BROWN MEDICINE

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TALKIN' 'BOUT A REVOLUTION

Megan Ranney, MD, navigates the brave new world of digital health.

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LETTER FROM THE DEAN

Older and Wiser

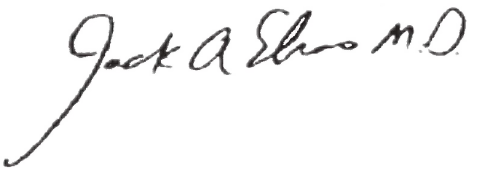
This issue of *Brown Medicine* checks in with alumni all across the country. It's fascinating to see the different paths they have followed, though their journeys all began in Providence.

There's a researcher at one of the country's leading cancer centers, working to diagnose pancreatic cancer earlier. An HIV physician-scientist whose studies are informed by the care she provides to the underserved residents of San Francisco. And several entrepreneurs who have hung up their white coats but are improving the lives of millions with their technology.

To an individual, they say that what they are doing now was shaped by their time at Brown. The lessons of humanism, of service, stay with them wherever their careers take them.

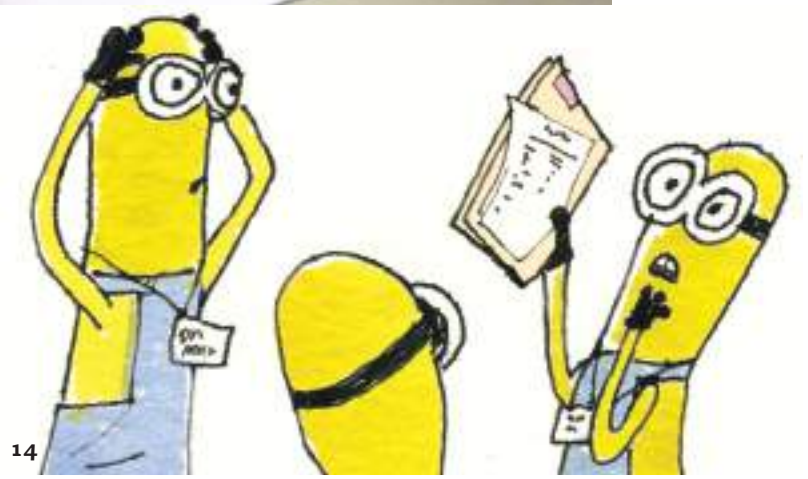
This edition also profiles basic science researchers studying the biology of aging. They are in Brown's Program in Biology, and aging is the focus of a horizontally integrated research team in the Brown Institute for Translational Science. Medical and public health advances have given us longer life expectancy. Wouldn't it be better to spend those years in good health, without the infirmities of age limiting us? The knowledge that these investigators have and will generate will synergize with the outstanding aging-related research that is done in our clinical departments to move us in this direction. These collaborations will hopefully bring about the discoveries that lead to new therapies. Since every single one of us is aging, this is something we can all get excited about.

Sincerely,



Jack A. Elias, MD
Dean of Medicine and Biological Sciences

DAVID DELPOIO



"It was scarier for me to feel locked in than to take a leap into the darkness." ***—Jason Slosberg MD'01,*** *Page 34*

INSIDE

DEPARTMENTS

Cover: Megan Ranney, MD, poses in a 3-D image of the brain in Brown's Yurt virtual reality theater. **Photo by Jared Leeds**

BROWN UNIVERSITY; FRANK MULLIN; BLAIR THORNLEY

LETTER FROM THE EDITOR

We Knew Them When

I've turned into one of *those* people.

The ones who say "I remember when you were this high!" to nieces and nephews. Who says, "I remember when you were a student!" I said that a lot this issue, reading John Aurelio's article about young alumni who are just striking out on their own as physicians—or not.

It's fun to see where life has taken them. For some, it's not how they planned. But for all, the desire to serve others is an immutable force. They're all living some version of that truth.

INBOX

BONE COLLECTOR

In the Winter 2015 edition of *Brown Medicine*, there is an article by Kris Cambra ("The Past Is Present") about the wonders to be found in the basement of the Biomed Center.

As a freshman at Brown in 1968-1969, I was employed by Dr. George Erikson to measure the bones for research that he was doing on primates. While he was at Harvard prior to coming to Brown, he was famous (or infamous in today's parlance) for taking trips to the Amazon rainforest. His express purpose in doing this was to "collect" specimens of various primates so that he could compare their bone structure. In the vernacular, this involved shooting the monkeys and preserving them long enough to get them back to the lab in Cambridge. I will leave to your imagination how the bones were cleaned and dissected, and to be fair I was not involved with that part of the process. I do remember sitting in a windowless room in the anatomy area, measuring monkey bones for about $2.50 an hour. I also remember him talking frequently about "the fire," which occurred sometime while he was at Harvard and which apparently destroyed numerous specimens. He did salvage some of them, which is why they may look a bit fried ...

Pardon R. Kenney '72 MMS'75 MD'75 RES'80, P'03

YOUR THOUGHTS?

Send your letters, which may be edited for length and clarity, to:

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The BEAT

WHAT'S NEW IN THE CLASSROOMS, ON THE WARDS, AND IN THE LABS

STUDENTS

RHODE MAP: Meredith Adamo talks with her client outside of his apartment. Her health care organization helped him get housing in the fall.

DAVID DELPOIO

Street Med

Students guide homeless Rhode Islanders through the health care system.

Walk through Providence on a winter night and you can find people sleeping on doorsteps, in bus shelters, any nooks that provide some refuge from the cold. The Rhode Island Coalition for the Homeless reports that in a given year more than 4,000 people in the state experience homelessness. "It's easy to just turn the other way," Meredith Adamo MD'18 says. But she and 20 other Alpert medical students are doing the opposite.

In 2014 Adamo cofounded the Rhode Island Medical Navigator Partnership (RIMNP), which pairs teams of medical, nursing, and social work students with a chronically homeless individual who is experiencing health problems. The group has worked with 13 clients so far.

RIMNP grew out of Adamo's experience doing street outreach with Craig Kaufmann, MD RES'06, clinical assistant professor of psychiatry and human behavior, and Megan Smith '10, a case manager from House of Hope Rhode Island. "We were all moved by the expe-

The BEAT

rience, but we also thought that there was more that we could do," Adamo says.

"There are medical illnesses that people have that have caused them to become homeless," Alicia Lu MD'18, a RIMNP cofounder, says, "and then there are also medical conditions that result from being homeless, and they often exacerbate each other."

Frequent emergency room visits are the norm among chronically homeless people. Adamo says her client goes to the ED about once every six weeks. "However, we also have clients that go [to the ED] multiple times a week," she says. Navigators visit clients during hospital stays and have called 911 for them in emergency medical situations.

But chronic illnesses such as hypertension and diabetes can become extremely dangerous when not properly managed. "A lot of these folks don't have primary care," Adamo says. "That's usually one of the first things that as navigators we help with, because the emergency room can only do so much." House of Hope case managers help clients get medical insurance and housing.

Students accompany clients to doctors' appointments, where, Adamo says, she can be "a constant presence not only for [my client] but for his team [at the hospital], who switch every shift. Providing a second voice, especially when he's feeling very sick, and making sure that the team knows the right thing is much of the reason we are there."

"In our normal medical school curriculum, all the students are required to follow a doctor who is a mentor," Lu says. "But this program allows us to follow a patient, which is a very different perspective."

Adamo says that finding solutions for clients is rewarding, but getting to know them individually is even more so. "My client used to be a radio DJ, and when you get him talking about music and his days on the radio it's like another person comes out," she says.

Lu and Adamo are working on a narrative project to tell clients' stories, through photos and audio and video interviews. "People want to share how they became homeless and what their lives were like before and what their interests are, what their passions are. They want to be more than just a body on the street," Lu says. "I think even if we weren't recording, it would still be extremely meaningful just to listen and to validate and humanize and acknowledge and bear witness to what they go through. I think it's one of the most important things that we can do. And anybody can do that." ***—Josephine Benson '17***

SEEKERS Navigators check bus shelters for clients in need of their services.

rimnp.wordpress.com

DOCTOR TO DOCTOR

Change of Culture

State-of-the-art neurosurgery comes to Rhode Island.

A native of Istanbul, Ziya L. Gokaslan, MD, FACS P'18 always wanted to live by the ocean. So it's no surprise then that he fell in love with the Ocean State. "It is as pretty as the Bosphorus in many places," the neurosurgeon says.

Gokaslan moved to Rhode Island last July, when he became the chief of neurosurgery at Rhode Island Hospital and The Miriam Hospital and chair of the Department of Neurosurgery at Alpert Medical School. He is also the clinical director of the Norman Prince Neurosciences Institute at Lifespan and the Brown Institute for Brain Science. He came to Brown from the Johns Hopkins University School of Medicine.

Brown Medicine talked to Gokaslan about his new role.

You are a neurosurgeon and researcher who focuses on the treatment of primary and metastatic spinal tumors, sacral neoplasms, and spinal cord tumors. What do you hope to accomplish at Brown?

The environment here is great and very unique. Brown University is a world leader in neurosciences with 130 scientists from across the campus focusing on advancing knowledge in this area. On top of that, we have wonderful hospitals and an excellent department with expertise in all areas of neurosurgery including cerebrovascular surgery, pediatric neurosurgery, pain, peripheral nerve surgery, and spinal surgery, as well as central nervous system tumors and stereotactic radiosurgery. Working with the Norman Prince Neurosciences Institute, we have a tremendous opportunity.

DAVID DELPOIO

Ziya L. Gokaslan

BILL MURPHY

An exciting area of research is **brain tumor immunology.**

Is there anything from your 13 years at Johns Hopkins that you would like to recreate?

Hopkins has been exceptionally successful in creating a culture where the physician-scientist model is celebrated, and clinical and basic science research are fully integrated into the care of the patients. I would like to create a similar culture here.

How will you coordinate efforts between clinicians and basic scientists?

I need to be an effective facilitator, which is my main role, with one foot on the Brown University side and the other at the hospitals to create a bridge for all neurosurgical faculty and the scientists at the main campus. If I can create opportunities for people to share their interests and research in areas such as neuroprosthetics, neuroengineering, and basic neuroscience, and combine that with our clinical experience, then we can make a great difference in the lives of our patients.

There is a picture of a man on your wall running a marathon who was told he might never walk again. Can you tell us about him?

This is a patient of mine on whom I operated for a spinal cord tumor. One year later he was able to run a marathon in 4 hours and 15 minutes. He won that medal and framed it and sent it to me. It was a very gracious gift.

There have been a number of patients who have come to me with conditions deemed to be incurable and tumors considered unresectable because the risks of surgery were so high. I have enormous respect for the patients who are able to make the decision to go through these very risky surgical procedures.

If you could research and solve one aspect of the molecular biology or the surgical resection of CNS tumors, what would it be?

I believe real advances in improving survival will derive from our ability to better understand the genetic alterations driving the tumors. An exciting area of research is brain tumor immunology and it is already showing great promise. We now know that tumor cells express a certain set of specific antigens on the cell surface. One can genetically engineer T-cells that can express receptors that recognize these specific antigens and selectively kill the tumor cells. This is a very exciting field, which is likely to have an immediate impact on the outcome of these patients.

What specific kind of technology, either now or in the future, would you like to have in the operating room?

The optimum is a fully integrated operating room where all the images, MRI, CT, angiogram, and functional studies can be made immediately available and fully merged, so that the surgeon can navigate precisely and seamlessly in the brain using computer guidance with full integration of the microscope and instruments, as well as real-time neurophysiological recordings to get immediate functional feedback. We will be building such an operating room at Rhode Island Hospital starting next year.

—Teresa L. Schraeder, MD

Teresa L. Schraeder *is the director of the Physician as Communicator Scholarly Concentration at Alpert Medical School.*

CLASSROOM

Drawn to Life

An elective teaches art as a communication tool.

It's not uncommon for a physician to grab a piece of scrap paper and sketch a complicated concept during a patient visit. The chambers of the heart, thyroid hormone synthesis—some are easier to illustrate than to explain verbally. A new elective last fall, "The Physician as Medical Illustrator," aimed to help Alpert medical students improve those sketches.

Despite the name, course director François Luks, MD, professor of surgery, of pediatrics, and of obstetrics and gynecology, says the course wasn't intended to turn medical students into professional illustrators. "It was meant to be news you can use. Not professional, but useful," he says.

In six weeks, students learned the history of medical illustration, the rudiments of sketching and drawing (including perspective, shading, shadows, and texture), and how to best communicate medical and surgical concepts, including choice of point of view, level of complexity, and narrative aspects. Weekly drawing assignments were critiqued by the class. Arlet G. Kurkchubasche, MD, associate professor of surgery and of pediatrics, was course coleader, and Allegra Parrillo MD'18 was a student facilitator.

About half of the students had no previous art experience. That led to some initial jitters. But, Luks says, "they quickly got over their hang-ups and did remarkable things."

Aviya Lanis MD'18 started drawing in high school, and uses it to de-stress and embrace her right-brain creativity. "When I heard about this course, I was excited not only for a guaranteed time to allot to drawing but also for the opportunity to integrate [it] into everything we've been learning in class," she says.

"I was most surprised by the course leaders' use of art in a typical consult with a patient, using basic diagrams to depict important concepts of processes going on in the body or procedures to be completed in surgery," Lanis says. The class gave her an opportunity to develop such skills for her future patients, she adds.

The course culminated with a visit from Ian Suk, professor of neurosurgery and of art as applied to medicine at the Johns Hopkins University School of Medicine. Suk described his process of observing surgeries and anatomical dissections with neurosurgeons and then translating that into drawings that can serve as models for any patient's individual anatomy.

Luks hopes his course will develop into a larger collaboration with the Rhode Island School of Design. Through his work he's discovered "latent needs in the institution" for illustration. "A RISD/Brown collaboration would serve them," he says.

—Kris Cambra

> **"They** quickly **got over** their hang-ups and **did remarkable things."**

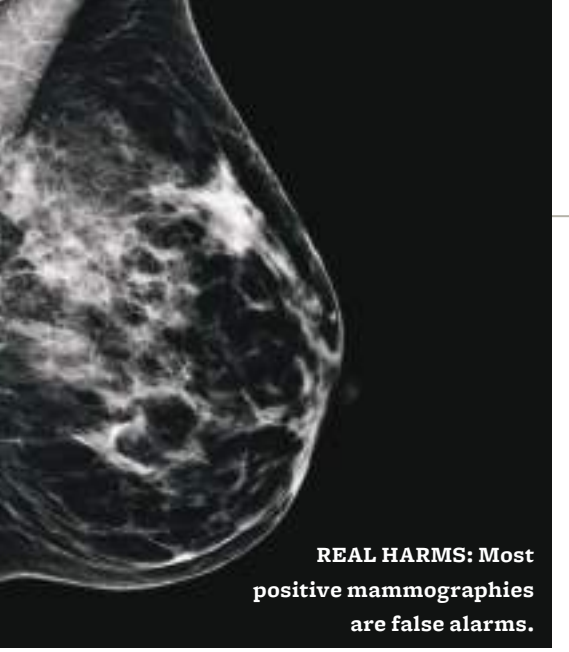
FRANK MULLIN (2)

LIKE SO: François Luks, left, with a student, is a self-taught artist with years of experience.

Ask THE EXPERT

Informed Guesses

Why are there different recommendations about mammography?



REAL HARMS: Most positive mammographies are false alarms.

The controversy about when and how often a woman should get mammograms is ongoing. Should she be screened every year beginning at age 40? Every other year starting at 50? And at what age should she stop? It seems that each time an organization releases new guidelines—the American Cancer Society, the National Comprehensive Cancer Network, the US Preventive Services Task Force—confusion ensues in the media, among patients, and in exam rooms. Thomas Trikalinos, MD, PhD, director of the Center for Evidence-Based Medicine at the Brown School of Public Health, helps us sort it out.

Screening for breast cancer has obvious benefits and less obvious harms. The main benefit is that if you detect cancer early enough, you can cure it and avoid dying from it. The harms stem from the fact that mammography, and other tests, are not perfect. In fact, because breast cancer is relatively rare in the general population, most mammographies that are suggestive of cancer are false alarms. For example, a study by the Breast Cancer Surveillance Consortium estimates that, for every 1,000 women aged 40 to 49 who get a mammography, approximately 100 receive positive mammographies—of which nearly 98 are false positives and only two are cancers! False positives are a big problem, because they lead to biopsies or sometimes surgery to remove a benign lesion. Such invasive procedures occasionally can cause complications. False positives are also associated with anxiety, financial costs, and time taken off work. In the bigger scheme these may be minor inconveniences, but they are real, and because most positive tests are false positives, they accrue.

Another complication is that there are many, many, many ways to screen: women can start screening at various ages; can get screened more or less frequently, for example, every one, two, or three years; and they might opt to stop screening in old age. Thus, many millions of practically implementable screening schedules exist, formed by different combinations of start/stop ages and screening frequencies. Different screening schedules correspond to a different balance of benefits and harms.

So what do the studies tell us? The problem is that we have only eight randomized trials, each comparing one screening schedule (out of the many millions that one might consider) versus not screening. Further, in these studies women did not faithfully follow the prescribed screening schedule. For example, in the screening group some women missed screening appointments, and some received screening more often than the study intended. Also, in the control group you can't tell women to never get a mammogram; you just don't advise them to screen. All of these issues complicate the analysis and the interpretation of the eight studies.

Although most of the studies have found that screening reduces death from breast cancer, compared to no screening, by approximately 25 percent, scientists disagree about exactly how these results can inform the benefits and harms calculations for the many million screening strategies one can consider. There is no single screening policy that has no harms and all benefits. If you have to pick something that works for the whole US population, you can imagine that's a very difficult task: each of us has a different risk tolerance. Public health recommendations are trying to make informed guesses about which of the many policies works best, but there is no best thing. We have to go with best guesses, and a lot of people don't like that; but there is really not a lot one can do.

ISTOCK PHOTO

ANATOMY OF A PHD CANDIDATE

Science Is Fun

The daughter of a teacher and an engineer, Vérida Léandre PhD'17 has found her calling in Brown's Department of Molecular Pharmacology, Physiology, and Biotechnology, where she's researching how body fat works. As a doctoral student in the lab of Edith Mathiowitz, PhD, professor of medical science and of engineering, Léandre, 26, is studying how brown adipose tissue—a fat that human babies and hibernating mammals burn to keep warm—can help adults lose weight. With her "army of undergraduates" as lab assistants, she implants proteins into rats that encourage stem cells to grow into brown instead of white adipose tissue, which stores energy, and makes us fat. The technique, if it works, could become "a cell-based therapy for obesity," Léandre says, though she's a long way from that goal. "I'm sometimes frustrated about my relative lack of progress," she says. Yet she's already been presenting her research, including at a conference in Scotland last year. "It felt really cool to be part of the global scientific community," she says. And she finds daily satisfaction training students. "I take almost every opportunity to teach," as a TA, mentor, and volunteer math and science instructor in a Providence after-school program. "If I can explain something to a 10-year-old, I can explain it to anyone," she says.

—Phoebe Hall

ADAM MASTOON (2); COURTESY HASBRO

(NOT) JUST A GAME

As the social chair of the MPPB student group, Léandre organizes board game nights; Clue is her favorite. "I get strangely competitive," she says. "I've flipped my fair share of Clue boards."

PERSONAL TOUCH

This anime-inspired caricature of Léandre, drawn by one of her undergrads, is one of many meaningful pieces of art that decorate her lab bench.

EYE CANDY

These lab glasses with animal print frames are just one of many flashy pairs in Léandre's possession. "I like to collect safety goggles with flare," she says.

SHE'S GOT RHYTHM

"I started playing the tambourine for the band because I needed something to do with my hands while I was singing," Léandre says. But she plays "too enthusiastically," she adds: "I had a huge bruise on my thigh after one show."

FISH FOR ANSWERS

As a TA, Léandre encouraged students to drop questions they were reluctant to ask in class into this aquarium. The "Gold!" refers to the cutout goldfish, "plus questions are gold!"

DYNAMIC DUO

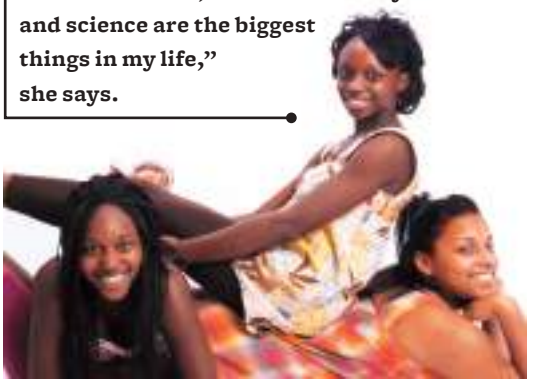
Léandre and her friend Elaina Atherton '12 ScM'14 PhD'21 are the folk-blues band Big Jim and the Sister Wives ("Jim is fictional"). Watch them perform at brownmedicine magazine.org.

CUTTING EDGE

Léandre wears these cut-resistant gloves for cryosectioning: cutting tissue into very thin slices in a -30°C chamber. "Only your hands are in there," she says. "Taking breaks is crucial. If you can't feel your fingers, that's a problem."

FAMILY TIES

Léandre with her sisters, Alexandra, center, and Yvette, right. She also has an older brother, Trenton. "Family and science are the biggest things in my life," she says.



OFFICE MAGIC

Léandre and a labmate made this whiteboard for her bench. "We have lots of weird stuff lying around in our lab," she says. "We found sheets of whiteboard. I said, 'How do I make this better?'"

ADAM MASTOON (5); COURTESY LÉANDRE

STUDENTS

Creatures Great and Small

Animal and human health are inextricably linked.

Every year Assistant Professor of Pediatrics Ian Michelow, MD, an infectious disease researcher, teaches the parasitology block of the first-year medical curriculum. Students learn that before parasites find their way to human hosts, causing diseases like malaria, schistosomiasis, and toxoplasmosis, many spend a portion of their life cycles in other animals.

After one of these lectures, Alice Tin, MPH MD'18 approached Michelow to tell him about One Health, a concept that acknowledges the inextricable ties between humans, animals, and the environment and encourages the collaboration of physicians, veterinarians, ecologists, and other professionals to address the impacts of those interactions on health care. Intrigued, Michelow gave Tin time in class to tell other students about One Health.

"Parasitology, virology, bacteriology—One Health has links to a lot of these different fields," Michelow says. "We need to make our approach more unified. We have been siloed, and what One Health does is it puts it all under one umbrella." Now, he says, his first-year parasitology lectures will include slides about One Health.

Tin, who grew up in Hong Kong, has been aware of the potentially disastrous effects of zoonotic disease since her eighth-grade classes were canceled for several months during the SARS outbreak there in 2003. But it was as a public health graduate student at Tufts, when she took an infectious disease epidemiology course that was cotaught by a physician and a veterinarian, that her eyes were opened to the connection. "I hadn't

been exposed to that worldview before," she says. "There are so many other people [in other fields] who are concerned about health. I realized how human-centric my focus on health was."

Tin started a chapter of Students for One Health at Alpert Medical School and was elected the human health student representative to the One Health Commission board of directors, an international body that meets regularly to educate and engage health and environmental professionals.

"We're beginning to see that 70 percent of emerging infectious diseases have a zoonotic source. Avian flu, swine flu, SARS, Ebola—all have jumped to humans," Tin says. "As human populations expand, our land use expands into animal habitats, so it brings us closer together and there are more opportunities for disease spillover."

To better understand the impact on animal and human populations, Tin says, One Health urges different professions to share surveillance data and prevention or contingency plans with each other. Strengthening these communication channels, she says, could "prevent outbreaks from happening."

But One Health is not only doom and gloom. Humans' bonds with animals are in many ways positive, and in ways that benefit our health. "A lot of patients have pets," Tin says. "It's a great way [for a physician] to connect with them." An animal may be a critical source of emotional support, or could help a patient form healthy habits, like a daily walk with the dog. The human-animal bond can affect health care outcomes, she adds: for example, some patients may leave the hospital too soon because they don't have alternate pet care arrangements.

DOG SHOW: Students for One Health brought therapy dogs to the Medical School for a study break in December.

Students for One Health has hosted speakers from different professions, including the head veterinarian from Roger Williams Park Zoo, and is working to create a clinical elective that would include shadowing a vet. Tin says the group's collaborative, holistic approach dovetails neatly with Alpert Medical School's emphasis on interprofessional education. "As we are taught about medicine," she says, "One Health really is a team sport." ***—P.H.***

Watch a video *of therapy dogs visiting the Medical School in The Beat section at brownmedicinemagazine.org.*

FINDINGS

Stress Kills

Even some bacteria are susceptible—due to certain antibiotics.

Just as mounting stress can sicken and kill a human, it appears that the bacterium *Escherichia coli* can be similarly vulnerable under antibiotic treatment.

A study by Peter Belenky, PhD, assistant professor of molecular microbiology and immunology, tested three antibiotics—ampicillin, kanamycin, and norfloxacin—and found that rather than kill outright, they upset *E. coli*'s metabolism, creating a state of oxidative stress that ultimately breaks down the bacterium's DNA and other key molecules.

The findings, published in *Cell Reports* in November, have specific implications for how antibiotics can be used and improved, Belenky says. "Understanding how antibiotics kill bacteria—the very specific pathways—becomes very important for figuring out ways we can potentiate antibiotic activity with current antibiotics."

In recent years many scientists have suggested that bacterial death stems from major metabolic disruptions. Belenky's study, as well as a paper he co-authored earlier this year in the *Proceedings of the National Academy of Sciences*, were the first

DAVID DELPOIO

to test these hypotheses by making direct measurements of the metabolic products of *E. coli* as it suffered antibiotic attack.

In all, Belenky and his co-authors, including research assistant Benjamin Korry, tracked levels of nearly 200 metabolites in the cell. Direct chemical evidence showed that the bacteria ramped up a key energy-generating process called the TCA cycle, which in overdrive produces oxidative stress, but were eventually overwhelmed.

They also directly observed the telltale damage of oxidative stress on proteins, lipids, DNA, and RNA. By sending in glowing proteins that attach to fractured DNA, for example, the team found fatal double-strand breaks in the DNA of *E. coli* subjected to antibiotics—breaks that occurred much less frequently in *E. coli* left unhindered by the drugs.

The findings suggest several pathways to more effective treatments, Belenky says. For example, the fact that antibiotics damage DNA indicates that sublethal doses may cause genetic mutations that may promote antibiotic resistance. Scientists could learn the efficacy of an antibiotic in minutes, rather than hours, if they can look for metabolic changes. They may also be able to find ways to boost the TCA cycle into overdrive to accelerate bacterial death. Finally, because antibiotics are often given in combination, understanding which ones tamp down TCA and which accelerate it could prevent doctors from inadvertently undermining treatment regimens. Belenky says he hopes the findings can lead to more effective treatments for patients fighting infections. ***—David Orenstein***

DEATH BLOW: Isolated bright spots show double-strand DNA breaks fatal to bacteria.

COURTESY BELENKY LAB/BROWN UNIVERSITY; RUPERT WHITLEY (2)

WHO KNEW?

Ocean State Honors

Two faculty are honored for their novel work.

Alzheimer's and Ebola are two of the more devastating diseases that torment humankind. For their work to understand and arrest these scourges, two Alpert Medical School faculty were honored as 2015 Rhode Islanders of the Year by the magazine *Rhode Island Monthly* in December.

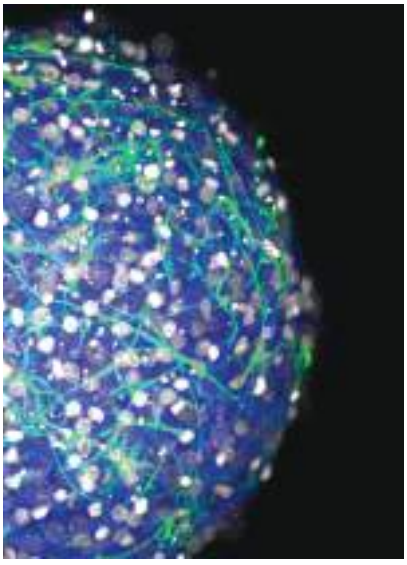
Adam Levine, MD, MPH, assistant professor of emergency medicine and director of the Brown University Global Emergency Medicine Fellowship, was one of the first responders to the Ebola outbreak in Liberia, where he set up the International Medical Corps' first treatment facility. After the epidemic subsided, Levine and his colleagues had data from more than 2,000 patients that, they hope, will unlock some clues to this still-mysterious disease; they're working with the World Health Organization to set up a data-sharing platform with other aid organizations. Levine told *RI Monthly* the research is vital because an outbreak will happen again. "The question is how do we prepare ourselves to make sure that we have the best tools and the best trained people available to respond the next time," he said.

With science and art, Peter Snyder, PhD, professor of neurology (research), is taking a fresh look at Alzheimer's disease. The chief research officer of the Lifespan Hospital System has been examining the eyes of children of Alzheimer's patients for evidence of protein buildup and other early signifiers of the disease, with the ultimate goal that physicians would be able to treat people sooner and slow its progress. "Once the tissue is lost, it doesn't come back," Snyder told the magazine. "So we want to protect it when it's vulnerable, not yet destroyed."

As he collected retinal and brain scans and other data for the study, Snyder, a sculptor, also found inspiration. With four other artists he organized an exhibition, "Interstice: Memory, Mind, and Alzheimer's Disease," at Brown last summer to illustrate the experience of patients, families, and caregivers—of their fear and uncertainty, but also love and hope. ***—P.H.***

GOOD GUYS Peter Snyder, above, and Adam Levine were chosen as Rhode Islanders of the Year.

The BEAT



PRETTY SMART: This tiny brain can be made for a quarter.

COOL TOOL

Build a Better Brain

These cheap balls of neurons are no Einsteins, but they're perfect for research.

A quarter can buy you some time on a parking meter, a giant gumball from a machine, and not much else—unless you're in the market for a miniature brain.

For just 25 cents, biomedical engineers at Brown can manufacture, from rodent tissue, a teeny brain—about a third of a millimeter in diameter—that can produce electrical signals and form synapses. It may not be good for thinking (sorry, Scarecrow), but that petite sphere of central nervous system tissue is functional enough to test drugs, neural transplants, or how stem cells work.

"We think of this as a way to have a better *in vitro* model that can maybe reduce animal use," says Molly Boutin PhD'17, colead author of a paper in *Tissue Engineering: Part C* in December. "A lot of the work that's done right now is in two-dimensional culture, but this is an alternative that is much more relevant to the *in vivo* scenario."

> "The **materials are easy to get** and the mini-brains are **simple to make.**"

Just a small sample of living rodent tissue can make thousands of mini-brains, the authors wrote. They isolate and concentrate the desired cells with a centrifuge and use that to seed the cell culture in medium in an agarose spherical mold. The orbs begin to form within a day after the cultures are seeded and form complex, 3-D neural networks within two to three weeks.

Though the mini-brains aren't the first or the most sophisticated working cell cultures of a central nervous system, they require fewer steps to make and use more readily available resources.

"The materials are easy to get and the mini-brains are simple to make," colead author Yu-Ting Dingle '06 ScM'07 PhD'15 says. Comparing them to retail 3-D printers, she adds, "We could allow all kinds of labs to do this research."

Senior author Diane Hoffman-Kim PhD'93, associate professor of medical science and of engineering, says her lab wanted to develop a model to test aspects of neural cell transplantation, as has been proposed to treat Parkinson's disease. Boutin, who is one of Hoffman-Kim's graduate students, wants to study how adult neural stem cells develop.

Hoffman-Kim hopes the mini-brains will proliferate to other labs. "We think you shouldn't have to equip yourself with a microelectronics facility, and you shouldn't have to do embryonic dissections in order to generate an *in vitro* model of the brain," she says. ***—D.O.***

See a mini-video *of the mini-brains at brownmedicinemagazine.org in The Beat section.*

OVER HEARD

"If leadership is valued in medical school admissions and is essential to the future of medicine, then how do we end up with physicians who need extensive retraining to become leaders?"

BRIAN CLYNE *MD'97, vice chair for education and associate professor of emergency medicine, who presented "Where Did All The Leaders Go? The Physician Leadership Paradox" on Nov. 17, 2015, at MedEd Talks, an annual series of short presentations by Alpert Medical School faculty on timely topics in medical education.*

COURTESY HOFFMAN-KIM LAB/BROWN UNIVERSITY

FACULTY

Train the Trainers

A Medical School program helps faculty improve their teaching.

For medical educators, teaching is a skill that needs to be honed and developed just like clinical practice.

Emily Green, MA, oversees the Program in Educational Faculty Development at Alpert Medical School, which began in August 2012. "The ultimate goal [of the program] is improvement in teaching to improve the experience of our students and residents," she says. But it's also about building a community of educators, and showing the faculty that their teaching is appreciated and supported. "People who attend our programs have said that sometimes it's just nice for doctors to have an opportunity to talk through issues and share best practices," Green says.

> "What's the **one thing** you learned that you will **apply in your teaching?"**

ADAM MASTOON (2)

STUDENT TEACHERS: Top photo, Star Hampton, MD, associate professor of ob/gyn, describes a short course for residents at the MedEd Talks.

By attending a sequence of programs over a three-year period, faculty are able to earn certificates of Participation or of Advanced Medical Education Training. Most of the workshops, Green says, are eligible for continuing medical education credits as well.

The workshops themselves vary, from standard seminars to MedEd Talks, which adopt the TED Talk style to deliver short, informative lectures on a wide variety of topics in medical education. For example, the second annual MedEd Talks, in November, featured 10-minute presentations on subjects as varied as training students to be leaders in medicine to the use of museum visits in the curriculum.

"Sitting in a workshop is one thing, but actually changing your teaching practice is a really hard thing to do," Green says. In order to close that gap between theory and practice, the programs always close with some form of the question, "What's the one thing you learned that you will apply in your teaching?"

The program is also a way for the Medical School to show how much the teaching contributions of faculty are valued, says Michele G. Cyr, MD, MACP, associate dean of medicine for faculty affairs. "All but one of our faculty tracks require excellence in teaching for promotion, and participation in these seminars demonstrates a faculty member's commitment to their teaching," she says. There's plenty of expertise to share, as well. "Many of the course instructors have been doing workshops at national meetings. This program allows us all to benefit right here at home."

Green's office also provides a talk feedback service. For example, they might review a faculty member's presentation for a national meeting and provide tips for improving content and delivery. Next on her office's agenda is the creation of a teaching academy that would broaden the services offered and reach more teachers.

"People who touch learners can be really far flung, especially as we cross into new clinical settings," Green says. "We want to gather under an umbrella and say we value what you do and want you to do it well, for ourselves and our learners." ***—K.C.***

RESIDENT EXPERT

BY LAURA MERCURIO MD'14 RES'18

Ghost in the Machine

Doctors can help design better electronic records.

"And, we're down."

Amid the Halloween costumes, there was an eerie silence. No typing, no clicking, no mouse-shuffling. Just a bunch of medical professionals, ironically dressed as the Minions, staring at each other. The electronic medical record system had crashed, and we had to run the emergency room on paper.

I shuffled around the secretary's desk looking for a makeshift chart. I selected a manila folder, and pulled out the papers. The layout was foreign. There were no links, no graphs, no interface. Just me, the Minions, and these pieces of paper. I looked up, and found one of the attending physicians smiling at me.

The lens through which I learned medicine was inherently digital. To me, charts are not folders or papers; the term "chart" represents an ecosystem of dynamic vitals, laboratory results, notes, and orders. Hundreds of lab results are displayed, shuffled, filtered at will; years of data are condensed into graphs. A patient no longer simply has a physical presence—she has a cyber-physical one.

Are trainees becoming a bunch of Minions following numbers instead of patients?

At its core, the medical interaction relies on human pattern recognition, and recent advances in medical technology enhance this capability. Using the electronic medical record (EMR), providers can rapidly synthesize information without having to first aggregate the data. As a result, physicians can spend their time using the EMR's output—graphs, patterns, etc.—to inform medical management. In this scenario, a well-designed EMR enables the doctor to spend more of her time physically with the patient. As such, the EMR should seamlessly integrate into the background of medical care.

Yet the reality of EMRs is somewhere in between my description and the old world of manila folders. Current EMR platforms rely heavily on the end user to input the data. Due to the clerical burden, trainees spend 20 percent of their time at the keyboard and just 12 percent physically with their patients. I can personally attest to spending just as much time charting as I do counseling my patients.

At a system level, there are too many data standards for efficient back-office integration. Each EMR has its own user interface, data input requirements, and document writers; one system cannot freely communicate with the other. This data environment creates the illusion that a single EMR holds all the patient information when, in fact, there are several missing sources. The burden of verification is therefore shifted to the end user, who must learn multiple systems and personally integrate the information.

This is where the new generation of physicians should step in. As digital natives, we represent the intersection between technology and medicine. First, we need to focus on improving data integration. Some examples include automatic approval and integration of outside records upon patient transfer, streaming vital signs entry, and real-time diagnostic imaging upload. Together, these would greatly improve the information experience of the end user, which would, in turn, improve patient care.

Second, there is a booming medical technology industry. Many companies are developing third-party devices that integrate the newest sensor technology with medical platforms. We should insert ourselves into this design process to help create a product that improves the joint experience of the physician and the patient.

So, my fellow Minions, let us drive the change we need to see in our medical system.

Laura Mercurio *is a second-year resident in pediatrics at Hasbro Children's Hospital/Brown. She completed a BS in biology of global health and African studies at Georgetown. Her interests include global health, digital medicine, and organizational change in health care.*

BLAIR THORNLEY

ESSAY

BY JON ELION '72 MD'75, P'05

Hippie to Hippocrates

Putting on the white coat shouldn't change the person who wears it.

On October 17, 2015, Clinical Associate Professor of Medicine Jon Elion delivered the Charles O. Cooke, MD, Distinguished Visiting Lecture to the MD Class of 2019 at the annual Ceremony of Commitment to Medicine, where students receive their first white coats. This essay is the text of his speech.

When I was a medical student, I hated any story that started, "When I was a medical student …"

When I was a medical student, I had long hair, a beard, and a collection of tie-dyed scrub shirts. Looking around, I can see that many of you here today know all about this fashion trend popularized by the Grateful Dead, and maybe even owned something similar yourself. For the rest of you, perhaps you have read about this in the history books. My scrub shirts look suspiciously like those that were stocked by the hospital. But I digress. Each day I would put on my tie-dyed scrub shirt, hop on my bicycle, and race to the hospital for my clinical rotations. My hair would stream out behind me, barely kept in check by a leather headband. When I arrived at the hospital, I would change into a dress shirt, tie my hair back in a ponytail (tucked into my shirt), and would put on … my white coat. Donning the mantle. My superhero costume. My own little White Coat Ceremony. For when I was wearing that white coat, I was part of a longstanding tradition, going back hundreds if not thousands of years. I could feel the transformation from hippie to Hippocrates as I slipped on that coat. It gave me a code I could live by.

When I was a medical student, I met a pretty red-haired nurse working in the intensive care unit. Little did I know that ICU nurses had no use for smart-aleck medical students. She hated me right off the bat, even if I did have a white coat. She reported me to the head nurse, and said she never wanted to see me again. We were engaged three months later and married eight months after that. That was more than 41 years ago. Kathy's here today, sitting in the front row. She still thinks I'm a smart aleck.

When I was a medical student, I worked at WBRU, which at the time was the No. 1 radio station in the Providence market. "You're listening to 95.5 … just a little left of center on your radio dial … ." Some of you may remember when radios had dials. At the end of the day at the hospital, my personal White Coat Ceremony would reverse. The white coat was carefully stowed away in the saddle bag, the dress shirt was exchanged for the tie-dyed scrub shirt, and I let my hair down, both literally and figuratively. Then I hopped on the bike and raced to

DAVID DELPOIO

TROUBADOUR: Jon Elion adapted '60s anthem "Teach Your Children" for the first-year students.

ESSAY

the WBRU studio, where I had an evening shift playing "progressive rock" or "album rock."

Over the years, this mini-ceremony was repeated often, and gained many different variations. Working in the computer research lab, then tucking in my shirt, putting on my shoes and a tie, donning the superhero costume, and going to make rounds on the intensive care unit. From algorithms to cardiac rhythms. Saving lives—it's a tough job, but hey—*somebody* has to do it!

For the longest time, I considered my white coat as transformative, covering up and disguising the hippie and turning me into something decidedly more medical. Until one day … I was on the intensive care unit caring for an elderly woman who was at the end of her life. Her organ systems were shutting down one at a time. It was like standing outside of a house at night, watching the lights being turned off one at a time. I was at her bedside with her daughter, Judy. Judy with tears streaming down her face, and me in my white coat. I was terribly saddened by the unfolding events. It would be death with dignity, but it was death nonetheless. Old wounds that I harbored were being torn open, and I knew I was going to start crying, too.

But people in white coats don't cry. So I turned to walk out of the room so Judy wouldn't see me crying. To this day, I don't know why, but I stopped in the doorway instead, turned, and went back to the bedside. I decided it was OK to cry. OK to be seen crying. Perhaps people in white coats *should* cry.

A few weeks after her mother died, Judy sent me a note that I have kept to this day:

Dear Dr. Elion,

It has taken me this long to write to you because I have been searching for the words to express my profound gratitude for your kindness as my mother was dying. Your intuition is remarkable; you knew what I needed to hear even before I asked the questions. I don't think anyone could have guided me as gently, as thoughtfully, or as wisely as you did through the waiting, the decisions, and the end of my mother's life.

I hope you are involved in teaching new, young doctors. They will be privileged to learn more than cardiology from you.

Please accept my thanks from the depths of my heart. I will never forget your kindness.

I am convinced that this unfolded as it did because I did not let the white coat transform who I am, but rather let it augment and enhance who I am. That long-haired hippie in the tie-dyed scrub shirt. The computer geek. The guy with a weird sense of humor, and with his own set of experiences, wounds, and pains.

I think that most of you have guessed by now where this is going. Parents and friends—you should be incredibly proud of the accomplishments to date of these students here today. And students—you should be incredibly proud to be sitting here today, awaiting the opportunity to don your white coat. To take another big step toward joining a centuries-old tradition and profession. But be sure that the white coat adds to who you are, enhances who you are, and does not in any way cover who you are. As the saying goes, "Be yourself; everyone else is already taken."

DAVID DELPOIO

VIDEO: Watch Jon Elion perform at brownmedicinemagazine.org.

Jon Elion *is a cardiologist and clinical associate professor of medicine at Alpert Medical School. He is the founder of Chartwise Medical Systems Inc.*

OPINION

BY LAUREN SUNHYE PARK MD'19

Mental Notes

A med student reflects on a year as a medical scribe.

On my second shift as a medical scribe in an emergency room, I saw a handful of medical staff running into a room for an emergent intubation. In minutes, the doctor successfully intubated the patient and secured his airway. While making sure I had all the details for a procedure note, I tried to process the moment of life and death that I had witnessed.

As a recent college graduate, I began working as a medical scribe at an ER without previous experience in a hospital. At first I made mistakes every day. Doctors and nurses would point out, "You misspelled amoxicillin," and, "That's not an ultrasound, that's an EKG machine." Most scribes work during a gap year between college and graduate school, so the job has a high turnover rate.

My role was to complete a patient chart with concise patient narratives, physical exam findings dictated by the physicians, and notes on procedures done during the visit. Scribes aim to alleviate the burdens of electronic medical record charting on physicians and improve billing efficiency. I worked with a team of care providers and was privileged to hear patient stories, see physical exams, and process how doctors make differential diagnoses.

At a Level 1 trauma center, seeing a wide range of patients taught me a great deal of clinical medicine. As I became more adept at spelling medical terminology, I also became familiar with the patterns of medications, symptoms, and diagnoses associated with certain clinical presentations. In medical school, I recently learned that troponin is a protein that leaks from heart muscles during an acute heart attack. Immediately I recalled from my scribe experience that troponin is one of the first proteins tested at bedside for patients with chest pain. Connecting past scribe experience with current preclinical course material makes learning far more intuitive and rewarding.

But I have come to realize the true depth of medical practice: how it is more complex than simply interpreting lab results or prescribing medicine. Friends outside of medicine often ask, wide eyed, "Have you seen someone die?" Unfortunately, yes, I have. Patients die in the ER. Documenting resuscitations and speaking with families facing a sudden loss are difficult. Walking into a shift, I would never expect to see a child with shaken baby syndrome or a 25-year-old with an irreversible head bleed. Standing on the provider side, I thought I had to put on a façade that I am OK encountering these tragedies on a daily basis. In retrospect, I feel that scribes are not adequately trained to handle the emotional burdens of repeated exposure to trauma. As I proceed headlong into a career in medicine, I need to take a step back to reconsider the tenuous balance between empathy and professionalism.

There are nuances to medicine that can be learned only in action. Some of the most valuable lessons were taught unintentionally, merely by seeing how different physicians treated their patients. I remember a doctor who would discreetly warm her stethoscope with her palm before every cardiopulmonary exam. That simple act didn't change the course of care, but it made one part of an ER visit less intrusive. In retrospect, not knowing what is relevant in a diagnostic process forced me to observe carefully and notice these details in patient encounters. These stories were left out of a patient chart, but were kept in my mental note for my future practice in medicine.

> There are **nuances** to medicine that **can be learned only in action.**

My year as a scribe proved to be only the beginning of my medical education. I saw patients through the lens of a care provider and learned valuable lessons that couldn't be taught in a classroom. Caring for the ill can be emotional, and social and financial issues complicate quality of treatments. I leaped into the ER without any knowledge of health care. Now I have holistic considerations to guide me through a long journey in medicine. And I can spell the most convoluted names of antibiotics.

Lauren SunHye Park *is a first-year student at Alpert Medical School. She majored in media studies and biology at the University of Virginia.*

ZOOM

BY PHOEBE HALL

Goal Keeper

The best defense is a good offense.

David Hernandez '16 MD'20 has played defense for intramural soccer all four of his years at Brown. But in the classroom, he quickly learned that if he didn't go on the offensive, he would fall behind, and fast.

A student in the Program in Liberal Medical Education (PLME), which admits high school seniors to Brown and Alpert Medical School, Hernandez enrolled in "Introduction to Neuroscience" in his first semester. The popular course attracts hundreds of students each year.

"I was one more student. It was hard to get individual attention," says Hernandez, whose class at Central Falls High School numbered less than 200. "It was something new for me."

Also new was his struggle to keep up with his coursework. The valedictorian at Central Falls, a tiny city just north of Providence, he says he was "not prepared" for the transition to college-level studies. "In high school there were so many ways to get graded and assessed. Here there were only three exams," he says. "It was a huge shock for me. … So I almost failed neuroscience."

But Hernandez went on offense. "It was a wakeup call," he says. He attended office hours, worked with individual and group tutors, and studied with fellow students. He figured out what resources he needed and where to find them, and never hesitated to ask for help.

Over and over, Hernandez, who wears thin wire-framed glasses and his dark hair cropped close, expresses gratitude for the people in his life, from his parents and high school teachers to professors, tutors, and friends, insisting that without them, "none of this"—four successful years in the Ivy League, on the cusp of medical school—"would be possible."

Joseph Browne '10 respectfully disagrees. The former coordinator of the University's New Scientist Program, Browne met Hernandez when he took part in the week-long Catalyst pre-orientation program, which prepares underrepresented students to major in the sciences. Right away, Browne says, Hernandez stood out from his peers.

"Some people are just going to get to where they're going, and David is one of those," Browne says. "Yes, people gave him a chance. They were supportive. But it's more than the role they played in supporting him. He's just a very determined kid. …

"Other paths could have been easier that excluded the sciences, and he didn't choose to do that. He had a choice, and he chose to stick with it."

FIRST GEN

Since childhood, Hernandez has been familiar with big challenges. Not long after he was born, in Medellín, Colombia, an aunt who had moved to the United States and become a citizen began to petition the State Department to allow her family to join her. It took 15 years to get their visas; in 2008, just before his freshman year of high school, Hernandez, an only child, and his parents moved to Rhode Island.

Hernandez says his parents take education seriously, and they sent him to a Catholic school in Medellín through eighth grade, but private school tuition in the US was out of reach. Though Hernandez knew some English, he wasn't prepared for full language immersion in an American high school—and ostensibly not one that perennially ranks among the lowest in the state, and garnered national headlines in 2010 when it fired all its teachers.

"But Central Falls opened their doors," says Hernandez, whose fluent English still carries a Colombian accent. "They have a great ESL program. They encouraged me to work hard. It was a great school, in spite of what the media say, in spite of what everyone says. They always supported me."

David Upegui became a biology teacher at Central Falls High School, his alma mater, during Hernandez's junior year. They connected not only as fellow Colombian immigrants, but through their mutual affinity for science. "I remember meeting him very vividly," Upegui says. "I gave my students a lab report to complete and I remember how his lab report was so impressive that I wrote on it, 'This is college-level material.' … He was not just completing

HEADS UP: "As a Colombian, I'm very passionate about soccer," says David Hernandez. He's wearing the jersey of Atlético Nacional, "the best team in Colombia and my favorite team," he says.

KAREN PHILIPPI

an assignment. He actually explored ideas."

Though Hernandez had been attending Rhode Island College's Upward Bound Program, which prepares first-generation college students for higher education, since his freshman year of high school, Upegui's comment excited him. "He wanted to make that happen," his former teacher says.

That year Upegui formed Central Falls' first Science Olympiad team, in which state high schools compete in science-themed events, from bridge building to meteorology to robotics. Upegui invited Hernandez to join the team, assigning him to the anatomy and physiology event with one other student, also a recent immigrant. With help from Alpert medical student volunteers, they prepared for two months for the competition, expecting to gain nothing more than new knowledge and the experience of a statewide academic competition. Instead, Hernandez and his teammate brought home the gold medal.

"I can't even begin to tell you, the eruption from everyone there in that room because they understood what had happened: two immigrant kids, from the inner city, competing against all the schools in Rhode Island," Upegui says, the memory still fresh. "And that sort of set the scenario for what would happen in the next few months. After that, David came back for his senior year and said, 'I want to go to medical school, if that is feasible.' I said, 'Of course it is.'"

SAVVY STUDENT

Hernandez began shadowing local physicians in high school. At Roger Williams

ZOOM

Hospital he watched 15 surgeries, including gastric bypass and hernia repair, and talked to patients. He decided to apply to Brown as a PLME, and wrote and rewrote his application and essays, seeking help from anyone who would give it. "He said, 'I want to go to the PLME program but it will never happen,'" Upegui says. "And then I got the call from him. He was opening the email [from Brown] and crying, he was so happy."

Julianne Ip '75 MD'78 RES'81, P'18, the associate dean of medicine for the PLME, says the program—which had a 5-percent admittance rate for the Class of 2016—doesn't interview prospective students, so her office didn't meet Hernandez in person until he arrived on campus. But "we 'met' him through the newspaper after he was admitted," Ip says. The local media, hungry for good news out of Central Falls after so much controversy, were all over the story of the Colombian immigrant who rose to the top of his class and got into not only Brown but its medical school. (The high school got another shot in the arm two years later when Upegui, who before becoming a teacher was a data manager at Brown, won the Evolution Education Award from the National Association of Biology Teachers.)

The *Providence Journal*'s coverage of Hernandez caught the eye of Joan Wernig Sorensen '72, P'06, '06, a trustee of the Brown Corporation. "I read his story and said, 'This is unbelievable,'" she says. She further connected with the future Brunonian because her husband, Paul (Pablo) Sorensen '71 ScM'75 PhD'77, P'06, '06, is a first-generation immigrant who was raised in Ecuador. The *Journal* reporter helped Sorensen get in touch with Hernandez, and she and her husband took him to lunch.

"In the very beginning it was very difficult for him," Sorensen says. "I told him that when I came here in 1968, from an all-girls Catholic school, I had taken two AP courses while most of my classmates had taken many more. I also told David that many of his classmates were up against the same thing when they came to Brown. The freshman year is the hardest."

> "I want to be **a doctor that my parents can go to**—the doctor they **haven't had.**"

Hernandez tried to get ahead of the game by enrolling in two pre-orientation programs: Catalyst, the science program, and Excellence at Brown, a week-long, writing-intensive seminar that introduces students to the academic and campus culture. "I wanted to hit the ground running," he says. "But I didn't have the study skills. I didn't have the prior knowledge. ...

"After neuroscience, getting a tutor and working with all the students has become a routine. I turned what was a weakness into a strength," he says.

Ip says she had worried about how Hernandez would transition to Brown. "He was coming from a small, supportive school, where he was a big fish in a small pond, and here he'd be a smaller fish in a big pond. I didn't want him to feel intimidated," Ip says. "But he asks for help. ... And he's always very willing to listen to advice, which has made him successful."

Plus, she adds, "He really utilizes his resources." Hernandez discovered a love for French during his first year, and wanted to get a tutor to improve his skills. So he traded Spanish tutoring with a student who was fluent in French. "I thought that was a creative use of his abilities," Ip says.

Though Hernandez receives scholarships, there are always extra expenses. "During David's freshman year, before he was in the swing of things, he needed money for books," Sorensen says. "I gave him some money, and he found the cheapest editions he could online and tried to give the rest [of the money] back. I told him to keep it; he'd have other expenses. But he's most resourceful—he has applied for and received many grants." He also holds campus jobs, including as a supervisor for intramural soccer and a teaching assistant for Advanced Spanish.

Because he'd fallen behind in his coursework, Hernandez wasn't able to fulfill his dream of studying abroad, but in the summer after his sophomore year he spent seven weeks taking intensive French at Middlebury College, and got to go to Montreal. It was nice, he says, to have "a break from science."

The trip was possible because, dur-

ing his sophomore year, Hernandez got his US citizenship. "A Colombian passport doesn't get you very far in the world, but an American one does," he says. "It was a very special moment. It opens the door. You can now travel anywhere you want."

That includes his home country, which he hadn't visited since he'd left five years earlier. Because it's so hard to get a visa, it can be difficult to return to the US, even for someone who's established residency and enrolled in college. "Getting my citizenship is just as important as gaining acceptance to Brown," he says. "It's a dream come true that millions of people wish they have and millions of people are denied each year. It's definitely a privilege." Now he goes to Medellín every winter break to see his family.

FINISHING STRONG

Hernandez, a biological sciences major, got involved with research early. As a freshman he took the "Phage Hunters" course, in which students find, name, and analyze the DNA of undiscovered viruses; then, during his first summer, he studied amyotrophic lateral sclerosis in *Drosophila* with the Brown Scholars Program. He's also shadowed neurosurgeons, cardiologists, and infectious disease doctors. "Every single experience has strengthened my wish to be a doctor," he says. "To see a patient walk out of the hospital feeling better thanks to the work a doctor did—it's something priceless. It's something I hope to one day be able to do for other people."

But more importantly, Hernandez wants patients to be comfortable and knowledgeable when they walk out of his office. That's what he says his unique position—bridging the gap between immigrant and citizen, able to navigate the Hispanic community—will bring to his practice. "I want to be a doctor that my parents can go to—the doctor they haven't had. … I want to give back to my community, to people who have gone through the things my parents have gone through." Hispanic patients, he adds, "need someone who can speak the language, who can tell patients their options, their resources, who can explain insurance and different treatments."

"He's the kind of person I would want to have as my physician," says Upegui, who has kept in touch with Hernandez. "I want someone who is a human, who makes their patients human again—someone who understands the complexity of the human experience. I don't know if he sees that in himself."

Sorensen has seen hints of what may one day be Hernandez's bedside manner. In addition to the "touching emails" that he sends regularly, updating her on his coursework and grades, she says, "When my husband had knee surgery, David wrote to ask for his phone number so he could call him and wish him well."

Ip, who taught Hernandez in her PLME senior seminar last semester, says he wrote thoughtful reflections for her class. "I think [as a physician] he's going to bring a phenomenal amount of insight," she says. She adds, "As an immigrant and a first-generation college student, he's very proud of that. He knew he didn't start at the same place as everyone else. I don't think I've met many kids who have had to work as hard to get where he is."

Medicine, Hernandez says, is "a field that's very hard to get into, even more for a minority student, even more for a recent immigrant." Though he makes time to ride his bike and play soccer, which help him get his mind off school, he rarely has time for chess anymore—he was a state champion all four years in high school, and his team won the Ivy League Chess Championship during his freshman year—or other extracurriculars. "I gave all my life to academics," he says. "I went from getting 60s to getting 80s. It feels good to be in this position, because medical school is right around the corner."

His pre-med requirements complete, he says he's been able to enjoy his senior year, taking courses in exercise physiology and French photography as well as infectious diseases and biochemistry. "I'm finishing strong," he says. He was thrilled to learn he'd met the requirements to earn a Bachelor of Science: "a nice reward," he says. As for the rigors of med school, Hernandez says he feels prepared. "I've learned how to study. I've fallen in love with it," he says, describing a strategy of reviewing every lecture within a few hours of class "to memorize concepts, clarify doubts, and identify questions."

Browne, who now works at the MIT Sloan School of Management, says Hernandez draws satisfaction not just from his achievements, but from his struggles. "He's aware of the frustration he felt, and how real and valid and important it was in that moment," Browne says. "And now, in the grander arc of things, he's past that. It could have been easier, it could have been better—and it was always going to be fine."


THE DIGIT
RE

TAL EVOLUTION

BY PHOEBE HALL
PHOTOGRAPH BY JARED LEEDS

Tech is changing health care as we know it. But can it make it better?

Late one night in the not-so-distant future, a man stumbles into an emergency department with slowed breathing and slurred speech. A triage nurse scans his face with an iPhone camera and records an erratic pulse and low blood pressure. At bedside, a resident dons a Google Glass headset and examines the patient while sending real-time video to a remote toxicology consultant, who confirms an opioid overdose and recommends treatment. After he's discharged, the patient responds to a few automated text messages checking on his recovery. He also agrees to participate in a treatment monitoring program, taking pills with ingestible biosensors that track medication adherence and wearing a slim wristband that can detect relapse, which his physician oversees from her office.

AT THE HEART OF THINGS: Megan Ranney, MD, photographed in a 3-D image of the heart in Brown's Yurt virtual reality theater, says the emergency department is an ideal place for digital health interventions because it's the entry point to the health care system for many patients.

> "You don't want your grandmother taken care of by something disruptive."

We may be a long way from the futuristic sickbay of the *USS Enterprise*, but all of these technologies exist, and they aim to streamline physician workflow, enhance patient engagement, cut wait times and health care costs, increase patient satisfaction, and, the true endgame, help them live longer, healthier lives. This intersection of tech and medicine, known collectively as digital health, is a small but growing field that's already attracting deep-pocketed venture capitalists along with medical researchers, clinicians, and patients.

"Digital health is reinventing the whole enterprise" of health care, says Megan Ranney, MD RES'08 F'10 MPH'10, assistant professor of emergency medicine and founder of Brown's Emergency Digital Health Innovation program. "It has the potential to transform the way we provide care and help our patients stay healthy."

"When you look at the future of what a hospital looks like, it's going to be fundamentally different from what it is right now," says Edward Boyer, MD, PhD, a professor of emergency medicine at the University of Massachusetts Medical School and a frequent collaborator with Ranney and others at Brown. "What this line of research does is it blows the walls off the hospital."

No one denies that health care in the United States is in dire need of tech's two favorite buzzwords: disruption and innovation. "The way the health care system currently works is broken," Ranney says. But researchers at Brown are cautious about VC and Silicon Valley's attention. "You don't want your grandmother taken care of by something disruptive that's not been appropriately tested," Leo Kobayashi '94 MD'98, associate professor of emergency medicine, says. "You could hurt her."

That's why, Ranney says, it's critical that clinicians as well as patients get in on the ground floor. "This is coming, whether we want to create it within medicine or it's created from the outside," Ranney says. "We"—physicians—"have a chance to keep it trustworthy and safe. Business isn't going to do that. And frankly, government isn't either." Successful digital health tools must be tested in the real world, and security, ethical, and privacy issues must be considered. Effective development also depends on inclusiveness—of believers and nonbelievers, even of the technologically impaired. "I'm not a techie. I don't know how to program," Ranney says. "But you don't have to, to work on this and enjoy it."

I'M SAD ALL THE TIME :(

Nine out of 10 American teens own or have access to a cell phone; texting is far and away their favorite form of communication. Yet it surprises skeptics that automated text messaging programs can be effective health care interventions. How could a computer be as helpful as a real person?

"Teens don't necessarily want to talk to a counselor," says Cassandra Duarte MD'18, who is working with Ranney to study iDove, a text-based program for teenagers at risk for depression. "They would rather interact with their phone."

And it's not just kids. More than 90 percent of American adults have cell phones, and more than 80 percent of them text. "It's the most ubiquitous, most stable method of communication," Beth Bock, PhD, professor of psychiatry and human behavior and of behavioral and social sciences (research), says. Automated text messages—to remind patients to take their medication, check in after a hospitalization, or manage chronic diseases—have repeatedly proved effective and are a regular aspect of care in a few US health systems.

Bock started her career running smoking cessation support groups, and she quickly saw the utility of texting in her work. "It's fascinating to take a face-to-face intervention and deliver it in little doses with a device they use anyway. We're worming into people's lives," she says. Furthermore, text interventions are cheap, can be delivered any time of day or night, and can help many more patients. "Scaling up a text messaging program is not hard," she says. "We could reach thousands of people."

Even though users know messages are automated, Bock stresses they won't work if they're too robotic. Her smoking cessation program includes a month of messages to prepare a participant for his or her quit date (which users set themselves) and eight weeks of supportive and educational texts after, but it adapts to individual situations. People who don't sign up until after they quit, for example, receive different messages. "And if they didn't quit [on their selected date] and need to start over, the messaging is different," Bock says. "We don't want it to seem completely mindless."

When trying to reach teens, it's even more important to sound authentic, she says. For a pilot aimed at heavy-drinking college students, Bock and Rochelle Rosen AM'91 PhD'02, assistant professor of behavioral and social sciences, assembled student focus groups to help write

the texts, which encourage safe drinking behavior. "My concern was that text messages written by overeducated PhDs wouldn't sound appropriate to the age group we were working with," Bock says.

She was right. Though some of the automated messages, which are sent on Thursdays, Fridays, and Saturdays, are educational ("Never leave your drinks unattended," "You don't need to be wasted to have a good time"), others that students helped her develop have an authentic irreverence ("If the room is spinning, the alcohol is winning"). Bock says students advised them, "Don't tell me how to drink, say you care about how I drink."

Teens interviewed during the development of iDove, which targets 13- to 17-year-olds with depressive symptoms, echoed this. "[I]t would just be nice, you know, just to get a message, just sayin' there's people out there," one boy told researchers. Faith Birnbaum '10 MD'16, who also worked on the project, says, "Teens feel like someone's there, even though they know it's an automated program."

Participants in the iDove feasibility trial, which is ongoing, are recruited in the Hasbro Children's Hospital emergency department. The intervention group learns some coping skills and takes home a packet with more information; then each day they receive the message, "Hi, this is iDove. How are you feeling today? (1= really bad, 5=great)." Based on the number texted back, the teen gets an automated response. For example, a 1 or 2 will prompt a reply that draws on their skills training, such as, "Remember, when something makes you feel bad, try to think of diff ways to approach the situation." Users also can write back a word like "sad" or "stressed," which triggers further automated responses.

iDove enrollees are cautioned that no one is monitoring the texts in real time, Ranney says. Unexpected words or numbers prompt a message advising the user to call a crisis hotline or 911 for immediate help. "We also check the text messages daily for signs of worsening mood or other potentially dangerous messages," she says. "I have only had to call participants one or two times over more than 130 patients' enrollment."

Texting lowers the bar of entry to mental health care, which can carry a negative stigma and be costly or difficult to access besides. Crisis Text Line, founded in 2013 by Nancy Lublin '93, is a free, nationwide service that connects texters to live counselors. According to

ON CALL: Automated texts from iDove may help troubled teens cope.

anonymized data compiled from the more than 12 million messages exchanged so far, many texters reach out from school—a bathroom stall, or even the cafeteria, where they're surrounded by people. Bob Filbin, CTL's chief data scientist, says a text feels more private and anonymous than a phone call. One teen told him, "I like the idea of texting because I wouldn't want the person on the other end of the phone to hear me crying."

When people contact CTL, they get an automated reply asking what's going on. "It's amazing how quickly they respond with really intense messages," Filbin says, like "I think I might b pregnant" or "I'm worried I might cut again." They're connected with volunteer crisis counselors, who exchange dozens of messages that employ "active listening" and collaborative problem solving, and if necessary refer texters to services. "It turns out most people in crisis just need somebody to talk to," Filbin says.

SENSE AND SENSIBILITY

Even the most gung-ho digital health advocates stress that texting and other tools are intended to enhance, not replace, the face-to-face clinical relationship. Text messages open the door to services a patient doesn't have the means to get and a physician doesn't have time to provide, or allow a doctor to reach more patients, or let a patient play a more active role in his or her own care. As practices become ever busier, texting may actually help clinicians and patients stay more connected. After all, Duarte says, "How big a difference can a 10- to 12-minute encounter with a physician really make?"

Especially in chronic disease man-

agement, it can seem like a doctor's work is never done. Medication adherence is a frequent challenge, but self-reporting is notoriously unreliable, and a text reminder to take a pill doesn't guarantee the patient will follow through. Even techie tools like "smart" pill bottles that record when the cap is opened offer only indirect evidence. The most

I SEE YOU: The author's fundus is a large, clear image on the screen of a digital retinal camera.

reliable technique, direct observation, is expensive and impractical in most cases. It's a ripe opportunity, says Peter Chai '06 MMS'07 MD'10 RES'14, for a digital health solution.

Chai, a toxicology fellow at UMass Medical, is working with Ed Boyer, his mentor and the director of toxicology, to study ingestible biosensors—tiny tags attached to gelatin capsules that, when dissolved in the stomach, send a radio signal that's picked up by a device worn by the patient. "The cool part is," Chai says, "not only do we know in real time if they took the medication, but we can respond in real time." The wearable device sends a signal to a HIPAA-compliant, cloud-based server, which the clinician can access and, if needed, send a text reminder or reinforcing message.

Chai and Boyer first tested the technology to monitor HIV medication adherence, but as toxicologists they see applications beyond disease management. "We're giving this to patients with extremity fractures who are prescribed opioids—some of the most dangerous medications we have in medicine," Chai says. "But our instructions are to take as needed, so we are putting the onus of a very dangerous medication on our patient." Ingestible biosensors could tell physicians how patients interpret "as needed": if they're taking fewer pills than expected, doctors can prescribe less; "if they're taking more, we should be careful not to get people hooked," he says.

Boyer has been working with biosensors for nearly a decade, when he began developing wearables with the MIT Media Lab. As a drug abuse researcher, he wants to find ways to "be there" for his patients at all times. "You would not necessarily want to rely upon a face-to-face clinical relationship if you have a condition or a medical problem that can raise its head at any time," such as drug cravings or relapse, he says. After years of tinkering his wearable biosensors have evolved into unobtrusive wristbands, which Stephanie Carreiro, MD RES'13, a toxicologist and assistant professor at UMass, is using to identify relapse in cocaine- and opioid-addicted patients.

The wristband measures skin temperature and conductance, motion, and heart rate with small electrodes, Carreiro says, and streams the data wirelessly to a clinician. A drop in skin temperature, increase in skin conductance, and "hyperkinetic" activity suggest cocaine use, she says: "that constellation of findings is pretty dramatic." Studies with cocaine users have been fairly successful so far, she says, and she's completed a small pilot with opioid users, who exhibit nearly opposite symptoms.

"The appeal of using something more advanced is we can monitor [patients] continuously in real time," Carreiro says. "There's no way a urine or blood test can do that." Furthermore, in these days of activity trackers and smart watches, wearing a wristband to monitor health trends is familiar. Patients can even download an app to see their data. "Patients have been incredibly engaged," Carreiro says. "It takes away some of the foreignness and the hesitancy some patients have to normal medical interventions and brings it back to their level."

She adds that patients are free to remove the bracelet at any time, "but a lot of our participants, especially the ones who are motivated, have left it on even when they relapse." Ultimately Carreiro hopes to collect enough data to predict relapse, so the clinician can contact the patient via text message or through a sponsor to head it off.

The wristband may help clinicians not only as monitors but as users themselves. For example, because some studies have found a correlation between stress and empathetic decision making, "you can trick out residents to see who is feeling

PHOEBE HALL

> "It's an example of iPhone-based technology that will change what we do."

stressed in a medical encounter, to teach empathetic skills," Boyer says. "The application of these things is very broad."

NEW WAYS OF SEEING

Chai, who began working in biotech development as a grad student at Brown, was dismayed to realize how much medicine lagged behind everyday tech trends. "Someone was critically ill, we needed to urgently communicate, but we were using pagers—technology from the '80s—sitting by the phone, waiting for a call back. It caused delays in care," he says.

When Google introduced Glass, a hands-free, head-mounted display, in 2012, Chai saw immediate applications in the Rhode Island Hospital emergency department. His 2014 study, with Ranney and several other MDs at Alpert Medical School, was the first in the nation to use the device in the ED, to conduct remote dermatology consultations by securely streaming live video and images to a specialist, who would diagnose the condition and recommend treatment. "It takes six months to see a dermatologist, but if a patient was in the emergency room with a skin complaint, we could get an immediate consult," Chai says.

At UMass, Chai, with Boyer, demonstrated that Google Glass also could work for live toxicology consults. He says they use it a few times a month, for difficult cases. Consultants typically log in at the office or from home, but "we can send a live video feed anywhere. They could be in Asia or Europe," Chai says. He adds that though patients reported they'd rather see a physician in person, they preferred Glass to the typical phone consult.

Back in Providence, the dermatology study changed hospital culture, according to Susan Duffy, MPH '81 MD'88, the medical director of the Hasbro Children's Hospital ED. "Now [with patients' permission] we all take pictures on our iPhones," she says, and save them directly to their electronic medical records; the photos help to track physical changes, like the progress of a rash. EMRs can store video, too. "We tell families to take videos of abnormal movement or seizures at home and bring it with them," Duffy says.

Smartphones are becoming as indispensable inside the hospital as they are outside. Many physicians already use them to quickly search for information about drugs, diseases, and the latest research. But they can do much more. Geoffrey Capraro, MD, MPH, assistant professor of emergency medicine, is trying out inexpensive apps and attachable devices to take vital signs and examine children's ears. "It's an example of iPhone-based technology that will change what we do, change patient expectations of what we do, maybe increase patient understanding of what's going on, and allow better teaching," he says.

Capraro, who studies pediatric sepsis, is collaborating with Leo Kobayashi to assess apps that detect vital signs remotely. "Vital signs are the bane of my existence because they are so challenging to capture in kids," Capraro says. Children squirm, they cry, they're afraid of cords. With the FLIR One, an infrared camera attachment, and an app that encodes each pixel with a temperature, a clinician may be able to simply scan a patient's face to measure body surface temperature; with another app, he can see each heartbeat by using the phone's own camera to detect subtle changes in facial coloration. "Eventually we imagine a patient in triage and with a camera system we look at the patient and get real-time vital signs," Kobayashi says. "We may find out they need to be in critical care now."

The accessibility of these tools means patients—or their parents—could be more directly involved in care. "A parent could assess vital signs with her child in the comfort of her arms," Capraro says. In the hectic pediatric ED, where Capraro says vital signs aren't taken as frequently as they should be, "it allows for more frequent monitoring."

Capraro also is trying out Cellscope, an iPhone camera attachment and app, for otoscopies. "In pediatrics looking at ears is a basic bread-and-butter thing," he says. But the standard otoscope is challenging for trainees. "We can't agree on what we see or we're not looking at the same thing," he says. The Cellscope takes videos that can be shared with other clinicians as well as patients. "People are coming together through technology," Capraro says. "A parent sees a video of an infected ear and says, 'Now I know why she didn't sleep.'"

Elizabeth Prabhu, MD F'17, a pediatric emergency medicine fellow, has discovered that same utility with a digital retinal camera that she's been testing. "Clinicians have varying funduscopic exam skills," she says. Like the traditional otoscope, the ophthalmoscope found in every exam room can be tricky to use: the image is tiny, and sometimes clinicians don't see the same things. The Horus Scope, which Prabhu got for her feasibility study in the Hasbro ED, re-

> "The technology supplements your exam skills, it doesn't replace them."

cords images that can be viewed on a screen, similar to that of a compact digital camera, and shared and saved in a medical record. "Families like to see the photos and it's quick for attendings to use," she says.

Duffy, who is overseeing Prabhu's study, says her department quickly incorporated the new device into daily practice. "[Physicians] will identify a patient to take a picture for teaching purposes, or put it in the medical record, or get an image for another use," Duffy says. "Twenty years ago, when I trained, there was very little tech. You had to rely on your clinical exam skills, your knowledge base, and your intuition." Prabhu laughs, and Duffy continues: "We all have to be open to new techniques. ... [But] it's a tool that, as you become facile with the technology, it supplements your exam skills, it doesn't replace them."

PUT IT TO THE TEST

At up to $15,000 a pop, the Horus Scope won't be in every exam room anytime soon. Money is only one of many factors that researchers consider when studying digital health tools. "We need to know when we are introducing new technology, is it valid? Is it feasible? What's it cost? What's the cost benefit? And does it lead to overtreatment?" Duffy says.

Roger Wu, MD, MBA RES'16, chief resident in emergency medicine, was a co-investigator on the Google Glass study at Rhode Island Hospital. "There's often a lot of media hype around these new technologies ... but you really need to let the dust settle and give it time to see what the real value is," Wu says. His department stopped using Glass after the study ended, he says. "In order to successfully launch new technologies in health care, you need to keep in mind organizational culture and workflow." Health care administrators should invest in new tech, he says, "but it's a kind of cautious optimism. It's important to invest with the understanding that there will be many challenges and obstacles."

Capraro agrees. "We need to test if the performance matches the excitement factor," he says. "We need skeptics. Does [the infrared camera] translate to clinical medicine? ... It's good we're in a critical academic place to put this technology to task to find their limitations. There's a lot to be learned. A lot of things fall apart as they get translated."

Nearly everyone interviewed for this article had a story about flawed research and unethical claims: a device to help the elderly when they fall that was tested on college students; an app that supposedly could diagnose melanoma from a photo of a mole, but wasn't tested clinically; another that scanned Twitter for signs of distress and, without users' permission, emailed their contacts.

"Developers will develop an app for one illness only, or a fixed number of symptoms because it's based on a book they read, instead of talking to patients," Cyrena Gawuga '03 AM'15 PhD'16 says. "They don't have a concept of the user experience. They develop things the way they think things might go."

A doctoral student in the molecular pharmacology, physiology, and biotechnology department, Gawuga came to Brown as a PLME but left the Medical School in her second year after struggling with chronic illness. She's an avid digital health consumer, willing to try apps still in development to track her symptoms and moods, and an active participant in Twitter chats related to medical issues. "Physicians are not developers by and large, and patients are not developers by and large," she says. "So by having groups of people work together on a project with different knowledge sets, we'll get better apps and better tech."

Rochelle Rosen has worked on several digital health studies to understand why and how participants use devices, texting programs, and other tools. "IT people aren't necessarily users of tech developed for diabetes and heart disease," she says. "Those patients are older; they're not technology natives. The apps, the devices, the data must be relevant to their lives."

And they have to work for the other end users: physicians. "Physician needs might include some consideration of what data are relevant, and what data are not," Rosen says. "We want to make sure users have a voice not only in the development of apps but even the development of theories."

"The people on the front lines, the physicians working with patients, they're going to have the best understanding of what the problem is and what the obstacles to implementation are," Wu says. He and Boyer say patients and clinicians must see an immediate benefit to any digital health tool for it to work. So, Boyer says, he often skips the usual research rigmarole and goes straight to real-world trials.

"If the interaction is off-putting in any way, they will never come back a second time to interact with your device. So I don't do clinical trials," Boyer says. "I'm interested in finding those features that make mobile health interventions

deliverable for the rest of their lives." He says he gauges a device's effectiveness not by whether someone likes it, but whether they'll use it again. "The best measure is leaving the technology with the patient [when a trial is over] and see if they continue to use it."

LEVELING THE FIELD

On social media and at conferences, Gawuga speaks passionately about the patient experience but seeks common ground with other constituencies. Doctors, patients, and developers can collaborate effectively only with mutual respect, which means breaking down traditional hierarchies. Social media is helping to do that, she says. "On Twitter everyone's reaching out. Doctors are sharing information, patients are saying to doctors, 'This is what's important to me,'" she says.

Ranney, who is active on Twitter and has organized Twitter focus groups, arranged to meet Gawuga after a TweetChat to talk more in person about the patient perspective. She believes it's up to patients, not physicians, to decide how much privacy they want. "It's scary for a lot of doctors," Ranney says. "It will level the playing field and make patients better consumers of their health care."

Physician involvement in the development of digital health tools will better ensure that they adhere to ethical standards. Just because the technology is new doesn't mean that time-honored commitments of doctoring, from confidentiality to the oath to "do no harm," go out the window. Indeed, given the very real concerns about data security, it's more important than ever that clinicians obtain patients' consent, take steps to protect their health information, and honestly discuss privacy concerns.

This may be a greater worry for health care systems than for patients, however; in surveys, large majorities have said they want to link their medical records to non-HIPAA-compliant sites, including the data-sharing platform PatientsLikeMe and even their social media accounts. Patients who text or email with their physicians know their messages aren't secure. "We need to be honest about the risks," Ranney says. But we take risks every time we use a credit card, she adds. "It's obnoxious of us to say, 'No, you can't have that.'"

"The reason [digital health] is coming is patients are driving it," Boyer says. "I recognize that it might not work necessarily for my mom, but as people in my generation and yours and my son's all get older, this will have increasing relevance for them, and that's why we need it."

> "It will level the playing field and make patients better consumers of their health care."

SEE ONE, DO ONE, TEACH ONE

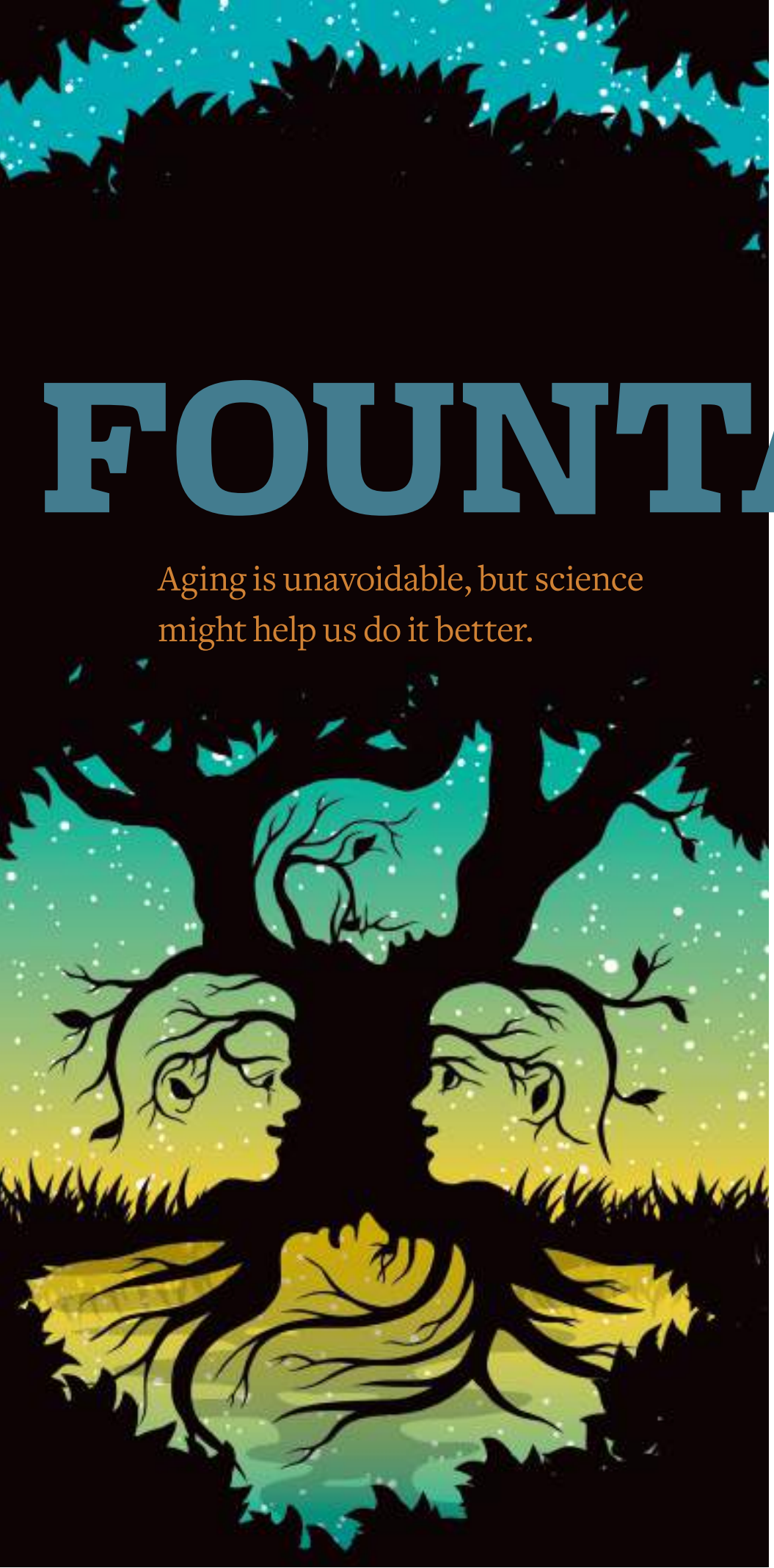
That's also why medical schools need to start incorporating digital health into the curriculum. Many devices have the potential to improve not only patient care but clinical training. "The medical education component of this is vast," Duffy says. Large, clear, shareable images of the inner ear or the back of the eye benefit learners and teachers alike. Remote consults give residents instant access to specialized knowledge. Hardware and software that gather and analyze patient data help trainees see patterns and make medical decisions.

But most digital tools are so new that teachers are learning to use them alongside their students. And in a busy practice, who has time for that? "It's going to be 15 to 20 years before digital health is ubiquitous in medicine," Ranney says. She's launching a preclinical elective in the fall, with the assistance of Margie Thorsen '15 MD'19, that will include workshops where students can explore how tech can be used in medical settings, and develop their own ideas for a final project. The medical students who learn now how to use and develop digital health tools and, most importantly, how to adapt when something new comes along, will be leaders in the future.

Duffy isn't ready to put her older colleagues out to pasture just yet. In every age group there are quick adapters and slow adapters, she says. The quick adapters will try out the latest tools, push buttons and play around and figure out how they work. The slow adapters wait and see. But if the technology works, she says, they come around. "When you realize the benefits to patients, you'll keep up."

FOUNTAIN

Aging is unavoidable, but science might help us do it better.



A CENTURY AGO, the average life expectancy in the United States was around 54 years. Now, thanks to improvements in sanitation, antibiotics, and vaccines, the average American lives almost to 80. But not only can we not live forever, we can't live much longer than that.

John Sedivy, PhD P'19, the Hermon C. Bumpus Professor of Biology, says that's because our longevity is genetically determined, and we're now rubbing up against the upper limit. "A dog lives 12 years and a cat lives 18 years and a horse lives 30 years and a chimpanzee lives 45 years, even in the absolutely best environment," he says. "There's a barrier; a dog is never going to live as long as a horse. Never."

As people live longer and spend more time in old age, they spend more time suffering from the diseases associated with aging, from arthritis to dementia. Researchers at Brown are trying to understand the molecular mechanisms that control not just how old a person gets, but how he or she ages—with the

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BY SUMMER E. ALLEN PHD'12
ILLUSTRATION BY NEIL SWAAB

OF HEALTH

ultimate goal of lengthening the human "healthspan," the years we spend without age-related health problems.

"There is a lot of new research in the last 10 to 15 years that very clearly says that aging is actually something that we can do something about," Sedivy says. He started his career as a cancer biologist, but serendipity, he says, led him to aging research in the late 1990s, when his group at Brown was studying a gene that, when overexpressed, causes cancer. "We found that if you go in the opposite direction"—if you reduce the activity of the gene—"you actually extend lifespan by a really nice chunk, like 15 to 20 percent in the mouse," he says.

Around that same time, Marc Tatar, PhD, arrived at Brown from the University of Minnesota, where he'd been studying longevity in fruit flies. Upon discovering their shared interest, he and Sedivy started the Brown Biology of Aging Initiative; nearly two decades later, the program has grown to include 19 faculty from several Brown departments and affiliated hospitals. The group coordinates a seminar series featuring outside speakers; the Providence Area Aging Research Forum (or PAARF, so named after Sedivy's idea—the Brown Aging Research Forum—was self-vetoed); and the annual Colloquium on the Biology of Human Aging, a daylong affair featuring talks by the glitterati of the aging field, which has taken place every May since 1998.

They also are trying to raise undergraduate interest. Sedivy, Tatar, and Professor of Biology Stephen Helfand, MD P'19, coteach an upper-level seminar, "The Biology of Aging," which examines demographics as well as molecular, cellular, and genetic processes. "It's a unique experience for the students in that you have three established senior scientists who've done very well, experts in the field, in the same room, and we will often disagree," Helfand says. "We have slightly different opinions about how things work, and the students get to see a balanced, sometimes lively, but very tactful discussion on these things." The course goes beyond the nitty gritty of the biology of aging—students also learn about the process of science funding by writing a mock grant and participating in a mock peer review of grant applications, like an NIH study section.

Tatar, now a professor of biology, hopes that someday every researcher in the initiative will share the same physical space. "My vision is that we could be like cold fusion if we just had a magnetic field to hold us together," he says. But for now, says Louis Lapierre, PhD, assistant professor of molecular biology, cell biology, and biochemistry, the initiative, despite the faculty's disparate locations, is working. "It's a positive environment to do research in," he says.


John Sedivy

And it welcomes people of disparate skills. Nicola Neretti PhD'01 came to Brown to study physics, but he made the jump to biology, and specifically aging, when Tatar and Sedivy comentored him on a grant. "Aging, to me, is such an interesting problem because, first of all, everybody ages, so it's relevant for everyone; and second, it's the highest risk factor for most diseases," says Neretti, an assistant professor of biology. "If we can delay the onset of aging, [we] can delay the onset of these chronic diseases."

For Tatar, whose father has Alzheimer's disease, the group's work has a new sense of urgency. "We really, really, really need treatments that can ameliorate the pain and suffering that people have as they are aging and becoming disabled," he says.

ADAM MASTOON

AS THE WORM TURNS

LOUIS LAPIERRE likens the effect of aging on cells to a tedious, timeless chore. "It's like laundry. You always have to do it or else it's going to pile up," he says. Cells rejuvenate themselves through autophagy, or self-eating, in which lysosomes break down damaged parts. But this pathway becomes less efficient as organisms get older, and damaged material starts to accumulate. "It's a fight against time," he says.

Using the nematode *Caenorhabditis elegans*—a good model to study aging due to its small size, short lifespan, and well-characterized biology—Lapierre is seeking ways to maintain the efficiency of autophagy to forestall the deleterious side effects of getting older. His year-old lab already has published its first research report, in the journal *Autophagy*, showing that sustaining the process in *C. elegans* does, indeed, delay aging; other researchers have made similar findings in flies and mice. "We know if we genetically improve autophagy by increasing the expression of certain autophagy-related genes, we can extend lifespan," he says.

Louis Lapierre

Lapierre hopes to identify genes that modulate the autophagy pathway and determine whether they could be used to develop new drugs to target age-related diseases. "*C. elegans* will allow us to look at the machineries inside the cells," he says. But, he cautions, "we and others will have to think about their implications in human physiology."

He realized he'd stumbled upon a gene that controls longevity.

FLY GUYS

MARC TATAR, an evolutionary biologist, studies how hormones control aging in *Drosophila*. His lab discovered that mutations that change insulin signaling pathways cause the flies to live longer, healthier lives. "The flies are amazing," Tatar says. "When we have these old [mutant] flies and we compare them to controls, the controls are dragging their little wings and selves along the bottom of the cage and the mutants are flying around like popcorn."

Marc Tatar

His lab is trying to determine just how insulin signaling controls aging in *Drosophila*. This is tricky because flies contain eight different insulin peptides that all signal to the same receptor. In turn, this receptor regulates everything from fly growth and metabolism to reproduction, development, and aging. To explore how these different insulins can have different effects when they bind to the same receptor, Tatar and colleagues have begun looking at mutations in two insulin genes. "We're trying to figure out: How does one receptor respond differently to different insulins? What kinds of different outputs do they generate?" Tatar says. "And which ones are associated with aging?"

The lab also is studying the structure and biochemistry of the insulin receptor by using a technique called homologous recombination to change particular amino acids within the receptor protein. "That's a big project. It's very technically hard to do," he says. "We've been doing homologous recombination for three years, and we finally have a small series of alleles to start studying."

Taken together, Tatar's research could lay the groundwork for determining whether there are hormonal manipulations within this system that may apply to human aging. Hormones, like insulin, are an attractive potential target in part because they are usually well tolerated and can be taken orally or via injection.

Stephen Helfand

Stephen Helfand, a board-certified neurologist who started off studying development, had no prior background in *Drosophila* genetics and aging and is largely self-taught—or, as he likes to joke, "I've been learning this on the fly."

He did get some help from one of his heroes: Seymour Benzer, PhD, a pioneer in neurogenetics. Benzer had identified a *Drosophila* gene, called "drop dead," that causes premature death. Helfand, meanwhile, had discovered genes whose expression levels changed as flies aged, suggesting that they could be used as biomarkers for aging. So he and Benzer

ADAM MASTOON; SCOTT KINGSLEY; STEWART MARTIN

SURVIVAL OF THE STEM CELLS

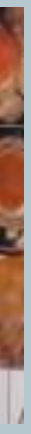
NEURAL STEM CELLS are the building blocks of the brain, developing into neurons via a process called neurogenesis. But over time they lose that constructive function, says Ashley Webb, PhD, assistant professor of molecular biology, cell biology, and biochemistry. "The main focus of my lab is to understand why these neural stem cells age and why neurogenesis declines with age," she says.

Webb, who joined Brown last year, studies the role of FOXO transcription factors, proteins that can bind to genes and turn them on, in neural stem cells. It's a hot topic in the aging field. "It was first discovered in worms and flies—actually in work done in part by Marc Tatar—that if you increase the activity of this factor you can extend lifespan," Webb says. The same may be true in humans. "Some studies have linked it strongly to longevity and even to extreme longevity in centenarians," she says.

Ashley Webb

The mechanisms behind this link remain murky, but Webb is hot on the case. "We believe that FOXO is important for preserving the neural stem cells in the brain," she says. Indeed, knocking out FOXO in a mouse speeds up the loss of neural stem cells—similar to what happens during aging.

True to the Biology of Aging Initiative's mission, Webb has found ready collaborators at Brown. With Tatar, she is looking at the genes that FOXO targets, as well as other proteins that partner with it, to understand how neural stem cells are depleted and how that might relate to lifespan and age-related deficits like dementia. "It's been a great opportunity for us to … put our heads together," she says.



ADAM MASTOON; MIKE COHEA

teamed up to see whether the drop-dead flies were dropping dead because they were aging too quickly.

But first they had to determine how long control flies live. *Drosophila* with a mutation in one control gene lived 180 days, when other controls died at 120 or 130 days. "I threatened at about 170 days to come in on the weekend when nobody was around and kill them all so I could just get the paper," Helfand laughs. "And somewhere around 180, we said, 'Gee, I wonder why they're living so long?'" It was then that he realized he'd stumbled upon a gene that controls longevity.

That gene was named "I'm not dead yet," or Indy, thanks to a suggestion by Professor of Biology Robert Reenan, PhD, a co-author of the 2000 paper in *Science*. Now Helfand is looking at Indy's role in metabolism to determine just how this mutation leads to longevity. He's also collaborating with John Sedivy to study the role of transposable elements in aging using different mutant flies.

GUT FEELING

NICOLA NERETTI first partnered with Marc Tatar and Stephen Helfand to study the effects of calorie restriction—an intervention that has increased longevity in model organisms—on gene expression in flies. They discovered that it changes the expression of a whole host of genes, and also appears to delay the gradual loss of gene silencing that is seen in normal aging.

Neretti also has collaborated with John Sedivy's lab to look at epigenetic changes in senescent cells, which have stopped replicating. "As they senesce, they protect you from potentially harmful consequences of DNA damage like mutations that can give rise to cancer," Neretti says. "But they might actually accelerate the aging process."

Nicola Neretti

Lately Neretti has been examining how the human microbiome might affect aging. The idea was planted when he met Luigi Ferrucci, MD, PhD, scientific director of the National Institute on Aging, who spoke at the biology of aging colloquium last year. Over time the lining of the gut becomes more permeable, allowing microorganisms to enter the blood, travel to other organs, and cause inflammation. This may lead to some of the health issues associated with aging. To explore this potential relationship, Neretti and collaborators in Brazil, Italy, and Baltimore will analyze viruses and other microbes found in the blood of people of different ages.

Sedivy, meanwhile, is looking at what he calls "life forms that infest your genome": pieces of DNA known as transposable elements that hop from chromosome to chromosome. "We have noticed that they become more active with aging, so we're trying to figure that out," he says.

The First 15

BY JOHN AURELIO '14

How are our young alumni faring in their careers?

EARLY START: Jyothi Marbin was executive director of City Year Rhode Island in the years between her undergrad and medical education at Brown, a role she says prepared her for a leadership position in academic medicine.

BROWN UNIVERSITY

At Alpert Medical School, the annual Ceremony of Commitment to Medicine, where students receive their first white coat, concludes with a class photo. The students smile up at the camera, all clad in their pristine, short coats. Though each has a different reason for being there, though each might wonder if she or he really belongs there, for that one moment in time they are united in their excitement, and in the promise and uncertainty of what the future holds.

Speaking to a diverse group of alumni who graduated 15 years ago or less, a new picture takes shape, one that is more heterogenic, less shiny. No longer are all of these MDs wearing white coats. Now they are united by their commitment to push the boundaries of medicine—against the scope of traditional care, the constraints of the health care system, and even the expectations of their profession. But the lessons learned as medical students have stayed with them and shaped them, not just as doctors but as people.

A HERO PROFESSION

"I didn't think I could step into a hospital again," Jyothi Marbin '96 MD'06 says. It was 1995, her senior year at Brown, and she was 21 years old. Her father had amyotrophic lateral sclerosis, or Lou Gehrig's disease, and he had just told her that he wanted to be taken off his ventilator.

ALS, a neurodegenerative disorder, slowly wears down a person's ability to live a normal life—to eat and move and breathe and sleep—and Marbin grew up taking care of her father. "We fed him, helped him get dressed, gave him a shave, and turned the pages of his newspaper," she says. Her high school years had many nights in, and she spent weekends during college at home. Giving her father a normal life meant giving up a normal adolescence. "I think I expected to feel happy that his suffering was over, but instead I realized I needed to grieve," she says of his death. It would be another five years before she returned to Brown to begin her medical education.

Marbin grew up in Brookline, MA, and her father was an incredible force and presence during her childhood. "He ran our household from his wheelchair," she says. Her parents were originally from India, and her mother became a physician before she left for the US; doing so was uncommon in a culture where women were expected to focus on raising a family. And for that, she was an inspiration to her daughter. "My mom was a doctor, and I wanted to be just like her," Marbin says.

"If you were proud of your parents, then the natural choice was to do what they did," says Amit Joshi '97 MD'01, a general surgeon at Einstein Healthcare Network in Philadelphia. "And I was always proud of my parents." Both his mother and father were physicians, and medicine was infused in his childhood. "As early as I can remember, I wanted to become a doctor," he says. Joshi felt no pressure from his parents to pursue medicine, but he never changed his mind about his path, applying early to Brown and the Program in Liberal Medical Education.

Joshi's wife, Nikki Ariaratnam '00 MD'04, was shaped by her parents' experiences in much the same way. Ariaratnam, a radiologist, is the only child of two physicians—her mother a psychiatrist, and her father a radiation oncologist. "You saw what you loved in your parents," she says. "They cared for people and that was their job. I couldn't think of anything better than that."

As Joshi put it, "Our parents were in hero professions."

EARLY LESSONS

Marbin's father's death left her an orphan; her mother had died eight years earlier. On a cold, snowy day in Boston on March 4, 1988, her mother was walking home after dropping her car off at the gas station. "When she arrived at the front door, she was gasping for breath," Marbin says, and she collapsed in the doorway. "She never woke up after that." Her mother had suffered a fatal asthma attack. "After losing her, I was so sure I wanted to be a doctor," Marbin

says, and her father pushed her along that path. "I understand now why he wanted this for me," she says. "He wasn't sure how long he would be there."

Ariaratnam, too, grappled with a parent's illness from an early age. When she was 13, her mother was diagnosed with ovarian cancer.

That year, clinicians were piloting a new radiological test for cancer, the PET scan. The uncontrolled growth of tumor cells leaves behind trails in the body where there is excessive glucose intake, and the PET scan flags the trails with a radioactive marker. When clinicians combine the PET scan findings with a traditional anatomic CT scan, they can easily follow the trails to the sources of cancer in the body.

Ariaratnam's father came across the then-experimental treatment by chance while reading a radiology journal, and without hesitation he flew his wife to Kentucky to receive the treatment. It proved to be a pivotal decision—one that gave her seven more years of health despite a diagnosis with a five-year survival window.

"That was the first time I realized how radiology can save lives," Ariaratnam says. As part of her day-to-day life now, she consults the same PET scans that saved her mother, along with life-saving breast imaging techniques that can detect cancers in the body long before they become fatal.

In 2007, Ariaratnam's mother died at Memorial Sloan Kettering Cancer Center in New York, blocks away from where Ariaratnam and Joshi were completing their residencies at Weill-Cornell NewYork-Presbyterian Hospital. After her mother's death, it was important to Ariaratnam to remember her experience on the other side of patient care. "A physician needs to understand fear and doubt," she says. "When I give my patients bad news, I feel connected to them because I've been through it with my own mother."

SMALL GOOD

Elizabeth Niemiec MD'10 didn't always know she would be a doctor. Medicine came into her life later, as a way to turn scientific rigor and service into meaningful good with patients. Niemiec, a psychiatrist, lives and practices in Newport, RI, and originally pursued ophthalmology. She poured her energy into the field as a student, and even published research in the journal *Ophthalmology*. But when Match Day arrived, Niemiec did not match with any of her preferred programs. "It was a huge blow," she says, and it forced her to reconsider what she truly wanted to do as a physician.

"I wanted to see someone now, and see someone later, and see how I have helped them or not," she says. And that, she later realized, was a luxury psychiatry afforded. "The primary way we figure out what's wrong with a patient is by talking," she says. Psychiatry is a slow science, and it may take weeks for a patient to begin responding to treatment. But even though it can take time, Niemiec derives satisfaction from the process of helping patients recover.

Dermatologist Antonio Cruz MD'06, meanwhile, loves the immediacy of his work. Cruz has his own private practice, SKINPros, in Providence and specializes in performing Mohs micrographic surgery, which is widely accepted as the most effective technique for removing the most common skin cancers. "We're lucky in our field," Cruz says. "People can come in with cancer and leave without it."

> **"If you were proud of your parents, then the natural choice was to do what they did."**

Cruz grew up in Cumberland, RI, and as a boy fixed boilers with his father. Many of his patients knew him back then, and Cruz relishes being close to his roots as a physician. His patients are also his neighbors. "My patients know of me and my family," he says. "We drive the same roads."

For Niemiec, medicine doesn't need to be anything grandiose. "My mission is pretty small," she says. "I want to be a good psychiatrist, and I know I can make a difference in lives one at a time."

A CULTURE OF HEALTH

Growing up in San Francisco, Kara Chew '01 MD'05 saw the forgotten faces

of her community volunteering in soup kitchens and with the homeless. As a physician, she cherishes what she learned from their experiences. "Medicine is much more than treating a condition; it's about advocating for patients in the face of immense barriers," she says.

"When I was younger I didn't feel like I had much time to make a real difference," Chew says. But now her work brings her into the same spaces as the shelters she grew up serving.

Primary care physicians often find themselves at a confounding intersection of medicine, where long-standing social inequalities and lack of access to care create barriers for both patients and physicians. But specialists are no strangers to the challenges of serving patients at the margins. Often patients will come to them in the late stages of disease, when earlier intervention would have led to better outcome.

> **"I would send my patients off with a hope and prayer because I didn't know if they could afford to come back."**

Chew, a physician-scientist at the David Geffen School of Medicine, UCLA, researches the ways hepatitis C affects cardiovascular risk in HIV-positive patients. But she still spends considerable time on patient care, seeing patients at a community HIV clinic and educating fellows in the infectious disease track at UCLA.

Early in her training she knew she would not be confined by the walls of a laboratory or a hospital, and as a student Chew began working with the prison populations of Rhode Island. At the time, very few prisons were treating or screening for hepatitis C in inmates despite the serious need; in Rhode Island alone around 17 percent of inmates are infected, according to a 2014 study in the *Journal of Urban Health*. Chew's work in Rhode Island's prisons rekindled a passion for primary care that solidified the kind of physician she wanted to be.

Akita Evans

KAREN PHILIPPI

THE GRIND

Akita Evans, MPH MD'07, who came to Brown via the Early Identification Program with Tougaloo College, a historically black college in Mississippi, is a family practitioner. She began her career in community health centers right around the time that funding for such centers was beginning to dwindle. "We provided great care with minimal resources," she says. Evans continued her work in community health centers at Oakhurst Medical Center in Stone Mountain, GA, and no matter where she went money was an issue for her patients. One visit could be the first and last chance she had to make an impact. "I would send my patients off with a hope and prayer because I didn't know if they could afford to come back," she says.

There can be an inevitable grind that defines specialties like family medicine. "As a primary care physician, you can do it all," John Luo '09 MD'13 says. The opportunity to use knowledge that spans specialties drew him to the field, but the same breadth of care eventually took its toll. "The toughest moments were feeling like I couldn't make a difference," Luo says. "Seeing physicians and patients suffer was awful, and to not have a solution for somebody was very difficult for me."

Physicians in primary care suffer some of the highest rates of burnout in medicine, a problem that spans the profession. "It doesn't take much to tip

over," Evans says, and last year, she decided to take a position at a practice focused on functional medicine. "You can't meet every need in one day," she says. "I could have stayed, but at my own cost." Evans is now hoping to address the root causes of disease at ANWAN Wellness Medical Center, near Atlanta, an integrative medicine clinic that focuses on lifestyle changes and preventive care. Even in the face of daunting social problems, she says, "people can still be better stewards of their health."

Faced with the same grind of primary care, Luo decided that he didn't want to continue on to residency. Instead he launched his own company, Doctor's Choice, which focuses on creating transparency and patient education around health insurance. The perspective he got while training in medicine was invaluable for learning how to spearhead change, he says: "I was always able to see inefficiencies when I was a student, and I always asked myself, how could I make it better?"


Giridhar Mallya

STEWART MARTIN

ROOT CAUSES

For Giridhar Mallya '99 MD'03, the answer to that same question lies in transforming social policies. "I want communities to demand more of their decision-makers," he says. Mallya is a senior policy officer at the Robert Wood Johnson Foundation, and before that honed his expertise at the Philadelphia Department of Public Health. Dedicated to finding ways to mend invisible tears in a patient's social web that create poor health and disease, he has tackled issues from tobacco control to childhood obesity.

And like Evans and Luo, Mallya's first encounters with these issues came from his training in family medicine. Witnessing patients suffer from preventable problems was a watershed moment in his career. "It was really eye opening," he says. "Without their health, people have much less ability to serve their families and communities."

Jyothi Marbin's approach takes something of a middle ground. "I want people to realize their potential to give," she says. Marbin hopes to empower young physicians to engage with their communities and provide innovative care as director of the Pediatrics Leadership for the Underserved (PLUS) residency program at the University of California, San Francisco School of Medicine. The 11-year-old program, of which she is an alum, trains pediatricians to lead the transformation of health systems for underserved children.

> **"The power of medicine relies on whether physicians actually try to change things."**

"You can't practice medicine in a silo," Marbin says. She spent the five years after her college graduation at City Year, an AmeriCorps program dedicated to transforming education in poor communities. And at Brown she aimed to foster the same kind of change. As a medical student she helped to create the Rhode Island Medical Legal Partnership, which connects patients with the legal help they need to resolve issues beyond the scope of a doctor's care: the presence of mold in a rental unit that causes asthma flare-ups, or an electricity shutoff in the household of a young mother. To instill the same innovative thinking in pediatrics residents, Marbin is working on plans to scale the PLUS program across other hospitals.

"Our problem is bigger than the solution we have," she says, but she remains hopeful. "The power of medicine relies on whether physicians actually try to change things."

SEARCH FOR MEANING

In a sharp gray suit and Chelsea boots, Jason Slosberg MD'01 has the easy manner of success. Slosberg, 44, is the CEO of Linkbee, a technology startup, but he comes from humble roots. He grew up in

a blue-collar town in Suffolk County, Long Island, where most kids pursued vocational studies. He became the first in his family to go to college, and by the time he arrived at Brandeis University, he was hungry for something different. After graduation his mother and father moved to opposite ends of the country. He knew he couldn't go home again, and did not have a clear plan for his career. "I was quite lost," he says. "I had drive, but no direction."

After a chance encounter in Boston, Slosberg joined and eventually led the development of a small computer business, beginning work that would become his life's calling: turning around failing businesses. Slosberg went on to lead a company focused on architectural skylights. But as much as he loved the work, he began to feel unsatisfied. Slosberg craved a career that could have a meaningful impact on others. A friend suggested that he check out the postbaccalaureate program at Columbia University, and the next day, on a whim, he was submitting an application.

He had never taken a science class during college. "When I stepped foot in Columbia, I knew that this was the right path," he says. After finishing his postbac, Slosberg was among the few students admitted to Brown Medical School through its linkage with Columbia.

CAPTAIN OF INDUSTRY Jason Slosberg is CEO of Linkbee, a New York-based startup that creates smart-home technology.

BENJAMIN COLLIER

THE CRYSTAL BALL

There is a tradition in the second year of medical school at Brown called the crystal ball, where students predict the specialties their classmates will end up in. When it came time for his classmates to write their guesses for him, Brad Weinberg '03 MD'11 was overwhelmingly a fill-in-the-blank for business. "I am medically trained but not a practicing physician—that's my complicated relationship with clinical medicine," he says.

After founding and leading his first venture-backed company while still a medical student, Weinberg went on to start Blueprint Health in 2011, and he is still the managing partner. The New York-based startup accelerator offers mentorship and funding for entrepreneurs in the early stages of launching health care-focused businesses. Even though Weinberg is now fully dedicated to his career path, he says he wouldn't be where he is if he hadn't gone through medical school.

Weinberg loved his clinical rotations, and still remembers patients from years ago. "It's those moments when you really touched someone that were special," he says. But he envisioned creating something bigger than what he alone could accomplish with patient care. In his third year of medical school, Weinberg launched his first company, ShapeUp, with his classmate Rajiv Kumar '05 MD'11 (see page 48).

"There is so much about medicine that I love," Weinberg says. "But there is something so amazing to see the impact we can have on thousands of people a year." In his fourth year of medical school, he decided to go all in with ShapeUp. "And in that moment, I was saying goodbye to medicine."

TAKING THE LEAP

During the early years of medical school, Slosberg longed for more patient contact, and the clinical years more than made up for it. He fell in love with surgery, as did one of his best friends, Amit Joshi, and for a while he was intent on doing plastic surgery. "He has an inquisitive mind and an eye for imperfections," Joshi says. "And Jason knew how to perfect them."

When it came time to choose a residency, Slosberg felt a familiar unease. "I had to come to terms with picking something I would do for the rest of my life," he says. "It was scarier for me to feel locked in than to take a leap into the darkness." So he leaped.

That year, Slosberg got a call from his brother. He had just taken over a distribution company specializing in disposable goods, and wanted Jason to join him in running it. Slosberg said yes, and after graduating in 2001, he, too, said goodbye to medicine. For years, he was torn about the decision, and when he explained his medical background to his new coworkers, many of them were incredulous. "They would ask me what I was doing here and my heart would sink," he says.

But it was ultimately the right decision. Since graduating from the Medical School, Slosberg has seen the turnaround of the company he joined with his brother, and cofounded another company, Legacy Converting, that was recognized by the state of New Jersey for its outstanding work culture. But with Linkbee, Slosberg is pivoting back toward his roots in medicine. Linkbee, he says, will connect household devices to an "Internet of things," where common objects can absorb and learn from a web of data detailing how people live: a light bulb automatically lights a path when you are up in the middle of the night, for example.

"Being a doctor is still a part of my DNA," Slosberg says, and for him the Internet of things is like the human body. "It's a way of bringing together disconnected parts like a biological system." Linkbee is in its infancy, but Slosberg has broad ambitions. "We are on the precipice of an era where technology will allow inanimate systems to act like biological entities," he says. "I have a vision and belief that it can be done."

HELPING AND HEALING

Wherever their paths have taken them, these young doctors live by values solidified by their education at Brown's Medical School. From transforming policy to launching businesses to caring for patients, alumni are serving their communities and changing the way people live. "It's simple. Physicians heal—whether that's a person, a system, or a problem," John Luo says. "Being a physician is a frame of mind. It is never going to change."

> **"Being a physician is a frame of mind. It is never going to change."**

Brad Weinberg adds, "I see so much of what I do now to help founders in the same way as when I would help my patients."

When the workday is done, alums change lives at home, too. This February marks two years since Jyothi Marbin took in her foster son. "We had the opportunity to help a wonderful young man who didn't have a home," she says. "We talk all the time about how important it is to serve our community, and this is how we brought that difference into our family."

For these MDs, medicine is all about making positive changes—large or small—a reality for everyone. "People ask me if I miss being a physician," Giridhar Mallya says, "and I tell them I can now be a physician to a community."

John Aurelio *is an analyst at a health care startup and freelance writer based in Brooklyn, NY. He wrote about preeclampsia research in the Fall 2015 issue of* Brown Medicine.

ALUMNI ALBUM

CHECKING IN WITH BROWN MEDICAL ALUMNI

LIKE YESTERDAY
Dean David S. Greer watches as Marilyn D. Sarles MD'76, PAM'07 is hooded during Commencement. The MD Class of 1976 will celebrate its 40th Reunion in May.

ALPERT MEDICAL SCHOOL ARCHIVES

CLASSNOTES
ALUMNI

1975

David Snyder '71, P'02, '04, '12 retired from private ophthalmology practice in Delray Beach, FL. He plans to spend his time teaching at the Schmidt School of Medicine at Florida Atlantic University in Boca Raton, where he is an associate professor, and hiking and photographing at his place in Cashiers, NC. He would love to hear from classmates and friends.

1979

Preston Calvert '76 earned rookie of the year honors in the 2015 racing season and finished fifth in the GT Cup standings. His team, Calvert Dynamics, will race in the 2016 Pirelli World Challenge program, with Preston behind the

wheel of a Porsche 911 GT3 Cup car. When he's not competing on tracks across the US, Preston, a retired neuro-ophthalmologist, serves as president of the Brown Medical Alumni Association Board of Directors.

1985

Yul Ejnes '82 RES'89 is an internal medicine specialist and founding partner at Coastal Medical in Cranston, RI, and a clinical associate professor of medicine at Alpert Medical School. He has served on and led numerous medical societies and committees, including serving as chair of the Board of Regents of the American College of Physicians. His wife, Anne Edwards Ejnes, MEd '83, teaches social studies at LaSalle Academy in Providence. Their older son, Sam, works in post-production sound for film and TV, including *Selma* and *Game of Thrones*; younger son Josh is a student at DePaul University.

1993

Bharat Ramratnam '86 was named director of Research Integration at University Medicine, a Rhode Island medical group. An associate professor of medicine at Alpert Medical School, he is director of the Lifespan/Tufts/Brown Center for AIDS Research Laboratory of Retrovirology at Rhode Island Hospital, where he leads a multidisciplinary team focusing on reproductive hormones and their impact on HIV-1 acquisition. Bharat also directs the COBRE Center for Cancer Research Development at Rhode Island Hospital and is the medical director for the Lifespan Clinical Research Center. At University Medicine, he will promote collaborative research across disciplines within the Department of Medicine.

Navin Singh, MSc, MBA '90 runs a private plastic surgery practice, Washingtonian Plastic Surgery, in McLean, VA, and Chevy Chase, MD. Named a "Top Doc" by *Washingtonian*, *Bethesda*, and *Northern Virginia* magazines, he focuses on breast surgery and cosmetic surgery and developed an app to help people envision how they will look following surgery. He travels several weeks a year on international medical missions to repair cleft palates and other birth defects.

Navin Singh travels on international medical missions to repair cleft palates and other birth defects.

Albert Telfeian PhD'93, director of pediatric neurosurgery at Hasbro Children's Hospital and clinical assistant professor of neurosurgery at Alpert Medical School, performed the first-ever endoscopic removal of a spinal tumor under local anesthetic, and while the 16-year-old patient was awake. The case report was published in *Clinical Neurology and Neurosurgery*.

1994

Joseph Lifrak RES'99 F'00 joined the Southcoast Physician Group in Swansea, MA. He is a member of the Providence College athletic program's medical staff, as the orthopedic physician for the men's ice hockey team, and a clinical assistant professor of family medicine at Brown.

1995

Atul Butte, PhD '91 MMS'95 was elected to the National Academy of Medicine (formerly the Institute of Medicine) in October. Atul, a professor of pediatrics at the University of California, San Francisco, directs the Institute for Computational Health Sciences and is executive director of Clinical Informatics for UC Health Sciences and Services.

1996

Joseph Diaz MPH'09 was appointed interim associate dean for diversity and multicultural affairs in Brown's Division of Biology and Medicine in October. Joe is an associate professor of medicine at Alpert Medical School and the chief of medicine at Memorial Hospital of Rhode Island. He is also a codirector of the Scholarly Concentration in Caring for Underserved Communities and of the Department of Medicine's medical exchange program in the Dominican Republic. His research has centered on assessing and addressing disparities in preventive health with a focus on the role of language and culture as a barrier to colorectal cancer screening.

Jake Kurtis '89 PhD'96, professor of pathology and laboratory medicine at Alpert Medical School, received the Bailey K. Ashford Medal from the American Society for Tropical Medicine and Hygiene. Jake coleads Lifespan's Center for International Health Research with his wife, **Jennifer Friedman**, MPH, PhD '92, professor of pediatrics and of

ANYTHING NEW?

Career news, weddings, births—your classmates want to know. Go to **med.brown.edu/alumni** and click on "Updates and Class Notes."

ALUMNI ALBUM

epidemiology. CIHR works in countries with major health problems such as malaria and schistosomiasis.

1997

Abeel Mangi '93 and his wife, Basmah Safdar, MD, welcomed their fourth child and second son on Oct. 19, 2015. Abeel is a cardiologist and associate professor of surgery and Basmah is an assistant professor of emergency medicine at the Yale School of Medicine.

1999

Brenna Anderson Hughes, associate professor of obstetrics and gynecology at Alpert Medical School, won the Best Poster Award at the 42nd annual meeting of the Infectious Diseases Society for Obstetrics and Gynecology for "Longitudinal cohort study of association of HIV infectivity with pregnancy." She also became a member of the Immunization Expert Work Group of the American College of Obstetricians and Gynecologists, which will develop and review documents such as committee opinions, patient and provider fact sheets, physician scripts, letters, and other patient and provider immunization materials.

2000

Joshua Schiffman '96, a pediatric hematologist-oncologist and professor of pediatrics at the University of Utah School of Medicine, garnered worldwide media attention in October when a study he co-authored in the *Journal of the American Medical Association* was picked up in the popular press. His study, which found genetic differences between elephants and humans that may explain why pachyderms rarely get cancer, was discussed in the *New York Times*, *Scientific American*, the BBC, and many other news outlets. Josh, an investigator in the university's Huntsman Cancer Institute, researches cancer susceptibility in families.

2001

Molly Hong '97, a family physician at Jefferson Healthcare Medical and Pediatric Group Clinic in Port Townsend, WA, became a fellow of the American Academy of Family Physicians. She completed her residency at Oregon Health & Science University and her rural health fellowship at Tacoma Family Medicine. Molly worked as a traveling doctor in Oregon, Washington, Wisconsin, and Alaska as well as a volunteer doctor in Thailand before joining Jefferson Healthcare in 2007.

Brenna Hughes won Best Poster Award from the Infectious Diseases Society for **Obstetrics and Gynecology.**

2003

Ethelind Cheng '98 and her partner, Stephanie Blank, announce the birth of Emerson Lin Blank-Cheng on March 9, 2015. Emerson joins siblings Eaton Josef and Auden Ellexes. Ethelind writes, "We live in Altadena, CA, and always look forward to visitors."

2005

Paul George '01 RES'08, director of the Primary Care—Population Medicine Program and associate professor of family medicine at Alpert Medical School, and Jeffrey Borkan, MD, PhD, assistant dean for PC-PH Program Planning and professor and chair of family medicine, were guest editors of a special section about the new program in the September issue of the *Rhode Island Medical Journal* (see *Brown Medicine*, Fall 2015).

Tonslyn Touré '01, an endocrinologist, joined the Southcoast Center for Primary and Specialty Care in Fairhaven, MA. Tonslyn, who went to Southcoast from the Beth Israel Deaconess Hospital in Milton, MA, where she was an office physician in endocrinology, is board certified in endocrinology, diabetes, and metabolism. She enjoys dancing, traveling, interior decorating, and genealogy.

2006

Jyothi Nagraj Marbin '96 directs the Pediatrics Leadership for the Underserved (PLUS) residency program at the

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EYE ON ALUMNI

The Golden Age

An MD-PhD is part of a new era of cancer breakthroughs.


Raghu Kalluri

Alpert Medical School can brag of many remarkable students and alumni in its short history, but Raghu Kalluri, PhD MD'09 was certainly the first to be a full professor at Harvard Medical School while simultaneously studying medicine at Brown.

Born in St. Louis, Kalluri grew up in India and received his undergraduate degree there. After earning his PhD in biochemistry and molecular biology at the University of Kansas Medical Center and completing a postdoctoral fellowship at the University of Pennsylvania School of Medicine, where he did research on immunology and organ fibrosis, he became an assistant professor of medicine at Harvard Medical School and Beth Israel Deaconess Medical Center in 1997.

He had long considered the idea of going for a medical degree, but Kalluri continued his teaching and research at Harvard, building a lab focused on matrix biology and cancer biology. "The idea of pursuing the unknown was more important to me," he says. At that point, he had already given hundreds of lectures around the world.

But a few years later, Kalluri, at 35, felt it was time to tackle the MD: "There was a knowledge gap I knew I should close. I had a personal desire to learn more." He felt the degree would make him more useful as a researcher; besides, "I was never afraid to be a student."

Kalluri confronted unusual challenges in finding a medical school. At Harvard he already was teaching its medical students, and so it was not an option. He needed to stay close to Boston because he planned to keep running his lab of more than 30 people. But some other Boston schools weren't the right fit. Then a colleague suggested his alma mater, Alpert Medical School. Kalluri found the deans and the School receptive to him. He went through the exact same admissions process as everyone else, and was admitted to the MD Class of 2009.

"It was a humbling experience," Kalluri says. He went from being "a master of my universe" in his lab to being one of a class full of remarkably smart students. "I learned to say 'I don't know' with great pride and respect," he says.

After graduating Kalluri continued his work at Harvard. But then came along an "amazing opportunity": he was recruited to the MD Anderson Cancer Center as professor and chairman of the Department of Cancer Biology. In 2012, he joined the highly regarded hospital that is a key part of Texas's aggressive, multibillion-dollar effort to fight cancer.

Kalluri, who continues to speak internationally, is full of enthusiasm and optimism. "This is the golden age of understanding cancer," he says. "This is an extremely exciting time." His research involves studying the environment of cancer cells, where he says great advances are being made. Recently he and his colleagues reported in *Nature* their findings that describe how pancreatic cancer could be diagnosed earlier. "We think in this decade we will have a lot more advances" as the cancer field reaps the benefits of many years of basic research, he says.

While he has moved farther from Providence geographically, Alpert Medical School remains close to Kalluri. "I am extremely grateful for the opportunity Brown gave me," he says. "It made me a better human being."

—Noel Rubinton '77

COURTESY KALLURI

EYE ON ALUMNI

That Was Then, This Is Now

Where are these women surgeons today?

In 1992, the predecessor of this magazine, *Signs & Symptoms*, published a cover story about women medical students and residents going into surgery. Three of the women, pictured below, represented three-fourths of the chief surgical residents at Brown that year; Naji Baddoura, MD RES'92 was the lone male. At the time, about 8 percent of general surgeons nationally were women.

Last summer, three of the self-named "girl surgeons"—Marlene Cutitar '83 MD'86 RES'92, Karen Vaniver, MD, FACS RES'92, and Jean Daley, MD RES'92—posed again for the camera. Cutitar is a breast surgeon at Randall Surgical Group in Providence and clinical assistant professor of surgery at Alpert Medical School. Vaniver is a plastic surgeon and principal physician at Lourdes Plastic & Reconstructive Surgery in Pasco, WA. Daley is an assistant professor of medicine (research) in the Division of Cardiology at Brown, studying tissue injury. Tara Sweeney MD'93, a medical student at the time of the story who wasn't at the reunion, is an ophthalmologist in private practice at White Plains Eye Surgery in New York, where she specializes in cataract surgery.

The number of women entering general surgery has climbed steadily since those days; they now account for more than 35 percent of trainees in the United States.

"I think that Brown basically made me think beyond gender or race," Sweeney says. "I never thought about being a woman as so many mentors, including the three incredible women who are in the photo, supported us equally. We were taught to pursue our interests and to develop our talents and skills irrespective of age, gender, or race. That experience was and remains a real education."

—Kris Cambra

THEN AND NOW: In both photos, left to right, Marlene Cutitar; Karen Vaniver; Jean Marie Daley. Center front and at left, Tara Sweeney.

ALPERT MEDICAL SCHOOL ARCHIVES; COURTESY MARLENE CUTITAR, TARA SWEENEY

UC San Francisco School of Medicine (see page 34). "PLUS is a separate match for pediatrics residents who are specifically interested in developing leadership skills and transforming health systems to better serve underserved families," she writes. Jyothi and her husband, Seth Marbin '05, live in Alameda, CA, with their three children. Contact her at jyothi.marbin@gmail.com.

2007

Pebble Kranz '91 is working in the Center for Primary Care at the University of Rochester Medical Center, where her focus is on clinical care with some teaching of residents and medical students. She was married on Oct. 12, 2014, with **Misa Perron-Burdick** MD'08 and **John Kelleher** '93 MD'07 in attendance.

2009

Neel Shah, MPP '04 joined the advisory board of Square Roots, a life sciences company that integrates technology and scientific findings to optimize maternal and infant care. Neel is an assistant professor of obstetrics, gynecology, and reproductive biology at Harvard Medical School, associate faculty at the Ariadne Labs for Health Systems Innovation, and the founder of Costs of Care (see page 50).

Jessica Zerillo '05 and her husband, Jesse Boodoo '06, welcomed Eva Rose Boodoo into the world on June 19, 2015. Jessica completed her residency and hematology-oncology fellowship at Harvard Medical School/Beth Israel Deaconess Medical Center.

2010

Andrew Brunner and **Katherine Thompson Brunner** MD'12 announce the birth of Liliane Grace on August 22, 2015. Andy is a fellow in hematology-oncology at Dana-Farber Cancer Institute, and Katy is in her final year of her internal medicine residency at BU/Boston Medical Center. The family lives in Boston.

Clifford Meyers '04 and his wife, Linda Chernak Meyers ScM'08 PhD'11, announce the birth of their daughter, Julia Jean, on March 6, 2015.

2011

Elizabeth Anto '06 was married Oct. 24, 2015, to Deepon Nag at the Shrine Church of St. Anthony of Padua in Manhattan. Lizzy is a staff psychiatrist for the Project for Psychiatric Outreach to the Homeless at shelters in Brooklyn and the Bronx, NY. She and Deepon live in Brooklyn.

Zachary Gordon '07 was named one of five American Board of Medical Specialties Visiting Scholars for 2015-2016. The program facilitates research projects designed to improve patient care and exposes scholars to the fields of professional assessment and education, health policy, and quality improvement. Zachary is in the fifth year of his urology residency at The Ohio State University Wexner Medical Center. His research project, "Using the Rothman Index to Predict Perioperative Complications and Improve Overall Quality of Care," will assess the impact of early interventions, based on index trends, and evaluate its potential to improve patient care.

Carleyna Nunes '07 joined La Dea Women's Health at the Sulphur Springs Medical Center in Willcox, AZ. Her professional interests include normal and high-risk pregnancy and women's reproductive health, freedom, and rights.

2012

Katherine Thompson Brunner. See **Andrew Brunner** MD'10.

Jay Levin '08 RES' won the 2016 American Society of Neuroimaging McKinney Award for the best abstract on basic or clinical research in neurosonology. His abstract was titled "Transcranial Doppler Ultrasonography Is a Monitoring Tool for Reversible Cerebral Vasoconstriction Syndrome." He is a neurology resident at Alpert Medical School.

Zachary Gordon was named an **American Board of Medical Specialties Visiting Scholar.**

RESIDENTS

1991

Scott Berns, MD, MPH, was appointed president and CEO of the National Institute for Children's Health Quality last September. He completed the pediatrics residency at Rhode Island Hospital/Brown University. Previously the senior vice president of chapter programs and deputy medical officer at the March of Dimes national office, he will lead the

EYE ON ALUMNI

Better Together

A wellness entrepreneur engages patients on a different level.


Rajiv Kumar

Coming from a long line of physicians, Rajiv Kumar '05 MD'11 always thought that he, too, would one day see patients in his office as a practicing pediatrician. But a student public health project that he helped design that focused on preventive health eventually became the platform for a successful startup in the corporate wellness industry. Kumar is now keeping people healthy as CEO of Providence-based ShapeUp Inc.

Kumar cofounded ShapeUp in 2006 with Brad Weinberg '03 MD'11 (see page 40). Ten years later, the company has more than 800 employer clients nationally and 2.2 million employee participants, and they've opened offices in Boston and San Francisco.

The corporate wellness industry serves employers who want both to control costs and boost productivity by keeping employees healthy. ShapeUp leans heavily on the latest tech to draw in and keep participants engaged in meeting their health and wellness goals. Healthy habits require behavior change, Kumar says, and "you can't do it alone. The idea of modifying your social network, pulling in your friends, family, and colleagues ... is critical to this type of behavior change."

ShapeUp unites employees through a software platform that integrates social media, fitness trackers, automated feedback, and rewards to drive behavior change and evidence-based outcomes. Its approach is different than traditional wellness programs that focus on biometric screening, health risk assessments, educational campaigns, and telephonic coaching; indeed, some employers that subscribe to traditional programs are also clients of ShapeUp. Employers don't just want their employees to be healthy, Kumar says. They also want them to form stronger bonds, collaborate more, and feel more enthusiastic and receptive toward workplace initiatives. "Our model is truly engaging, from a bottom-up, grassroots approach," he says.

Kumar's background as a physician informs his role as CEO. "Treating patients in the hospital in their most vulnerable moments and seeing the burden of disease and the impact it has on them and their families gives you a unique perspective," he says. ShapeUp shares the goals of the primary care physician trying to help his or her patients control their blood pressure, cholesterol, and diabetes, he says, only "our intervention happens to be a software platform, and our venue happens to be the workplace."

And ShapeUp can promote health on a much larger scale, Kumar says: "Participants that have engaged in our program have lost over 2 million pounds, and they have walked over 1 trillion steps."

When it comes to the well-being of his own employees, Kumar walks the talk. The corporate culture fosters a relaxed atmosphere: employees' dogs are welcome in the ShapeUp headquarters. The company hosts yoga and resilience classes and offers a master trainer who leads boot camp workouts multiple times a week. "We have a company rock band, we have an annual company ski trip, and there is a lot of celebration here," Kumar says. His goal is the same as that of his customers. "We want to make sure that we communicate effectively, that we work together well on teams, and that we are stronger together than on our own." ***—Mary Stuart***

COURTESY SHAPEUP INC.

Boston-based nonprofit's efforts to improve children's health by helping health care systems enhance their quality of care. Scott's wife, **Leslie Gordon** ScM'91 MD'98 PhD'98, is a professor of pediatrics at Alpert Medical School. They are the founders of the Progeria Research Foundation.

2000

David Anthony, MD, MSc, an associate professor of family medicine at Alpert Medical School and a family medicine physician at Memorial Hospital of Rhode Island, was named editor-in-chief of Family Medicine Computer-Assisted Simulations for Educating Students, a program used by medical schools to teach the Society of Teachers of Family Medicine's Family Medicine Clerkship Curriculum.

2002

Gary Epstein-Lubow, MD, F'03 was named in October by the US Department of Health and Human Services to the Advisory Council on Alzheimer's Research, Care, and Services. Gary is an assistant professor of psychiatry and human behavior and of medical science at Alpert Medical School. His professional interests focus on treating persons with dementia in collaborative decision-making models with family caregivers.

Melissa Nothnagle, MD, MSc '93, the family medicine residency program director at Alpert Medical School, received the Family Medicine Mid-Career Faculty Achievement Award from the Family Medicine Education Consortium, which serves the northeastern US. Melissa also is an attending at Memorial Hospital of Rhode Island and directs the scholarly concentration in Women's Reproductive Health at Alpert Medical School.

2003

W. Curt LaFrance Jr., MD MPH'07 has released his second and third books, *Taking Control of Your Seizures: Workbook* and *Treating Nonepileptic Seizures: Therapist Guide* (Oxford University Press, 2015). The books are used to treat both epileptic and nonepileptic seizures and represent the first manualized evidence-based nonpharmacologic therapies for epilepsy and for conversion disorders, based on clinical trials for patients with seizures. Curt is director of neuropsychiatry and behavioral neurology at Rhode Island Hospital; a staff physician at the Providence VA Medical Center, where he is the clinical lead for the National Telemental Health Center Tele-Seizures Program; and associate professor of psychiatry and human behavior and neurology at Alpert Medical School.

Matthew Siegel is the principal investigator for the **Autism Inpatient Collection.**

2008

Matthew Siegel, MD, is the principal investigator for the Autism Inpatient Collection, a project of the Autism and Developmental Disorders Inpatient Research Collaborative, a nationwide research network of child psychiatry units that specialize in assessment and treatment of children with autism. The study, which will include more than 1,600 individuals with autism spectrum disorder, will gather data to better understand the genetic underpinnings of autism, help identify biologically based autism subtypes, and potentially develop targeted therapies. Matt was the senior author of a paper, published in December in the *Journal of the American Academy of Child and Adolescent Psychiatry*, that outlines best hospital practices for children with autism. He is the director of the Developmental Disorders Program at Maine Behavioral Healthcare and a research scientist with the Maine Medical Center Research Institute.

2010

Daniel Aaron, MD '98, an orthopedic surgeon, joined UMass Memorial Medical Group in Worcester. Daniel earned his bachelor's in biology at Brown and his medical degree at SUNY Downstate in Brooklyn. He returned to Providence to complete his residency and trauma fellowship at Rhode Island Hospital, and then a shoulder and elbow fellowship at Mount Sinai Hospital in New York. He previously worked at Blackstone Orthopedics & Sports Medicine, a Providence-area practice.

2012

Alina Huang, MD F'15 joined Virginia Cancer Specialists as a hematologist-oncologist. She completed her residency in internal medicine and her fellowship in hematology-oncology at Alpert Medical School. At Brown, she was a teaching fellow in medical oncology and hematology, led lectures and group sessions focusing on hematology, and participated in hem-onc grand rounds. Alina enjoys reading, traveling, watching movies, and yoga.

ALUMNI ALBUM

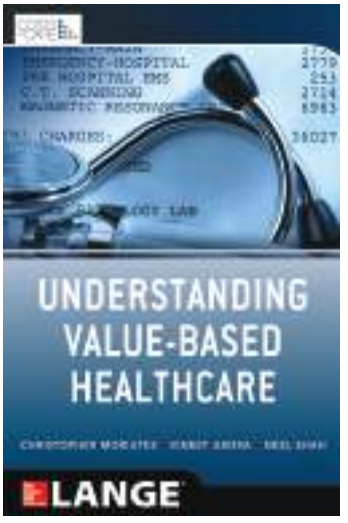
2013

Jennifer Buckley, MD F'14 joined the UMass Memorial Hahnemann Family Health Center in Worcester, MA, and is specializing in family medicine, including obstetrics. Jennifer completed her family medicine residency and maternal child health fellowship at Alpert Medical School, where she was also a clinical instructor of family medicine.

Birju Shah is leading an initiative to **support parents of post-NICU infants.**

Luu D. Ireland, MD, MPH, joined the UMass Memorial Medical Group in Worcester in November as an obstetrician-gynecologist. Luu received her MD at the David Geffen School of Medicine at UCLA before completing her residency at Alpert Medical School, where she trained at Women & Infants Hospital. She also completed a family planning fellowship at UCLA and received her

ALUMNI BOOKSHELF



Understanding Value-Based Healthcare

By Christopher Moriates, MD; Vineet Arora, MD, MPP; and **Neel Shah**, MPP '04 MD'09
McGraw Hill Education, 2015, $55

"Some physicians and ethicists may warn that the separation of medical care and costs is an important, necessary aspect of the medical profession, ensuring a firewall between clinicians' medical decisions and their financial incentives. However, this separation is actually relatively new to the profession of medicine. ... Even as late as the 1960s, about 50% of healthcare costs in the United States were paid out-of-pocket."

—from **Understanding Value-Based Healthcare**

Many of us are quick to blame politicians and insurance executives for the wasteful, inefficient morass that is the US health care system. But Shah and his co-authors argue that true reform can happen only on the front lines—when clinicians offer patients less wasteful, more affordable care that's delivered fairly, equitably, and safely. Shah is the founder and a leader, with Moriates and Arora, of the nonprofit Costs of Care (see *Brown Medicine*, Fall 2012), which strives to improve the value of health care. They weave succinct, accessible presentations of research and data with case studies and personal essays to provide an overview of the many challenges of the existing system, and they dedicate more than a third of the book to solutions, from medical education to better screening practices to reimbursement reform. "[C]linicians can take the responsibility for helping alleviate this problem," they write.

—Phoebe Hall

Spread the word: *If you'd like your book featured in* Brown Medicine, *have your publisher send us a copy at Box R-220, Providence, RI 02912.*

COURTESY MCGRAW HILL EDUCATION

MPH from the Columbia University-Mailman School of Public Health.

2014

Heather Spader, MD, is a pediatric neurosurgeon at Joe DiMaggio Children's Hospital in Hollywood, FL. Heather served as chief resident of neurosurgery during her final year at Alpert Medical School, where she also was an instructor in brain sciences and a guest lecturer in neuroanatomy. She completed her fellowship in pediatric neurosurgery in 2015 at Primary Children's Hospital at the University of Utah in Salt Lake City.

2015

Jayne Bird, MD, joined Ringpfeil Advanced Dermatology in Haverford, PA. The chief resident during her final year at Alpert Medical School, she published several papers in general dermatology and dermapathology and presented at both regional and national meetings.

FELLOWS

2015

Jessica Schoen, MD, joined the emergency medicine department of the Mayo Clinic Health System in Albert Lea and Austin, TX. She completed a teaching fellowship in medical simulation at the Lifespan Medical Simulation Center at Alpert Medical School.

Birju Shah, MD, MPH, a neonatologist, joined OU Children's Physicians, which is affiliated with the University of Oklahoma Medical Center. Birju completed his neonatal-perinatal medicine fellowship at Alpert Medical School. He is a team leader for the American Academy of Pediatrics' initiative to support parents of post-NICU infants.

OBITUARIES

ALUMNUS

PATRICK S. CONKLIN, MD F'10

Patrick S. Conklin, 44, died in a motorcycle accident on Nov. 4, 2015, in Chicago. He attended high school in Mukwonago, WI, and graduated from Semmelweis University Medical School in Budapest, Hungary, in 2004. He completed his medical residency in radiology at St. Vincent Memorial Hospital in Bridgeport, CT, and the interventional radiology fellowship at Alpert Medical School in 2010. Patrick lived in Chicago, where he worked as a radiologist at West Suburban Hospital, Weiss Memorial Hospital, and Westlake. During his residency, he met Sandra Rao, who was his chief resident; they enjoyed 10 years of companionship together. He will be remembered for his love of the Green Bay Packers, riding his motorcycle, traveling the world, and enjoying a good bottle of wine with his guests. He is survived by his partner, Sandra Rao, MD; his father; five sisters; and one brother.

FACULTY

RICHARD A. ELLIS, PHD

Richard A. Ellis

Professor of Biology Emeritus **Richard A. Ellis**, 87, died in Prague on December 31, 2015.

Ellis graduated from the University of Massachusetts in 1949 and received his PhD from Harvard University in 1954. Following two years of service in the Army, working at Walter Reed Army Institute of Research, he joined the Brown University faculty as an instructor in biology. He was appointed to assistant professor in 1958, to associate professor in 1962, and to professor in 1967.

During his 39 years at Brown, Ellis was an adviser and mentor to many students; director of the Biomed Electron Microscopy Facility; a member of the Department of Molecular Biology, Cell Biology, and Biochemistry; and a Faculty Fellow, organizing cultural and social events for students living in dormitories. He established the Richard Ellis and Robert Burch Scholarship to support undergraduates at Brown after meeting students at those events who were holding two or three jobs to help cover their college expenses.

In his retirement Ellis returned to Cape Cod, where he had grown up. He enjoyed painting and was a member of the Provincetown Art Association and Museum. He is survived by his husband, Pavel Farkas, PhD. Remembrances of Ellis may be posted on his website, profellis.com.

Gifts in his memory can be made to the Richard Ellis and Robert Burch Scholarship. Checks payable to Brown University should be sent to Brown University, Gift Cashier, Box 1877, Providence, RI 02912.

MOMENTUM

A Race Against Time

A foundation gift provides a boost for ALS research.

Amyotrophic lateral sclerosis, also known as Lou Gehrig's disease, remains one of the great medical mysteries. The neurodegenerative disease causes progressive deterioration of motor neurons, leaving those affected unable to speak, eat, move, and breathe. There is no cure, nor treatment to slow it.

Meeting those challenges requires innovative approaches that capitalize on expertise from disparate fields. A new $1.8 million grant from the ALS Finding a Cure Foundation has coalesced a team at Brown to do just that. The grant "is important seed funding for innovative ideas and collaborations that wouldn't have happened" otherwise, says Diane Lipscombe, PhD P'14, interim executive director of the Brown Institute for Brain Science and professor of neuroscience. Merit Cudkowicz, MD, chief medical officer of the ALS Finding a Cure Foundation and chief of neurology at Massachusetts General Hospital, says the Brown-led effort could be key to the organization's goal. "It's exciting because it brings together many different labs," she says.

LOOKING FOR CLUES: Graduate student Saba Baskoylu works in Anne Hart's lab.

SCOTT KINGSLEY

ALS "is a problem that has resisted the standard approaches," Lipscombe says. The new effort will span several species—worms, fruit flies, mice, and human induced pluripotent cells—and look for common triggers and suppressors of the disorder. The Brown team, which includes five principal investigators, will work with two more PIs and others at Mass General and the University of Massachusetts Medical School, including Robert J. Brown, MD, DPhil, one of the world's foremost ALS researchers. Among the goals are to understand why and how certain neurons lose function and die; to identify genes that will slow or stop the disease; and to pinpoint early events that could be used to prevent disease progression.

This multi-institutional, multi-species approach holds promise for developing new models of ALS, Cudkowicz says, and for replicating features of the human disease and doing important work in identifying suppressors.

The ALS Finding a Cure funding is expected to be for three years, with additional dollars coming in each subsequent year if the team shows progress. The grant will offer opportunities to "talented young scientists at all levels," Lipscombe says, with funding to hire undergraduate, graduate, and medical students, as well as postdoctoral students.

"The foundation money changes what we can do," says Anne Hart, PhD, a principal investigator at Brown and professor of neuroscience. One of Brown's greatest advantages is the collaboration for which the University is known. She adds, "People talk to each other and collaborate at Brown at a level you don't see many places."

Brown's ALS work and successful grant proposal to the ALS Finding a Cure foundation incubated for several years with the aid of other important support, including the Istanbul-based Suna and Inan Kiraç Foundation, the DEARS Foundation, and Biogen.

Last summer the Rhode Island chapter of the ALS Association conferred its highest honor, the Spirit of Lou Gehrig Award, on researchers at Brown for their work so far. Lipscombe says the team was moved and inspired by meeting many patients with ALS and their families. "This is an incredible responsibility," she says. "This is a race against time."

—Noel Rubinton '77

IMPRESSION

IMAGE BY DAVID GREENKY MD'16

Flying Leap

David Greenky captured this image at Angkor Wat in Cambodia during a six-week backpacking trip through Southeast Asia in 2011. Something of a renaissance man, David sings, writes, and loves to travel and take photos in his spare time. He is a 2007 graduate of Cornell University, where he majored in Near Eastern studies and government. He started medical school at Brown after living and working in New York City for four years. He plans to do his residency in pediatrics. *—Kris Cambra*

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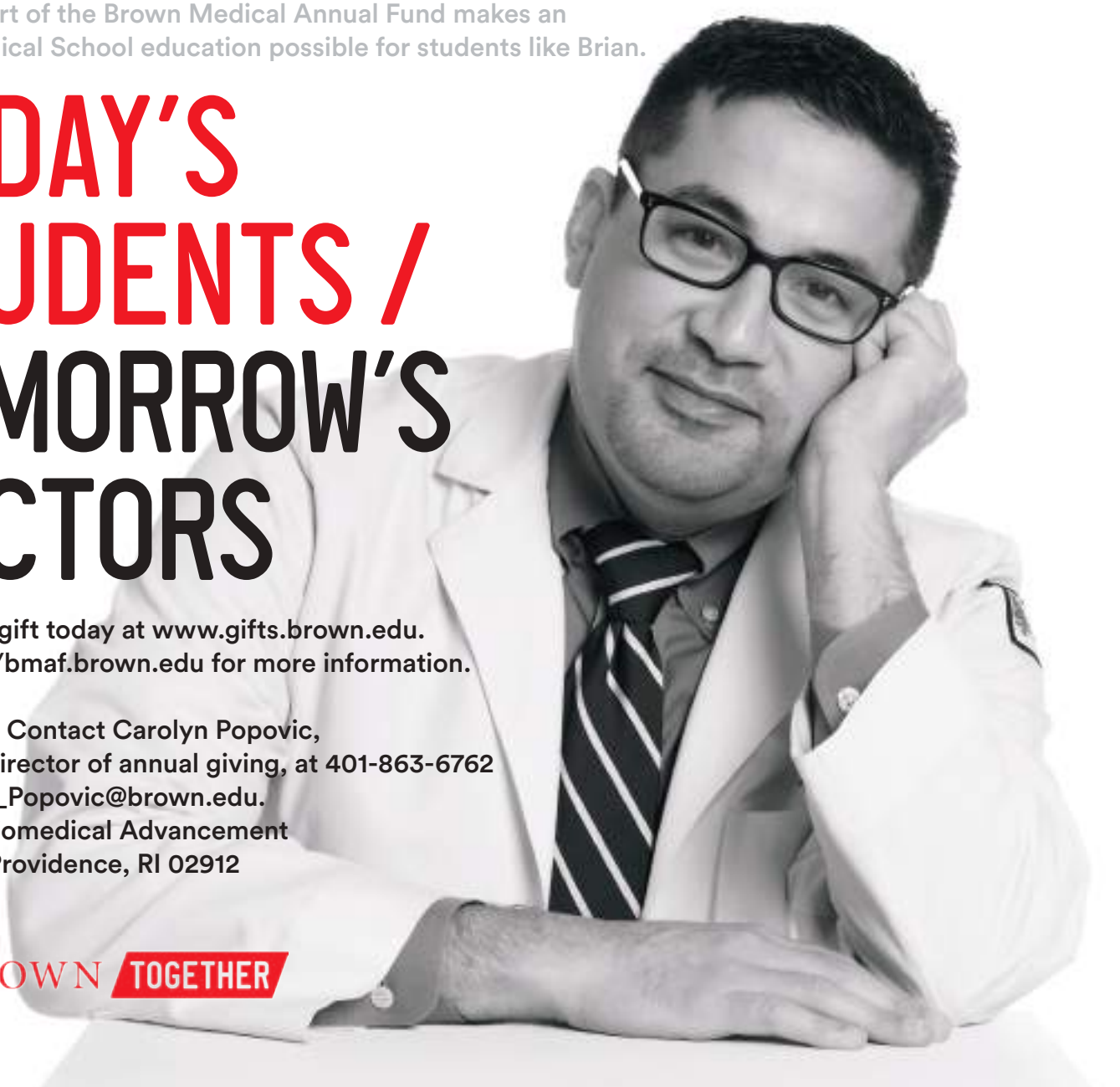
Your support of the Brown Medical Annual Fund makes an Alpert Medical School education possible for students like Brian.

TODAY'S STUDENTS / TOMORROW'S DOCTORS



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