 2021 Carol Emmott Fellowship class where she will implement an impact project to accelerate equity within Penn Medicine and beyond.

Send your progress notes and photos to:
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Penn Medicine Development and Alumni Relations
3535 Market Street, Suite 750
Philadelphia, PA 19104-3309
medalum@dev.upenn.edu

1970s

David Herbert, MD'77, earned the 2021 "Most Admired CEO" award from the *Sacramento Business Journal*. He serves as CEO of Sutter Independent Physicians and practices as an infectious disease specialist in Sacramento, Calif. Herbert was described as a "phenomenal leader" who champions collaboration and who has put in "tremendous" efforts during the COVID-19 pandemic, particularly with regard to securing personal protective equipment for his team.

Anthony Rothschild, MD'79, was appointed editor-in-chief of the *Journal of Clinical Psychopharmacology.* For 24 years, he has treated and studied psychotic depression at the University of Massachusetts Medical School and UMass Memorial Health Care. He serves as the Irving S. and Betty Brudnick Endowed Chair in Psychiatry and vice chair for Research in Psychiatry. He is also an elected fellow of the American College of Neuropsychopharmacology and the International College of Neuropsychopharmacology.

1980s

Richard M. Sherry, MD'82, was named senior vice president, TIL specialist, and clinical lead at Lyell Immunopharma, an immune-oncology company dedicated to the mastery of T cells to cure solid tumors. He is among the most cited medical experts in the field of adoptive cell therapy for solid tumors, and he has conducted more than 30 years of research on tumor-infiltrating lymphocytes as treatment for solid tumor patients.

Michael J. Kramer, MD'84, was named managing director and wealth manager of his wealth management team, which joined First Republic Investment Management in New York City. He previously served as a principal at B. Riley Wealth Advisors and managing director at Ladenburg Thalmann & Co.

1990s

Christopher D. Kager, BA'90, MD'94, was appointed director of clinical strategic partnerships for Torque3, an advanced, robotic-assisted simulation platform that uses virtual reality to improve neurological rehabilitation for stroke survivors. Kager also serves as chief of Neurosurgery at Lancaster General Hospital.

Douglas R. Martin, MD'95, was named life sciences global portfolio practice leader at Guidehouse, a provider of consulting services to the public and commercial markets, as part of the company's effort to strengthen the life sciences arm of its health segment. Martin previously led the firm's U.S. commercial growth strategy team.

Todd M. Fruchterman, BA'92, MD'96, PhD, was appointed president and chief executive officer at Butterfly Network, Inc., a digital medical imaging services firm that aims to improve global health equity by widening access to advanced medical imaging technology. The company went public in February 2021 through a merger with Longview Acquisition Corp., a special purpose acquisition company.

2000s

Asit Parikh, PhD, MD, GME'02, was appointed president and chief executive officer of MOMA Therapeutics, a biopharmaceutical company in Cambridge, Mass., focused on discovering

the next generation of precision medicines by targeting molecular machines that underlie human disease. Parikh previously served as senior vice president and head of gastroenterology at the pharmaceutical company Takeda.

Melissa Johnson, MD'04, was promoted to program director of Lung Cancer Research at the Sarah Cannon Research Institute in Nashville, Tenn. She will lead the lung cancer clinical trial portfolio across the Sarah Cannon network in addition to leading its Solid Tumor Immune Effector Cellular Therapy program. Johnson also currently serves as chair of the Cancer Committee at TriStar Centennial Medical Center in Nashville.

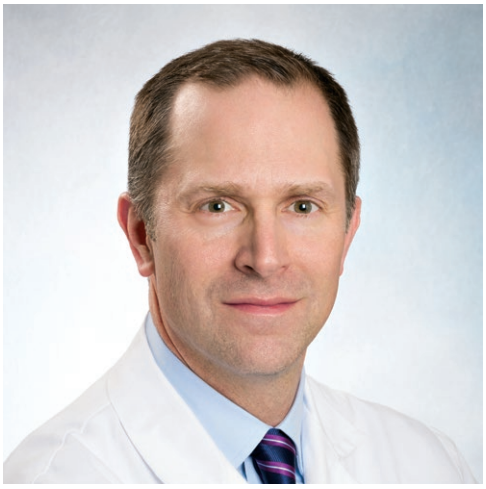
Michelle E. Morse, MD'08, MPH, was appointed chief medical officer at the New York City Department of Health and Mental Hygiene. As the first chief medical officer in the agency's history, she will lead efforts to bridge public health and health

care, ensure greater alignment and coordination with health care systems, and act as a key liaison to clinicians and clinical leaders across New York City. Morse also continues to serve as a hospitalist at Brigham and Women's Hospital and as the founding co-director of EqualHealth, an organization that aims to transform medical and nursing education for Haitian health care professionals.

Shantanu Agrawal, MD, GME'08, MPhil, was named chief health officer at Anthem, Inc., a leading health benefits company within the Blue Cross Blue Shield Association. He oversees its enterprise health strategy, including medical policy, clinical quality, and the company's industry-leading work to address the social drivers of health. He will also lead Anthem's community health strategy and the Anthem Foundation.

IN CONVERSATION: Alumni Presidents of the Association of Program Directors in Surgery

By Jonathan Riggs



Kyla Terhune, MD'04, and Douglas S. Smink, MD'98

The Association of Program Directors in Surgery (APDS) recently elected an incredible Penn Medicine double act who are ready to follow in the footsteps of PSOM Professor of Surgery and former APDS President Jon B. "JoMo" Morris, MD: President Douglas S. Smink, MD'98, and President-Elect Kyla P. Terhune, MD'04.

The APDS is the organization of general surgery residency program directors from across the United States, which includes the leading surgical educators from across the nation. It focuses on supporting residency directors and their residents to provide the highest quality surgical training. The organization has been in existence for over 40 years and is a forum for program directors to work together and share ideas to continuously improve surgery resident training.

Smink, who took office in May 2021, is an associate professor at Harvard Medical School; associate chair of education in the Department of Surgery; and chief of Surgery at Brigham and Women's Faulkner Hospital. At APDS, he will be working with Terhune—vice president for educational affairs and ACGME/NRMP designated institutional official (DIO) at Vanderbilt University Medical Center —until he turns the role over to her in April 2022.

TERHUNE: I've been involved with the APDS since I was a resident, and was a teacher in my first career, so to be able to represent it is a big honor. It's interesting, too, that my job as DIO has evolved primarily to support program directors, so this role dovetails beautifully.

SMINK: I'm excited to work with Dr. Terhune, who is one of the leading surgical educators in the United States. She has extensive experience as a program director, and is now overseeing all graduate medical education at Vanderbilt—a huge responsibility that she is more than capable to take on.

TERHUNE: I'd say the same about Dr. Smink. He has been dedicated to APDS for as long as I can remember. I learned recently that his father was a program director, so maybe even more of a history with APDS.

He's remarkable at what he does, and I am excited to learn from him as he moves into this national leadership role.

SMINK: I think for both of us, our experience at Penn Medicine was incredibly formative. The commitment I saw to surgical education there has always stuck with me. I still consider Dr. Jon Morris—who was the surgery clerkship director when I was a third-year student—to be a mentor, and I'm honored to follow in his footsteps in the APDS.

TERHUNE: Yes, Penn was probably the best place I could have gone for medical school because it really pushed us in terms of the amount of appropriate autonomy, the breadth of pathology, the opportunity to be in Philadelphia—as a city steeped in the richest possible history of medical education, and the incredible surgical program. It's no coincidence that both of us came away from Penn with the desire to work for and with residents throughout our careers to pay this forward.

SMINK: It's exciting to think about how we can apply everything we learned at Penn—and since—to lead this organization. Ensuring that we continue to grow as a vibrant community of competent, compassionate surgeons is a huge task, and we are up for the challenge.

2010s

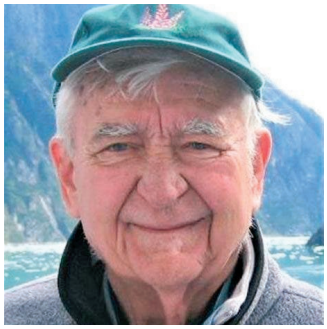
David Chacko, MD'10, MBA'11, MPhil, was appointed chief financial officer at Erasca, Inc., a biotechnology company that aims to erase cancer and solve oncology's most difficult challenges by supporting the development of precision oncology treatment options. Since joining the company in 2019, Chacko had served as its chief business officer. Prior to Erasca, held a dual investing and operating role as a principal at Versant Ventures.

David Fajgenbaum, MSc, MD'13, MBA'15, joined a group of Philadelphia-area community leaders and scientists to create The Ark Institute, a nonprofit to help the region and country recover from the COVID-19 pandemic and ensure better preparedness for future public health crises.

OBITUARIES

1940s

Edwin R. Cornish, Jr., MD'47, a physician; Jan. 4. He earned his medical degree from the University of Pennsylvania School of Medicine, then completed his residency at Lankenau Medical Center, where he met his wife. He was a medical researcher at Fort Detrick in Frederick, Md., then wrote scientific opinions while working for the Federal Trade Commission in Washington, D.C. He finished his career completing a psychiatric residency at the University of Virginia. Even as a retiree, Cornish was committed to education and completed numerous courses at Frederick Community College.



1950s

Richard J. Best, MD'53, GME'60, a surgeon; Feb. 4. In 1945, he enlisted in the U.S. Navy and served in World War II. He later earned his medical degree from the University of Pennsylvania School of Medicine, and he continued his training in thoracic and general surgery at Penn. A member of the American College of Surgeons, Best moved to Butte, Mont., and began his medical practice. Over the years, he served as president of the St. James Community Hospital and volunteered a physician for the Butte High School football team and Butte Rodeo Club. In his retirement, he grew cherries and became president of the Flathead Cherry Growers Association.

A. Ralph Kristeller, MD'54, an internist; Nov. 26. After earning his medical degree at the University of Pennsylvania School of Medicine, he completed his training in San Francisco and Texas. He then served as a captain in the U.S. Army Air Corps; his first tour was in Oahu, Hawaii, where he later maintained a second residence and took surfing lessons at age 85. After being honorably discharged, he operated a private practice for 30 years in Millburn, N.J. Kristeller later began a second career in hospital administration, working at Christ Hospital in Red Bank, N.J., and with the Joint Commission. A recipient of Penn's Alumni Award of Merit, he remained involved with the school as a member of the Phi Delta Epsilon medical fraternity, NYC Club, and Regional Alumni Club.

Marvin H. Balistocky, BS'46, MD, GME'54, an ophthalmologist; Dec. 18. After serving as a medical technician in the U.S. Army during World War II, he resumed his undergraduate studies at the University of Pennsylvania and earned his medical degree at Hahnemann Medical School. He completed his internship at Philadelphia General Hospital, where he became chief of Ophthalmology. He operated private practice offices in Norristown, Pa., and King of Prussia, Pa., served as chief of Ophthalmology at Sacred Heart Hospital, and was appointed to the medical staff at Montgomery Hospital, Wills Eye Hospital, and Mercy Suburban Hospital. Balistocky taught at Thomas Jefferson Medical School, Wills Eye Hospital, Mercy Suburban Hospital, and New York College of Osteopathic Medicine. He was also passionate about providing free care for patients at state correctional institutions and psychiatric hospitals, Catholic clergy, and underserved patients in Mexico.

Sheldon A. Lisker, BS'54, MD'58, GME'62, an internist; Feb. 21. After earning a medical degree from the University of Pennsylvania School of Medicine and completing his internship year at Penn, he served as a physician in the U.S. Air Force. Upon returning to Philadelphia, he completed his training at Penn and became an attending physician at Graduate Hospital for more than 30 years. He served as chief of Hematology-Oncology and co-director of the Graduate Hospital Cancer Center, and he was a clinical professor of Medicine at Penn for more than 25 years, earning the Dean's Award for Excellence in Clinical Teaching. At the end of his career, Lisker served as a medical director of VITAS Hospice until retiring in 2009.

Stanley Burns, MD, GME'58, a physician; Oct. 21. After serving as a surgical technician in the U.S. Army during World War II, he earned his medical degree from the University of Vermont (UVM) and completed his training in internal medicine, cardiology, and hematology at the Hospital of the University of Pennsylvania. In 1960, he returned to Vermont and joined the UVM medical faculty. Throughout his professional career, Burns devoted his career to teaching clinical skills, providing patient care, and acting as a source of hematology consultations. He became a professor of Medicine in 1972, then an emeritus professor in 1991.

Donald LaVan, MD'59, GME'63, a cardiologist; April 1. After earning his medical degree at the University of Pennsylvania School of Medicine, he completed his training at Penn and remained in the Philadelphia area to practice cardiology. A passionate supporter of his medical alma mater, he was a member of the school's Medical Alumni Advisory Council and a volunteer with the Thistle Society and Benjamin Franklin Society. He spent his retirement years volunteering at a migrant clinic in West Chester, Pa.

1960s

Joel A. Tobias, MD'63, a surgeon; Dec. 8. After earning his medical degree at the University of Pennsylvania School of Medicine, he continued his medical training in general surgery at Virginia Mason Medical Center. He then pursued a fellowship in thoracic surgery at the University of Florida. Tobias practiced in Medford, Ore., and he was named a fellow of the American College of Surgeons and certified by both the American Board of Surgery and the American Board of Thoracic Surgery.

Martha Jane Hester Tanner, MD'64, an internist; Feb. 20. After graduating from the University of Pennsylvania School of Medicine as one of only five women in her class, she continued her medical training at the University of Wisconsin Medical School, Temple University, a cancer research center in Heidelberg, Germany, and the University of Michigan. She worked in private practices in Bloomington, Ind., and Idaho Falls, Idaho. A respected infectious disease specialist, she co-authored eight publications in national medical journals and co-founded the Rocky Mountain Pus Club, an infectious disease society. Tanner also made strides to provide accessible mental health resources to communities in Idaho, bringing crisis centers and crisis intervention police training to the state.

Richard D. West, MD'65, GME'72, a surgeon; July 12. After earning his medical degree from the University of Pennsylvania School of Medicine, he completed an internship at Great Lakes Naval Hospital and served as a medical officer in the U.S. Navy. Following completion of his residency at Penn Presbyterian Medical Center, he practiced general surgery for 35 years. West held a variety of leadership roles over the years, including medical director of Trauma Services of Virginia Beach General Hospital and chairman of the executive board for Virginia Beach Ambulatory Surgical Center. He was also a member of many organizations, including being named a fellow of the American College of Surgeons and serving as secretary of the Virginia Beach Medical Society.

Joel Lench, MD'65, an obstetrician; Feb. 19. After earning his medical degree from the University of Pennsylvania School of Medicine, he joined the U.S. Navy and served as a flight surgeon in the Vietnam War. He served in many duty stations

around the world, rising to the rank of captain and earning numerous military citations, including the Air Medal, Vietnam Service Medal, Navy Achievement Medal, and Humanitarian Service Medal. After 20 years of military service, he became the medical director of the Nurse Midwifery Service, in the Naval Medical Center in San Diego. Lench also worked at Planned Parenthood, volunteered at St. Vincent de Paul Homeless Shelter Medical Clinic in San Diego, and participated in relief missions to disaster areas.

Robert A. Zimmerman, MD, GME'69, a radiologist; Feb. 23. After studying biology at Temple University, he continued narrowing his focus to neuroradiology at Georgetown University School of Medicine. After earning his degree, he began his 46-year career at the Hospital of the University of Pennsylvania (HUP) and Children's Hospital of Philadelphia (CHOP). Upon completing his residency and fellowship, he served as a radiologist in the U.S. Army, ranking as a major. He then returned to HUP, where was appointed professor of Radiology and Neurosurgery. In 1989, he moved to CHOP as chief of Pediatric Neuroradiology and MRI. Over the course of his career, Zimmerman established the division of Neuroradiology at CHOP, which—under his leadership—became one of the largest and most respected pediatric neuroradiology departments in the country. CHOP awarded him the Richard D. Wood Distinguished Alumni Award in 2014 and established an endowed chair in his honor in 2018. He published nearly 500 manuscripts, edited textbooks and other publications, and served on dozens of academic and public policy committees. He also was a vising professor at institutions around the world, and he served as president of the American Society of Pediatric Neuroradiology, receiving the organization's Special Recognition Award.

1970s

Paul M. Weinberg, MD, GME'70, an emeritus professor; Oct. 15. He earned a medical degree from a program run by Pennsylvania State University and Jefferson Medical College, then completed his training at the Children's Hospital of Philadelphia (CHOP). Following service in the U.S. Navy as a pediatric cardiologist, he completed an additional fellowship in cardiac morphology at Children's Hospital Boston. He joined the faculty at the University of Pennsylvania School of Medicine; his appointment then moved to CHOP. By 2002, he was a professor of Pediatrics, and he continued to hold appointments at Penn in Radiology and Pathology & Laboratory Medicine. For 24 years, he also served as director of the Fellowship Training Program at CHOP, training more than 145 cardiology fellows. As director of resident education in Pediatric Cardiology at Penn, the division became one of the largest in the world. Weinberg also served as president of the Society for Pediatric Cardiology Training Program Directors and was a member of the International Working Group for Mapping and Coding of Nomenclatures for Paediatric and Congenital Heart Disease. He received the Osler Award for Excellence in Clinical Teaching and the Robert Dunning Dripps Memorial Award for Excellence in Graduate Medical Education.

Laurence E. Carroll, MD'71, GME'77, a nephrologist; Feb. 11. After earning his degree from the University of Pennsylvania School of Medicine, he was a lieutenant commander in the U.S. Navy and provided medical care at Guantanamo Bay Naval Base. As a practicing nephrologist in Lancaster County, he contributed to local medical journals, lectured and mentored students, and served on the Ethics Committees of Lancaster General Hospital and St. Joseph Hospital for decades. After retiring from private practice, Carroll continued to serve his community. He held many volunteer positions with the Unitarian Universalist Church of Lancaster, and he was vice president of the Lancaster Medical History Museum, a board member for the Kidney Foundation of Central Pa., and chair of the Manheim Township Senior Advisory Committee.

1980s

Lynn Alan Christianson, MD, GME'83, an anesthesiologist; Jan. 4. He earned his medical degree at the University of Minnesota Medical School, then continued his training at Parkland Memorial Hospital. As an anesthesia resident at the Mayo Clinic, he discovered an interest in pediatric cases. Mayo sponsored Lynn's fellowship training at the University of Pennsylvania in pediatric anesthesia, requesting that he return to share what he had learned about the nascent specialty. He went on to practice pediatric anesthesia at Minneapolis Children's, Gillette Specialty Care, and Children's West Surgery Center in Minnesota.

Thomas Patrick Storey, MD'85, MPH, an internist; Dec. 31. After earning a medical degree from the University of Pennsylvania School of Medicine, he completed his residency in Internal Medicine at the University of Rochester, where he met his wife who started the same residency on the same day. He spent his career working for the Philadelphia Department of Public Health, directing the city's primary care

health services. Leading the division of ambulatory health services and its staff of more than 500, he expanded and renovated community health centers across the city. Storey also earned his master's degree in Public Health from Johns Hopkins University in 1993. Throughout his career, he demonstrated a passionate commitment to promoting equitable, accessible health care.

FACULTY

Jonathan Black, PhD'72, a former professor; Dec. 5. After earning his PhD in Materials Science from the University of Pennsylvania's School of Engineering, he joined the School of Medicine as an associate in orthopaedic surgical research. In 1977, Black—at that time an associate professor of research in Orthopaedic Surgery—was named to the faculty of the university's new Center for Sports Medicine. He later became chief of biomaterials in Orthopaedic Surgery and conducted research on reliable joint implants. In 1988, he left Penn to become chair of Biomaterials at Clemson University, then started an independent consultancy in biomaterials science and engineering. He also served as an adjunct professor of Biomedical Engineering at Cornell University.

Maria Delivoria-Papadopoulos, MD, an emeritus professor; Sep. 11. After earning her medical degree from the University of Athens, she traveled to the United States in 1957 to pursue a postdoctoral study in physiology at the University of Pennsylvania. After completing her medical training, she returned to Penn in 1967, rapidly becoming a professor of Pediatrics, Physiology, and Obstetrics/Gynecology. She created the neonatal unit, serving as director of Newborn Services and the Intensive Care Nursery and as associate dean for International Medical Programs. Among her many groundbreaking achievements, she performed the first successful ventilation treatment for premature infants in North America.

Papadopoulos also served as an advisor to the National Institutes of Health, authored more than 400 publications, and received numerous awards, including the American Academy of Pediatrics Lifetime Achievement Award, and Penn's Lindback Award for Distinguished Teaching and Leonard Berwick Memorial Teaching Award. Each summer, she returned to Greece for a month to provide free medical care; she gave each child a toy to ease their anxiety. After leaving Penn as an emeritus professor, she ended her 50-year career with appointments at Drexel University College of Medicine and as director of neonatal intensive care at St. Christopher's Hospital for Children.

Sheldon A. Lisker, MD. See Class of 1954.

Harvey Nisenbaum, MD, an emeritus professor; Oct. 8. After earning a medical degree from Tufts University School of Medicine, he completed his training at Mount Sinai Hospital and Montefiore Medical Center in New York. As a lieutenant commander in the U.S. Navy, he became director of ultrasound at the Naval Regional Medical Center in Philadelphia. After leading the Ultrasound and Radiology sections at Albert Einstein Medical Center, he joined the Radiology faculty at the University of Pennsylvania School of Medicine. Nisenbaum served as chair of Medical Imaging at Penn Presbyterian Medical Center (PPMC) until 2018, when he took a yearlong sabbatical to volunteer with the World Federation for Ultrasound in Medicine and Biology. He was a member of 15 professional societies, served on 140 committees, and earned honors like Penn's Special Dean's Award and the Peter H. Arger, MD Excellence in Medical Student Education Award. The Harvey Nisenbaum Award for Medical Imaging Research at PPMC was created in his honor.

Paul M. Weinberg, MD. See Class of 1970.

Frank A. Welsh, III, PhD, an emeritus professor; April 2. He earned his degree in pharmacology from Washington University in St. Louis, then pursued a postdoctoral fellowship in biochemistry at Duke University. Known to most as "Dusty," Welsh's career at the University of Pennsylvania spanned 40 years. Before retiring in 2011, he served as a professor of Biochemistry in Neurosurgery, Biochemistry, and Biophysics. In addition to teaching biochemistry to first-year medical students, he authored more than 75 publications in the field of stroke and cerebral blood flow and was a member of global professional and scientific societies. He also shared his expertise at several international conferences and served as an editor for several scientific journals.

Robert A. Zimmerman, MD. See Class of 1969

THE ROAD TO ADVANCED COMMUNITY CANCER CARE

Across a span of hundreds of miles from central Pennsylvania to central New Jersey, patients are increasingly gaining convenient access to cutting-edge cancer treatments and experts. Here's how they're getting there.

By Steve Graff

Calling it a hub-and-spoke model doesn't quite fully capture how the Abramson Cancer Center delivers advanced cancer care to patients at Penn Medicine locations far from the center's downtown Philadelphia home. It's more dynamic than that, like a lit-up, interconnected set of highways ferrying innovation and expertise back and forth.

"This is how Penn Medicine is influencing care in the community," said James Metz, MD, chair of Radiation Oncology at the Perelman School of Medicine. "Part of the whole idea of bringing together Princeton Health, Chester County Hospital (CCH), Lancaster General Health (LGH), and all of the other places was to be able to deliver high-end care across the community and impact those communities. But not just through an acquisition of those facilities. It's about a true partnership with them to make it happen."

So far, those highways have been busy. Tele-health, the electronic health record system, and virtual tumor boards are just a few of the new and immersive ways that clinical teams and patients at the sites, including the new Penn Medicine Radnor facility and CCH, are now more connected than ever with experts at the Perelman Center for Advanced Medicine (PCAM). The efforts became accelerated and even improved by the COVID-19 pandemic, as remote care became essential and patients preferred to be as close to home as possible.

"We have been able to prove in a rapid way that we can do it and do it effectively," Metz said.

Many of the cutting-edge cancer technologies and care patients receive in downtown Philadelphia continue to make their way to community sites, and, in reverse, patients travel to the city when appropriate to receive specialized care. Penn residents and fellows who practice at many of the network sites live locally as well, making them not just providers but part of the community fabric.

Advanced Cancer Clinical Trials—With Shorter Commutes

In February, Mary Barbee enrolled in a metastatic breast cancer clinical trial for women with certain genetic mutations led at Penn by Payal D. Shah, MD'09, a breast medical

oncologist and assistant professor of Hematology/Oncology at the Perelman School of Medicine, when she heard about it from her N.J.-based oncologist, Priya P. Gor, MD, MSCE'07, the medical co-director of the Penn Medicine Virtua Cancer Genetics Program. Barbee was excited for the opportunity to be enrolled in the trial that put her on the targeted therapy olaparib after learning her tumors had grown, even if it meant crossing the Delaware River to get to the trial site at PCAM.

"When Dr. Gor told me about the clinical trial, I said, 'Yes, anything to help me extend my life,'" said Barbee, who was diagnosed with metastatic breast cancer in 2019 and lives in Voorhees, N.J., with her husband. "It sounded like a promising trial, it's specific to my inherited gene, and the fact that they had some success with the first part of the trial, I'm cautiously optimistic that it's going to help."

Meanwhile, lung cancer patients are finding it easier to enroll in clinical trials thanks to telemedicine screenings of LGH lung cancer patients for clinical trials at PCAM.

"This has taken a huge travel burden off our patients and will likely increase participation in these trials," said Shanthi Sivendran, MD, chief of Hematology/Oncology at LGH.

Ongoing efforts are also bringing more advanced care and trials directly to patients in the community—no bridge crossings or highways required.

"The community sites are hungry for more clinical trials at their locations," said Lynn M. Schuchter, MD, chief of Hematology/Oncology. "And we're committed to expanding them."

For example, a $2.5 million philanthropic gift from Robert Orsher, V'79, and Andrea Orsher, V'79, made to support Angela M. DeMichele, MD, MSCE, the Alan and Jill Miller Professor in Breast Cancer Excellence, will help fund a network for metastatic breast cancer clinical trials: a mobile research unit allowing nurses and coordinators to travel to sites to perform follow-ups on patients and other related tasks.

First up is a pilot at Penn Medicine Valley Forge (PMVF) and LGH, and there are plans for future sites. Another trial that has already opened at PMVF, thanks in part to $1 million gift from Sallie Korman and her late husband Berton supporting community research, will advance Schuchter's work in melanoma, with two more trials expected to open at LGH's Ann B. Barshinger Cancer Institute in Lancaster.

Three Lanes of Access to Proton Therapy Radiation

By the spring of 2022, cancer patients in the Lancaster area will also have access to proton therapy at the Ann B. Barshinger Cancer Institute, giving Penn Medicine and Pennsylvania its second proton site after the Roberts Proton Therapy Center opened its doors 12 years earlier. The single-room center will be the only location in Central Pennsylvania to offer the advanced mode of radiation treatment.

"I think adding proton to the cancer institute at Lancaster General is going to be an inflection point in cancer care, not only in Lancaster but across Penn Medicine," said Kevin Mahoney, CEO of the University of Pennsylvania Health System, at the virtual groundbreaking of the proton center. "This has been a moment we have been waiting for, and it's where we take the absolute best of the science we create downtown and bring right to the patient's front door."

While Lancaster patients receiving proton therapy won't be in Philadelphia 90 miles away, some of their clinical team will. After initial scans to access their tumors, gigabytes of data will be electronically whisked back to the physicists and dosimetrists at PCAM, who will expertly map out customized treatment courses.

"The patient may never see that all that work has been undergone centrally to assure they get the highest quality of care locally," Metz said. "That's a unique process."

As part of the Penn Medicine and Virtua Health strategic alliance, plans for a third proton center are also underway in Voorhees, making it the first proton center in Southern New Jersey. The center will join a slew of established cancer care services already offered at Virtua, including medical and surgical oncology, microvascular reconstructive surgery, cancer genetics, and high-risk screenings.

The $48 million proton therapy project at LGH hit a milestone in January. The cyclotron, a centerpiece of the technology weighing as much as a 747 airliner, was delivered via tractor-trailer and hoisted and lowered into its new home.

"We have a road map that will help us continue to drive the right technology and care to the right patients in the right location," Metz said. "This is only the beginning."

Read this story online at PennMedicine.org/magazine/communityoncology

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When the 17-story Pavilion at the Hospital of the University of Pennsylvania (HUP) opens this fall, it will be home to HUP's inpatient care for neurology and neurosurgery, cancer, transplant, and heart and vascular medicine and surgery, as well as a new two-story Emergency Department. For neuroscience, the unique integrated research space will function as a testing ground for developing novel technologies which researchers hope will have the potential to head off seizures in epilepsy patients; restore visual function to the blind; and even cure psychiatric disorders.

Read more on page 16.