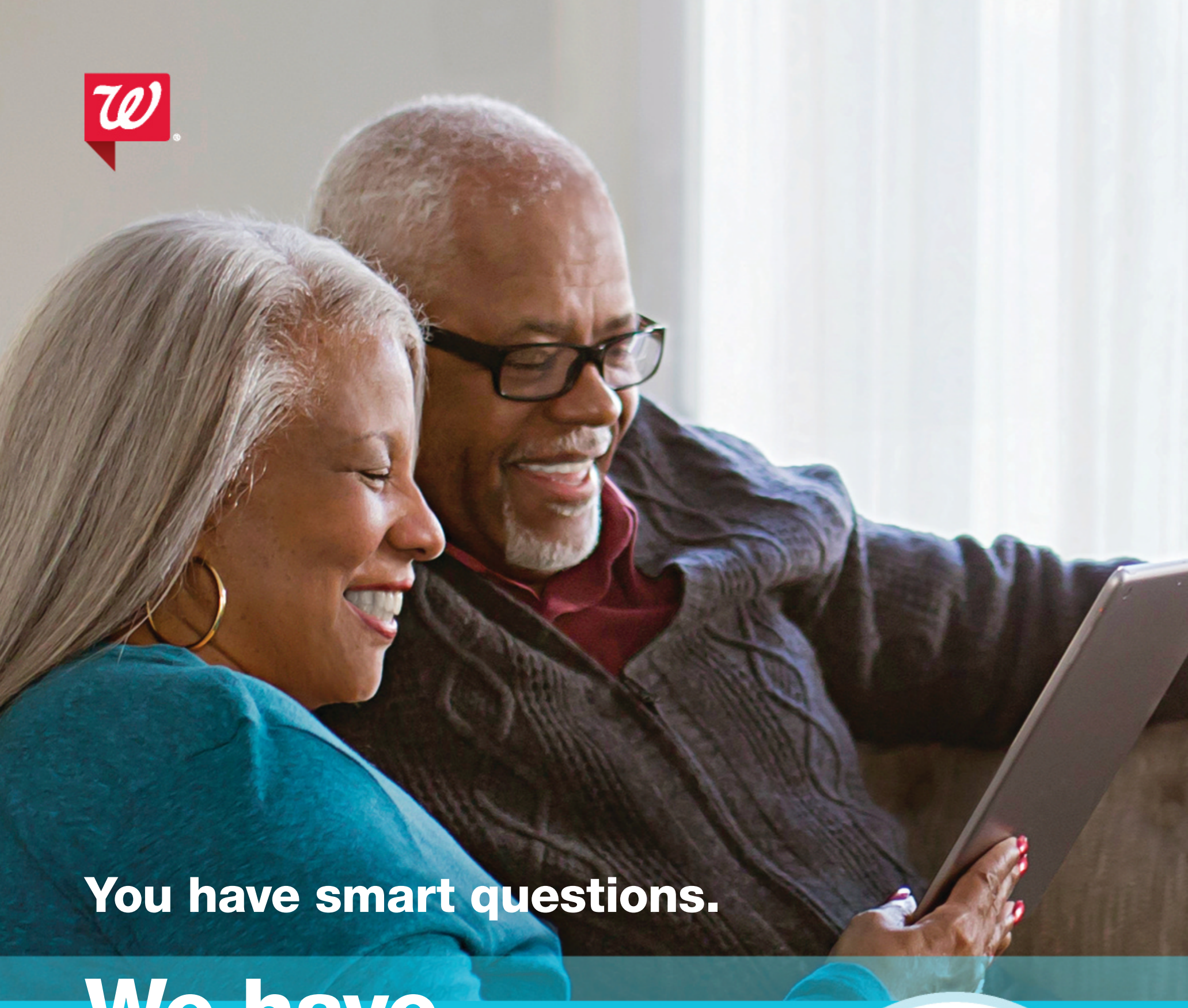


You have smart questions.

We have smart answers.

Smart savers want to save on Medicare Part D.
That's why we've teamed up with eHealth, a licensed, independent insurance broker, to help savers like you enroll in a plan that could save you money.*
Learn more at www.ehealth.com/walgreens.

Get free, personalized advice

by calling eHealth's licensed insurance agents at
(844) 401-7890
TTY: 711†

Get started today—Medicare Part D Annual Enrollment ends December 7th.

*Copay savings is on Tier 1 generic drugs available through plans that include Walgreens as a Preferred Pharmacy. No obligation to enroll. eHealth is a licensed insurance broker. No commissions are paid to Walgreens.
†Monday to Friday from 8 a.m. to 8 p.m. EST.

Walgreens Trusted since 1901™

TIME

HEALTH INNOVATION ISSUE

WHO GETS TO BE HEALTHY

by *Francis S. Collins* • *Raj Panjabi* *Jennifer Doudna* • *Bernard J. Tyson*

WHAT WOMEN NEED

by *Angelina Jolie*

THE ROBOT WILL SEE YOU NOW

by *Corinne Purtill*

SOLVING SUICIDE

by *Mandy Oaklander*

A HISTORIC FACE TRANSPLANT

by *Jamie Ducharme*

ELECTRIFYING MEDICINE

by *Alice Park*

TIME
VOL. 194, NO. 18 | 2019

6 | From the Editor
8 | Conversation
10 | For the Record
12 | TIME 100 Health Summit highlights

The Brief

News from the U.S. and around the world

17 | **Impeachment** inquiry ratchets up

19 | Remembering **Elijah Cummings**

22 | Strife in **Kashmir**

24 | The law **shielding** gunmakers

26 | TIME with … author **Christopher McDougall**

28 | A messy exit from **Syria**

The View

Ideas, opinion, innovations

31 | David French on the President's **temperament**

33 | Ian Bremmer on **violent unrest** in Chile

34 | David Shulkin's brush with **chaos** in Trump's Cabinet

36 | A **Catalan leader** in exile appeals to Spain

37 | Marc Benioff on a free and **vibrant press**

Health Special Report

Innovation

The era of electroceuticals
By Alice Park **44**

Caregiving robots
By Corinne Purtill **52**

Access

A face-transplant first
By Jamie Ducharme **62**

Doctors pushing Medicare for All
By Abigail Abrams **70**

The promise of DIY insulin
By Grant Burningham **74**

Prevention

Solving suicide
By Mandy Oaklander **84**

Plus: viewpoints by Dr. Raj Panjabi, Jennifer Doudna, Angelina Jolie, Geralyn Miller, Martin J. Blaser and Bernard J. Tyson

Time Off

What to watch, read, see and do

93 | André Aciman's ***Find Me*** is no obvious sequel to *Call Me by Your Name*

96 | Reviews: ***Jojo Rabbit***'s satire; ***Mrs. Fletcher***'s mother-son bond; Helen Mirren's ***Catherine the Great;*** and ***BoJack Horseman***'s final season

100 | ***Call of Duty*** grows up

102 | **"Food-fluencers"** move to print

104 | 8 Questions for economist **Robert J. Shiller**

Face-transplant recipient Robert Chelsea with a speech pathologist at Brigham and Women's Hospital in Boston on Oct. 11, three months after his procedure

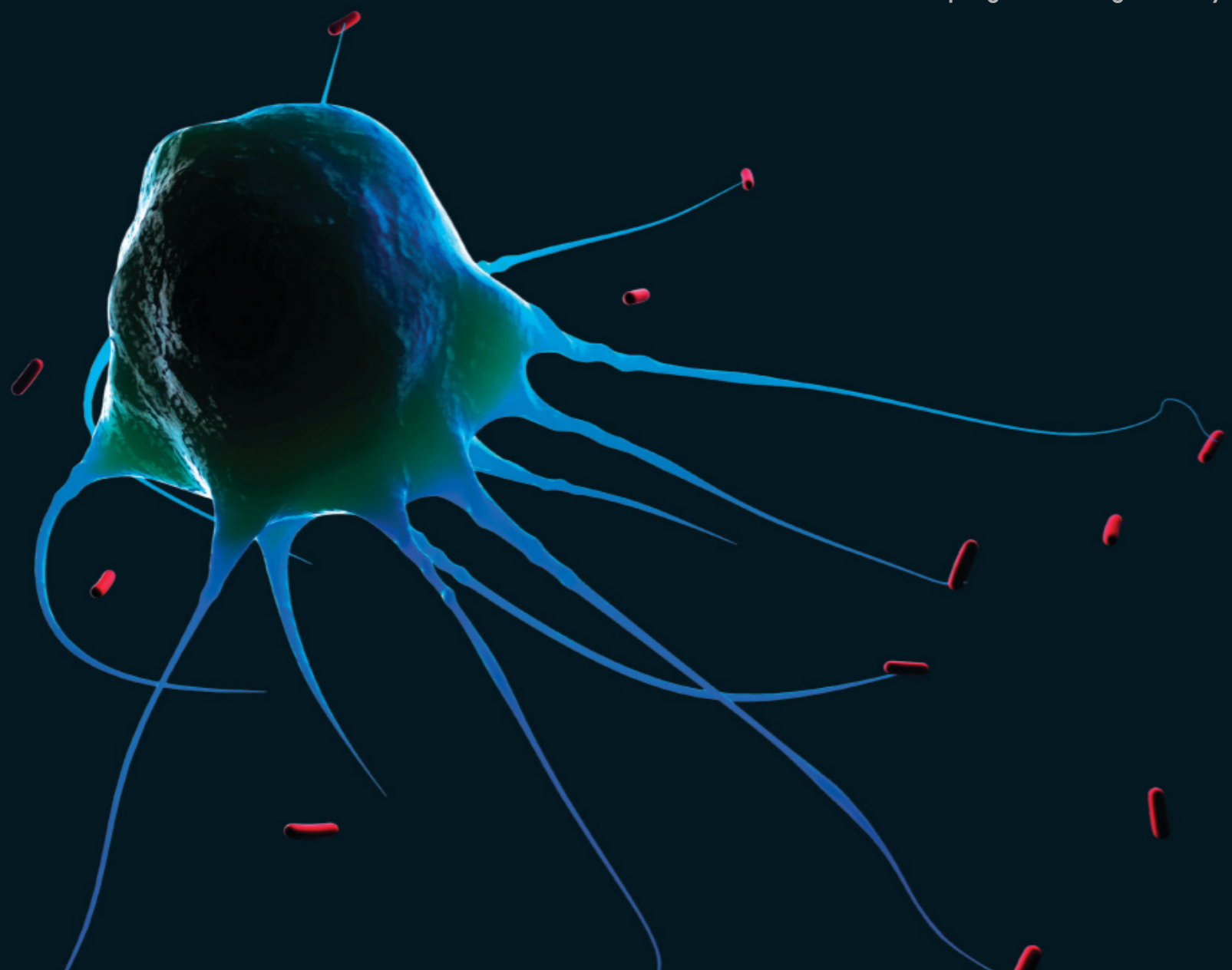
Photograph by John Francis Peters for TIME

ON THE COVER: *Stevie, a socially assistive robot created by the Robotics and Innovation Lab at Trinity College Dublin. Photo-composite, photographs by Greg Kahn for TIME*

TIME (ISSN 0040-781X) is published weekly, except for two weeks in February and December and one week in January, May, June, July, August, September, October due to combined issues by TIME USA, LLC. **PRINCIPAL OFFICE:** 3 Bryant Park, New York, NY 10036. Periodicals postage paid at New York, N.Y., and additional mailing offices. **POSTMASTER:** Send all UAA to CFS (See DMM 507.1.5.2); **Non-Postal and Military Facilities:** Send address corrections to Time Magazine, PO BOX 37508 Boone, IA 50037-0508. Canada Post Publications Mail Agreement # 40069223. BN# 888381621RT0001.

innovation.org

Macrophage defending the body



Cancer started this fight.
It's about time we finished it.

CAR-T Cell Therapy, originally designed to defeat Leukemia,
is now also on the verge of defeating Multiple Myeloma.
That's the true beauty of innovation:
one breakthrough can lead to thousands more.

Welcome to the future of medicine. For all of us. GOBOLDLY®

America's Biopharmaceutical Companies®

Felsenthal, center, with the summit's co-chairs, TIME's Alice Park and Dr. David Agus

The power of optimism

WHILE ONSTAGE AT OUR INAUGURAL *TIME* 100 Health Summit on Oct. 17, former U.S. President Bill Clinton shared an observation gleaned from attending his high school reunions (he's only missed one in 55 years): Clinton's classmates who fared best over the years are the ones who remain optimistic.

Optimism—about better outcomes, technological advances and the future of care—is a major theme of this special issue of TIME, devoted to what we as a society can do to seize this incredible moment of possibility in health care. "Our world has never witnessed a time of greater promise for improving human health," writes Dr. Francis S. Collins, director of the National Institutes of Health for the past decade, in opening this issue.

Health is central to what we do at TIME. We're living through epic global events, with a news cycle at warp speed, yet there is no topic more personal or more important to our audiences than their health and that of their families. Keeping up with advances in medical research has never been more important—or challenging. While more information is available to patients than ever before, it can be difficult to know what information can be trusted.

There has also never been more innovation in health, as the NIH's Collins notes—and yet unequal access remains one the blights of our age. What, for example, is the biggest single factor in determining how long each of us will live? It may be your ZIP code, as we reported earlier this year. Here in New York City, according to NYU data, average life spans are almost 20 years longer for people living on the Upper East Side than their neighbors in nearby East Harlem. It's a pattern of inequality repeated across much of the U.S.

THESE CHALLENGES—and opportunities—are what prompted not only this issue but also our TIME 100 Health Summit, which brought together physicians and policy leaders, actors and activists, scientists and CEOs in New York City. It was an extraordinary day—part of a major initiative at TIME, convening our TIME 100 community of the world's most influential people and working together toward greater collaboration, action and progress.

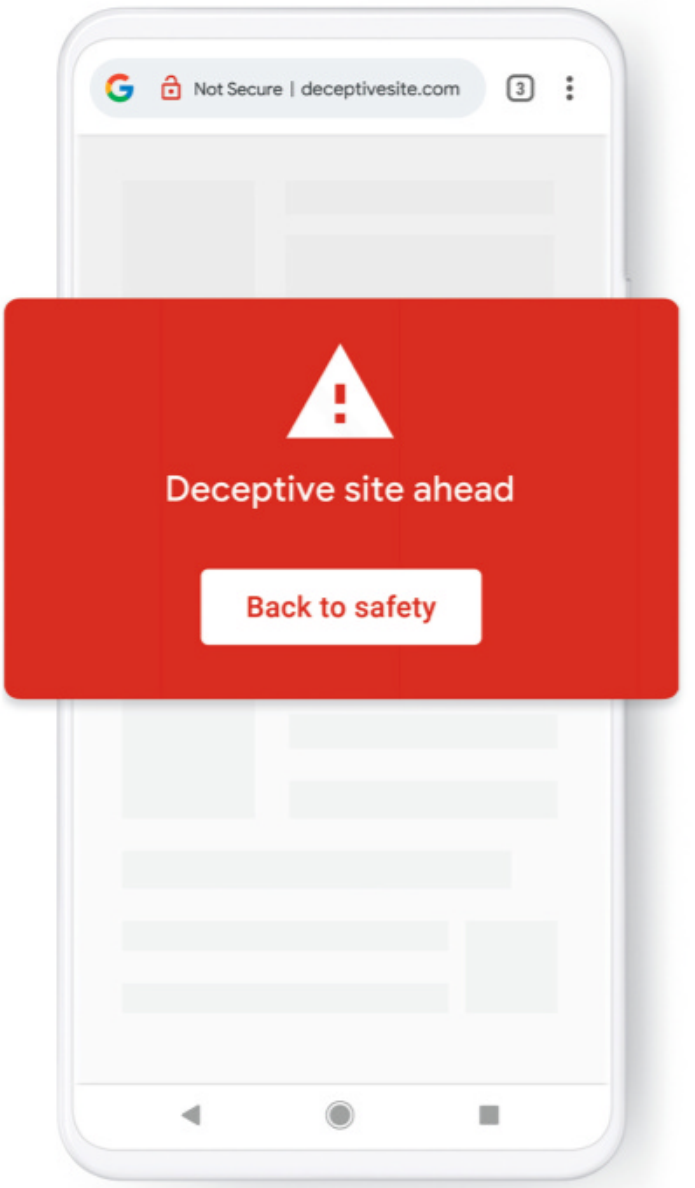
I too am optimistic—having learned from so many thoughtful people on our stage and throughout the room at the summit. You will find many highlights and insights from the event throughout this issue, as well as video at time.com/summit-videos.

Edward Felsenthal,
EDITOR-IN-CHIEF & CEO
@EFELSENTHAL

BRIAN ACH—GETTY IMAGES FOR TIME

Google

Safe Browsing protects 4 billion devices, including yours.



Our technology flags risky sites on Chrome and other popular browsers to help protect you from threats. Another way we keep your data private, safe, and secure.

g.co/security

Conversation

WHAT YOU SAID ABOUT ...

AMERICA'S FOREVER WAR In the Oct. 21/Oct. 28 cover package about America's military, Elliot Ackerman made the case for a draft—and many of his fellow veterans agreed. Iraq War vet Mike Busovicki of Canonsburg, Pa., said he'd never supported the idea but now thinks "it's the only way for Americans to take their military—and our lives—seriously." Navy vet Bruce Jayne of Saluda, N.C., said those who serve would gain an "appreciation" for people from all walks of life, and vets and civilians alike said the wealthy would particularly benefit from service that would give them experience of challenges faced by those less fortunate, as Del Jordan of Monroeville, N.J., put it. But Tim Ackert of Orlando felt differently. "Keep it a volunteer military," he wrote, "but take care of the troops and their families better."

> ***'We elders make a decision to go to war and put our children in harm's way.'***
>
> **NALIN M. SHAH,** Greenwood, Ind.

THE OVERLOOKED Kate Pickert's Oct. 14 feature on the lack of research into metastatic breast cancer hit home with survivors. "Us 'metsters' (metastatic people) are so often overlooked, and yet we are the ones so urgently needing help," said Johanna Rauhala of Richmond, Calif. Celeste Jones Fraser, a metastatic-breast-cancer patient in Estes Park, Colo., said that she's been "living a full life" since her first cancer diagnosis 17 years ago and that Stage IV "is not a death sentence." William Sykes, a survivor in Xenia, Ohio, said he could relate too, as men "face the same issues once diagnosed."

> ***'Here I am, seven years later. Other than the time lost to rehab from surgeries, I've been having a lot of fun.'***
>
> **SUSAN CROSSER,** Wilson, Wyo.

NOW ON NETFLIX TIME's Emmy Award–winning documentary series *A Year in Space* followed American astronaut Scott Kelly—left, with his twin brother and fellow astronaut Mark Kelly—during the historic year he spent aboard the International Space Station. As NASA continues to study the impact of his time in orbit, you can stay busy too, as all 12 episodes are now available for streaming on Netflix.

AWARD-WINNING WORK

TIME's journalism took home several Front Page Awards from the Newswomen's Club of New York on Oct. 14. Stephanie Zacharek won in the Essay category; Krisanne Johnson and Collier Schorr in the Feature Photography category; and Natalie Keyssar in the Photography Essay category, for images accompanying a Feb. 24 piece on violence at the Venezuela-Colombia border *(above)*.

Also in October, the video mural for TIME's Guns in America project, directed by French artist JR, won an Edward R. Murrow Award for Excellence in Innovation from the Radio Television Digital News Association. The multimedia project—which was featured on the cover of the Nov. 5, 2018, issue—was also nominated for a News and Documentary Emmy Award last summer. See more at **time.com/guns-in-america**

bonus TIME health

This week's special report is just one part of TIME's continuing coverage of **innovations in medicine and health care.**

Subscribe to TIME's free health newsletter and get a **weekly dose of news and advice** to help keep you well.

For more free TIME newsletters, visit **time.com/email**

TALK TO US

SEND AN EMAIL:
letters@time.com
Please do not send attachments

FOLLOW US:
facebook.com/time
@time (Twitter and Instagram)

Letters should include the writer's full name, address and home telephone and may be edited for purposes of clarity and space

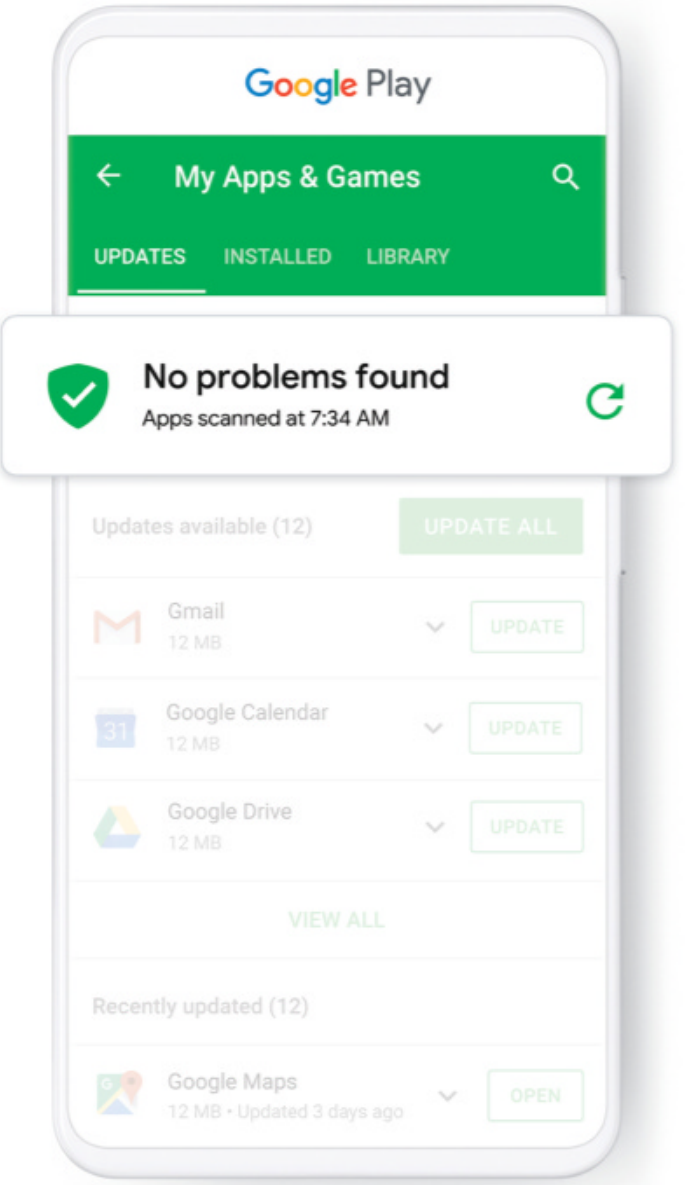
Back Issues Contact us at customerservice@time.com, or call 800-843-8463. **Reprints and Permissions** Information is available at time.com/reprints. To request custom reprints, visit timereprints.com. **Advertising** For advertising rates and our editorial calendar, visit timemediakit.com. **Syndication** For international licensing and syndication requests, contact syndication@time.com

Please recycle this magazine, and remove inserts or samples beforehand

SPACE: MARCO GROB FOR TIME; VENEZUELA: NATALIE KEYSSAR FOR TIME

Google

Google Play Protect scans 50 billion apps, every day.



We help keep your Android device safe by checking apps before, during, and after download. Another way we keep your data private, safe, and secure.

g.co/security

For the Record

‘I never thought that this would be easy, but I thought it would be fair.’

MEGHAN MARKLE,
Duchess of Sussex, on British tabloid coverage of her marriage and pregnancy

2026

Year in which New York City’s notorious Rikers Island jail complex is set to close, after an Oct. 17 city council vote

‘I guess I’m the Meryl Streep of generals, and frankly that sounds pretty good to me.’

JAMES MATTIS,
former Secretary of Defense, in an Oct. 17 speech; President Trump called both Mattis and the Oscar-winning actor “overrated”

0.8 in.

Amount by which part of California’s Garlock fault has slipped since a large earthquake in July, according to a study published Oct. 18 in *Science*

Astrobiology
An agency review panel said NASA should redo its rules on keeping Earth’s microbes out of space

Chemistry
Michigan scientists built a football-field-size periodic table of the elements

‘One way or another, we will leave the E.U. with this deal.’

BORIS JOHNSON,
U.K. Prime Minister, when Parliament on Oct. 22 rejected a proposal that would have allowed his Brexit deal to be approved by the Oct. 31 deadline

720

Number of volunteers who will take part in Federal Aviation Administration tests to determine how packed planes affect evacuation time

‘THE PROBLEM IS REAL, THE SITUATION IS DIRE.’

TINASHE FARAWO,
Zimbabwe National Parks and Wildlife Management Authority spokesperson, after at least 55 elephants starved to death during a drought

‘We’re not naive enough to think that this is the last time that someone tries something.’

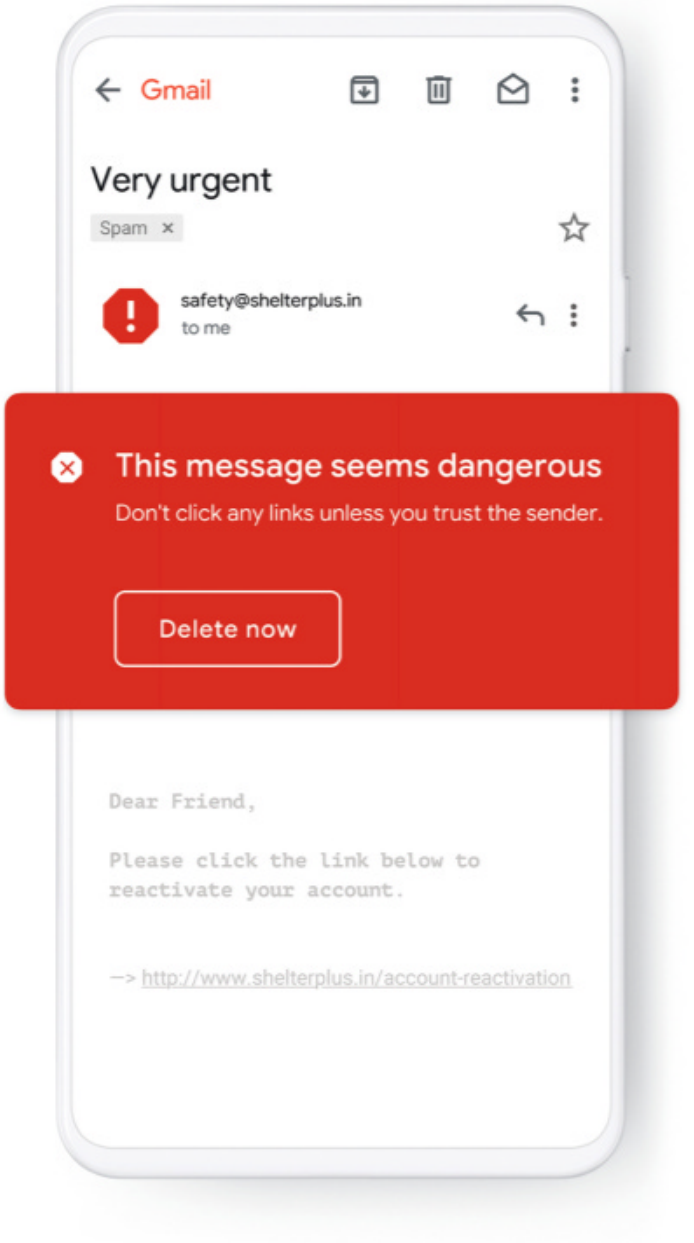
PATRICK WEEMS,
executive director of the Emmett Till Memorial Commission, after the Oct. 19 dedication of a new bulletproof historical marker acknowledging Till’s 1955 murder; the previous three were vandalized

ILLUSTRATIONS BY BROWN BIRD DESIGN FOR TIME

SOURCES: PEOPLE; NPR; SCIENCE; FOX 17 NEWS; AP; CNN; USA TODAY

Google

Gmail blocks over 100 million phishing attempts, every day.



Gmail phishing protections help keep your inbox secure by warning you about suspicious emails. Another way we keep your data private, safe, and secure.

g.co/security

Making the world a healthier place

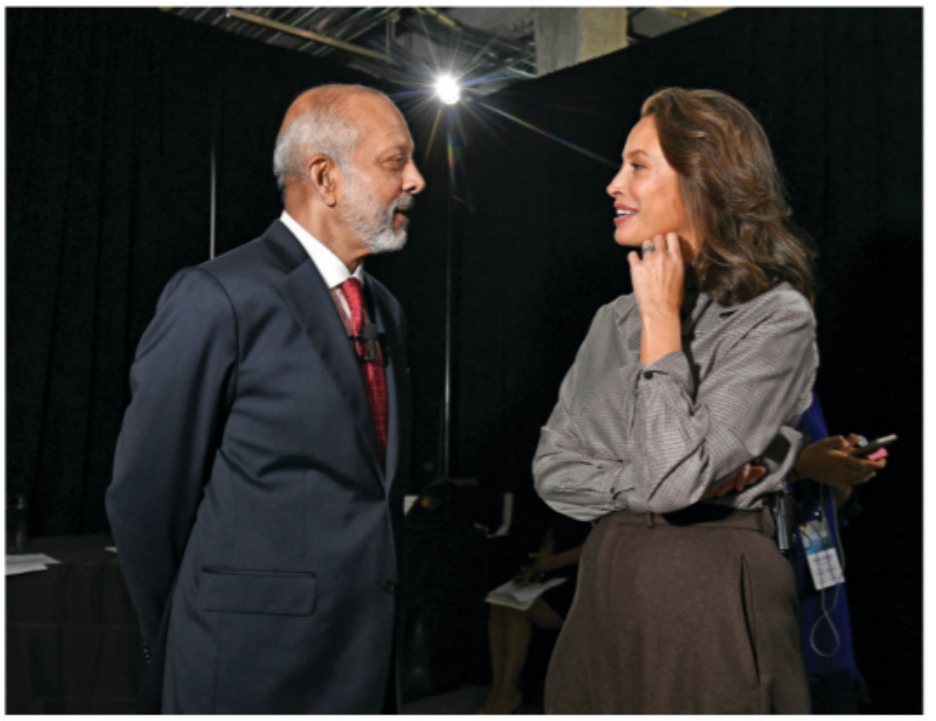
FOR THE INAUGURAL *TIME* 100 HEALTH SUMMIT, the prescription was: one former U.S. President; one former U.S. Vice President; three entertainers turned activists; assorted scientists, researchers, physicians, insurers and entrepreneurs; one sculptor; the commissioner of the National Basketball Association; and, finally, heads of the Department of Health and Human Services, the National Institutes of Health and the federal official who administers Medicaid and Medicare, overseeing a budget of $1.3 trillion. The result, which streamed live online on Oct. 17 from New York City, can also be glimpsed in these photos.

French sculptor Prune Nourry describes how a cancer diagnosis and mastectomy influenced her art. The experience is at the heart of her new documentary, Serendipity

U.S. Department of Health and Human Services Secretary Alex Azar, left, during an interview with TIME editor-in-chief Edward Felsenthal

Former Vice President Al Gore in conversation with Nancy Gibbs, Visiting Edward R. Murrow Professor of Practice of Press, Politics and Public Policy at Harvard Kennedy School and former TIME editor-in-chief

Dr. Naveen Rao, senior vice president of health at the Rockefeller Foundation, left, and Christy Turlington Burns, founder of Every Mother Counts



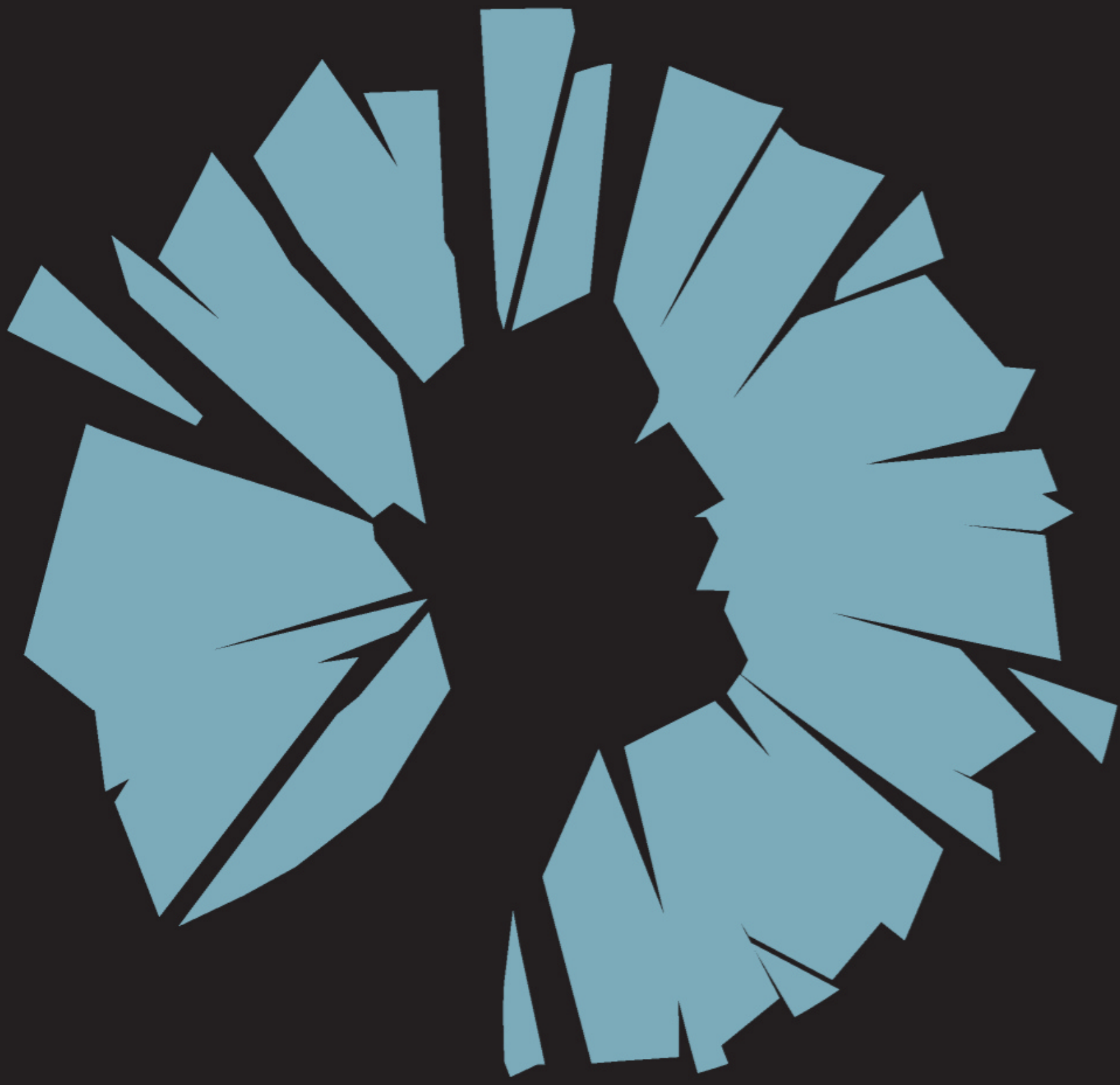
Actor Selma Blair, left, with Robin Roberts, co-anchor of ABC's Good Morning America

Attendees in the TRIPP Oculus VR lounge try out TIME's self-guided meditation app LUMEN

GETTY IMAGES FOR TIME (6)

IF SOMEONE BREAKS INTO YOUR HOUSE

CALL THE POLICE



IF YOUR HOUSE IS ON FIRE

CALL THE FIRE DEPARTMENT

IF YOUR TEEN HAS A DRUG PROBLEM

GO TO DRUGFREE.ORG

Partnership™
for Drug-Free Kids
Where families find answers

The Brief

COMFORT ZONE President Trump arrives at a rally in Lake Charles, La., on Oct. 11. In Washington, support is less secure

INSIDE

THE LEGACY OF CONGRESSMAN ELIJAH CUMMINGS

THE EXTRAORDINARY PROTESTS SWEEPING ACROSS LEBANON

THE DRUG CARTEL THAT TOOK ON AN ARMY

PHOTOGRAPH BY SAUL LOEB

POLITICS

Impeachment drains White House power

By Brian Bennett

PRESIDENT DONALD TRUMP IS SUPPOSED TO be the man who could shoot somebody in the middle of Fifth Avenue without losing any political support. But the threat of impeachment is constraining the President's power in surprising ways. As defiant witnesses provide damning testimony in the House inquiry, Republicans are increasingly seeking shelter from unrelated scandals. The result—a spreading weakness in the West Wing—has driven increasingly erratic behavior by Trump, according to those close to him inside the White House and outside of government.

Examples of Trump's diminished power aren't hard to find. A series of government officials have defied the White House's Oct. 8 edict that the Administration would not comply with the impeachment inquiry. Most damaging so far was the Oct. 22 testimony of acting U.S. Ambassador to Kiev William Taylor tying Trump to the alleged quid pro quo at the heart of the Ukraine scandal.

Amid the parade of defiance by public servants, Republican politicians are showing signs of turning on Trump. On Oct. 19, some GOP legislators sent the President a message that they wouldn't defend his decision to hold the next G-7 summit at his resort in Doral, Fla., a senior White House official says. Already angry over Trump's decision to withdraw American troops from Syria, the lawmakers were taking fire on too many fronts, they told the White House. So Trump did what he's rarely done as President: he reversed himself.

It wasn't pretty. Taking to Twitter that night, Trump blamed "both Media & Democrat Crazed and Irrational Hostility" for the climb down. But it's what he sees as a lack of Republican resolve that is really bothering him. During an Oct. 21 Cabinet meeting, Trump went on a wide-ranging on-camera rant that kept the press in the Cabinet Room for 72 minutes. "This is a phony investigation," Trump told the journalists. "And Republicans have to get tougher and fight." After reporters were escorted out, Trump railed about the political limitations he feels are being imposed on him by those in his own party.

THE EXASPERATION IS MUTUAL. Many congressional Republicans are tired of seeing Trump tweet about everything except their agenda. Impeachment is consuming the political oxygen in Washington, and GOP leaders are concerned that the White House doesn't know how to manage it, according to several high-level Republican aides.

Trump's own aides aren't helping. In a jaw-dropping press conference on Oct. 17, acting White House chief of staff Mick Mulvaney sought to rebut Democratic accusations that Trump had improperly pressured Ukrainian President Volodymyr Zelensky to launch investigations that would benefit Trump politically. Instead, Mulvaney acknowledged that U.S. military aid to Ukraine had been held up to press the country to cooperate with one such probe. Mulvaney later reversed himself and denied there was a quid pro quo.

Democrats are looking for ways to widen the rift that such performances are opening among Republicans, and the House inquiry is giving them plenty to work with. Taylor painted a devastating portrait of U.S. foreign policy hijacked for domestic political purposes. In a detailed 15-page statement, he described a "highly irregular" back-channel policy operation "guided by" Trump's personal lawyer, Rudy Giuliani. One member of that operation, Ambassador Gordon Sondland, told Taylor that Trump had insisted Zelensky publicly commit to investigating the Bidens and the 2016 election before he would release $392 million in military aid, according to Taylor's testimony.

'Holding up security assistance for domestic political gain was "crazy."'

WILLIAM TAYLOR, acting U.S. ambassador to Ukraine, in an Oct. 22 statement

Taylor cited 50 years of public service, from his time as an infantry officer with the 101st Airborne in Vietnam to his visit to the front lines of Ukraine's ongoing war with Russia in July, in welcoming the chance to comply with the House subpoena. It was key, he said, to explain "the profound importance of Ukraine" to American security and to show why "holding up security assistance for domestic political gain was 'crazy.'" Four other currently serving Trump Administration officials have complied with congressional subpoenas, and more are on the way.

Will such testimony ultimately end Trump's hold on power? Hill Republican support for the President may be showing signs of softness, but 20 GOP Senators would have to defect to remove him from office in a Senate trial. Some 93% of Republicans don't believe Trump should be impeached, according to an Oct. 21 poll by the nonpartisan Public Religion Research Institute, and if those numbers hold, few if any Senate Republicans can be expected to defy their base and likely end their political careers.

But Democrats are hoping the ongoing inquiry, and Trump's own missteps, will take him down, one way or another. "Most Americans would say, if you told a foreign leader to go investigate dirt on my opponent, that's bad enough," says Representative Ro Khanna, a California Democrat. But with a little more than a year before the 2020 election, voters, not Congress, may be the ones left to limit Trump's power. —*With reporting by* ALANA ABRAMSON *and* PHILIP ELLIOTT/WASHINGTON ◻

PREVIOUS PAGE: AFP/GETTY IMAGES; THESE PAGES: TAYLOR: SHUTTERSTOCK; CUMMINGS: JUSTIN T. GELLERSON—THE NEW YORK TIMES/REDUX

CONGRESS

What Elijah Cummings left unfinished

By Alana Abramson and Lissandra Villa

EARLIER THIS YEAR, WHEN THE LATE REPRESENTATIVE Elijah Cummings was assessing new members for the House Oversight Committee, he met with New York Congresswoman Alexandria Ocasio-Cortez, a young politician whom many of his colleagues had dismissed as a showboat. Ocasio-Cortez remembers the elder statesman sizing her up.

"He said, 'I'm not here to play games,'" she told TIME. "'I'm not here for people who aren't serious about this work.'" Ocasio-Cortez assured Cummings that she was serious, and he took a chance on her, welcoming the freshman lawmaker to the committee.

The interaction stuck in her mind. "The decisions we make [in Congress] are enormous, but they happen so quickly, and it's easy for people to get lost in that," she said. "He never did."

In an era defined by vitriol and division, Cummings, whose death Oct. 17 of long-term health complications surprised the public, was a remnant of a not-so-distant time when bipartisanship wasn't just a talking point. The progressive institutionalist earned a reputation in his nearly quarter-century on Capitol Hill as a fair mind and a calming presence, and an orator who had the power to unite. "We respected him because he was good. We respected him because he beat us many times," said House minority leader Kevin McCarthy in a tribute on the floor on Oct. 17. "We respect him because what he fought for, he believed in."

Cummings in the House Oversight Committee hearing room in Washington on May 2

RECENTLY, HOWEVER, Cummings found himself the subject of more polarized attention. The timing of his death means his immediate legacy will be dominated by his commitment to investigating the Trump Administration. As Oversight Committee chair, he focused on White House security clearances, the transfer of nuclear technology to Saudi Arabia and the President's finances—even as he lamented the need to do so. "None of us wanted to be in this position," he said in June. "The Trump Administration is challenging the very constitutionality of congressional oversight."

His effectiveness drew Trump's ire. The President, who struck a more respectful tone after Cummings' death, recently lobbed insults at Baltimore, the city the Congressman represented, and called Cummings "racist."

In the weeks since House Democrats announced a formal impeachment inquiry, Cummings' health kept him from the Capitol. But his work continued. The Congressman approved every subpoena from his committee with his name on it, even if it meant staffers had to hand-deliver it for his signature to his hospital room. Representative Carolyn Maloney will serve as acting Oversight chair, and the investigations continue, now without the man who was their standard bearer.

"He was our moral compass," said Missouri Representative Lacy Clay. "He was the one that we knew would tell it to us straight." *—With reporting by* ABBY VESOULIS/WASHINGTON

MILESTONES

A leader among leaders

By John Lewis

Elijah Cummings was so human. I think that had a great deal to do with his parents, who were both ministers. I think it's something they instilled in him: to be kind, to be good, to be wise and to respect the dignity and the worth of your fellow human being. In the years I got to know him, I never heard him say a negative word about any person. For some people, it's in their DNA to do what's right.

We met in Congress, and I got to know him fairly well because from time to time people would confuse us. There would be individuals from his own city who would say things like, "I'm from Baltimore," and I would say, "But I represent Atlanta." People would sometimes call him John and they would call me Elijah, and we would laugh about it—and I took some joy in it, since he was taller and younger.

When he died on Oct. 17, at age 68, I heard the news on television. I had stayed up all night working and couldn't fall asleep after that. He will be deeply missed, not just by the people of Baltimore but also by the people of America, especially his colleagues in Congress. When Elijah Cummings spoke, members listened. They wanted to hear his words. They said, "If Elijah Cummings said such and such a thing, it must be the right thing to do." When he said yes, he meant yes. When he said no, he meant no. He was a leader among leaders. But more than a leader—Elijah Cummings was a friend.

Lewis is the U.S. Representative for Georgia's Fifth Congressional District

NEWS TICKER

State Dept. closes Clinton email inquiry

The State Department ended a three-year inquiry into Hillary Clinton's use of a private email server during her time as Secretary of State, concluding there was **no "systemic, deliberate mishandling of classified information,"** according to a report made public on Oct. 18.

Trudeau re-elected but loses majority

Justin Trudeau's Liberal Party won the most seats in Canada's general election on Oct. 21 but **lost its parliamentary majority,** so it will have to seek opposition votes to pass legislation. The Prime Minister's campaign was rocked by revelations, first reported by TIME, that he had worn brownface and blackface makeup in the past.

Ohio opioid settlement reached

Four drug companies, including McKesson and Cardinal Health, **reached a $260 million settlement** with two Ohio counties on Oct. 21, hours before a federal trial was to begin. The counties would have been the first of hundreds to go to trial over allegations that drug distributors contributed to the opioid epidemic.

HOLDING ON Pastor Matt Younger *(right)* hugs facilities associate Robert Lusk inside the heavily damaged Northway Church in Dallas on Oct. 20, after a tornado ripped through the area. Three twisters—one with maximum wind speeds of 140 m.p.h.—tore roofs off buildings, toppled trees and destroyed homes and businesses. No deaths and only a handful of injuries were reported in Texas, but the pattern of violent storms across the region led to four deaths in Oklahoma and Arkansas.

THE BULLETIN

Lebanon's biggest protests in a decade threaten to topple the government

ON A WALL OUTSIDE THE U.N. OFFICES IN central Beirut, protesters have posted the names of every lawmaker in Lebanon's parliament, the word *thief* under each one. The protests—the largest to sweep the Middle Eastern nation in 14 years—began Oct. 17 after the government unveiled new taxes, including a $6 monthly fee on calls from messaging apps like WhatsApp. Authorities quickly dropped the taxes, but hundreds of thousands marched for several days in cities across Lebanon, voicing anger at decades of corruption, nepotism and dysfunction.

THE PEOPLE'S PAIN The same parties have dominated Lebanese politics since a civil war ended in 1990, when the country restored a complex power-sharing system that guarantees positions to each of Lebanon's many religious groups. Many party leaders today are former warlords, and sons often take over seats vacated by fathers. Protesters say corruption and mismanagement divert money from weak public services. A new austerity budget, passed in July in response to an economic crisis and spiraling public debt, has fueled greater anger.

RESCUE PLAN Prime Minister Saad Hariri, the son of a former Prime Minister who was assassinated in 2005, has tried to appease the protesters. On Oct. 21, he announced a package of reforms, including assistance for poor families and improvements to the dilapidated state electric system. He also pledged to halve politicians' salaries, launch a corruption commission and recover any stolen public funds. But protesters have continued to pour into the streets, saying they don't trust a corrupt system to change.

EXTRAORDINARY REVOLT The most striking aspect, analysts say, is that protesters have risen above Lebanon's sectarian divides. Lebanese people of all religious backgrounds have come together for a mostly peaceful rejection of politicians from all groups. Staying so united will be a challenge. But with economic problems likely to hamper Hariri's ability to quickly improve the quality of life, some think the government has a revolution on its hands. "They don't understand," one protester told TIME. "The people aren't sheep anymore."

—REBECCA COLLARD/BEIRUT

TORNADO: JEFFREY MCWHORTER—AP; INGREDIENTS: GETTY IMAGES (3)

GOOD QUESTION

How did El Chapo's drug cartel beat the Mexican army?

IN MEXICO'S BIG CITIES, DRUG-CARTEL gunmen normally act like phantoms. They hide in safe houses or amid communities, suddenly striking with an assassination or a gunfight, and then disappearing again.

But on Oct. 17 in the Sinaloan city of Culiacan, the cartel gunmen were everywhere. Flights in and out of the airport were canceled as they took control of roads, blocked government buildings and exchanged fire with security forces for hours, leaving at least 14 people dead. Everyone else had to act like ghosts, hiding behind locked doors, not daring to step outside.

And in this unusual battle, the Sinaloa Cartel won. The uprising was in response to soldiers' storming a house and arresting Ovidio Guzmán López, the 28-year-old son of convicted kingpin Joaquín "El Chapo" Guzmán. In February, the U.S. Justice Department announced it had indicted Guzmán López on charges of trafficking cocaine, marijuana and meth. But after hours of cartel chaos, Mexico's federal government capitulated, giving soldiers the green light to release him.

"The city was under siege," says Vladimir Ramirez, a political scientist in Culiacan. "People slept wherever they were. Businesses are closed. Nobody wants to go out."

This change is the result of a bloody trend of cartels developing insurgent tactics over many years. The cartels have armed up with stolen military weapons and an endless stream of rifles from the U.S.; from 2007 to 2018, more than 150,000 firearms seized in Mexico were traced to U.S. gun shops and factories. And they have learned to protect their leaders with rings of gunmen who can cause trouble to stop their capture.

"The Sinaloa Cartel demonstrated a tremendous ability to mobilize rapidly and take effective control of the city," says Raul Benitez, an expert on Latin America's armed conflicts. "They showed that in Sinaloa, they are the ones who run things."

In contrast, the Mexican military was in shambles. Officials made contradictory statements about why the soldiers had gone to arrest Guzmán López without enough backup. In many places in the city, the cartel gunmen went unchallenged. There were reports that the cartel had held various soldiers hostage and threatened to kill them. "You can't fight fire with fire," President Andrés Manuel López Obrador said on Oct. 18. "We don't want deaths. We don't want war."

The worry now is that the Mexican government's decision to release Guzmán López sets a precedent. If other traffickers are arrested, their cohorts could kidnap people to demand their release. It also raises the specter of the cartel's appearing more powerful than the army, which could have implications for governability. There has long been an image of traffickers as rebels; some in Sinaloa call them *valientes* (brave ones). Now it seems as if these rebels are almost in control.

—IOAN GRILLO

BUSINESS

Not-so-secret ingredients

In a suit filed Oct. 17, Budweiser brewer Anheuser-Busch alleges that a former employee, now working for longtime rival MillerCoors, obtained its secret beer recipes. (MillerCoors says it "respects confidential information.") Here, other recipe leaks. —*Ciara Nugent*

CREAM SCHEME
In 2014, a federal court found two men guilty of stealing DuPont's recipe for a chemical used in paper, plastic—and the filling in Oreo cookies. They sold the info to a state-owned Chinese firm.

SPICY SCOOP
While reporting a story on Colonel Sanders in 2016, a journalist snapped a picture of a family scrapbook that appeared to detail KFC's secret spice mix for its fried chicken. KFC denied its authenticity.

KERNEL OF TRUTH
In April, the parent company of Garrett Popcorn Shops sued its former research director, alleging she stole recipes. The files were guarded by biometric sensors and accessible by only three people's thumbprints.

NEWS TICKER

Northern Ireland makes abortion legal

Abortion and same-sex marriage were decriminalized in Northern Ireland on Oct. 21, after the regional government **failed to reassemble in time to block the legislation.** The new policy, which was passed by the U.K.'s Parliament in July, brings Northern Ireland in line with the rest of the nation.

Energy Secretary Rick Perry to resign

Rick Perry, one of President Trump's original Cabinet picks, will **resign as Energy Secretary by the end of 2019,** the White House said Oct. 17. Perry, who pushed for increased U.S. fossil-fuel exports, has been subpoenaed by the House as part of the impeachment inquiry into the President.

Netanyahu fails to build a coalition

Israeli Prime Minister Benjamin Netanyahu has **failed to form a coalition government** for the second time this year, meaning opposition leader Benny Gantz gets the opportunity to do so. Gantz has until Nov. 21 to form a government; if he cannot, Israel could face its third election in 2019.

Kashmir simmers between dueling nuclear powers

By Naina Bajekal

IT'S APPLE SEASON IN KASHMIR, BUT in orchards across the fertile Himalayan valley, unpicked fruit rots on the branches. Markets lack their usual bustle, most shops are open for only a few hours each morning, and schools and colleges are largely empty of students.

The slowdown reflects both the firm grip of the Indian government on the Muslim-majority state and the Kashmirian people's seemingly spontaneous reaction to it. A tweet posted on the account of Mehbooba Mufti, the state's former chief minister who has been detained for more than two months, read, "Kashmiris have been resolute about a civil curfew as a mark of protest."

It was on Aug. 5 that Prime Minister Narendra Modi's Hindu nationalist government said it would scrap the semiautonomous status that the state of Jammu and Kashmir had held under India's constitution for seven decades. For the next 72 days, the Kashmir Valley and parts of Jammu endured a communications blackout, with landlines, cell phones and the Internet suspended. "Nine to 10 million people were pushed behind an iron wall. We'd never seen anything like this," says Anuradha Bhasin, executive editor of the Kashmir *Times,* citing previous Internet blackouts that still left phone services intact. "There was an absolute silence." Already one of the world's most militarized regions, the Valley was flooded with thousands of Indian troops.

If the heavy-handed measures of the curfew were intended to dampen the threat of violence, they succeeded—at least for a time. But now that India has begun lifting restrictions on the valley, Kashmiris are bracing for what happens once the clampdown is over. In a Sept. 29 column, former Indian Supreme Court Judge Markandey Katju wrote that Kashmir would become India's Vietnam War, a nightmare with "body bags" returning in large numbers. "Remove the restrictions, and popular protests will engulf the whole Valley. Continue them, and the pot will boil until it explodes."

THE PROBLEMS IN KASHMIR have been shaped by colonial history, religious tensions and nationalism. During the partition of British India in 1947, the leader of Jammu and Kashmir pushed for independence rather than joining Muslim-majority Pakistan or Hindu-majority India. When Pakistan tried to take the territory anyway, Kashmir's leader asked for help from India, which agreed—on the condition that Kashmir accede to India. What followed was the first of two wars that Pakistan and India fought over Kashmir. Today, both of the nuclear-armed countries claim the state as a whole; India controls roughly half the land, Pakistan controls less than a third, and China the rest.

'There's a collective sense of fear, humiliation, hurt and anger. This will erupt in different forms.'

Over the past three decades, Pakistan has also partially backed and funded insurgents in Kashmir, where India has responded with troops and brutal measures. A U.N. report in July noted serious abuses by Indian forces, including extrajudicial killings, torture and pellet-gun blindings. New Delhi dismissed the report as a "false and motivated narrative."

Repealing Article 370 of the Indian constitution—which gave Kashmir autonomy in all areas except foreign affairs, defense and communications—was a long-standing goal of Modi's party, which sees India as a Hindu nation and has long opposed rules preventing outsiders from buying land in Kashmir. Stripping the special status has seemed to rouse the party base. "For 70 years, Article 370 was proving to be an impediment in the way of the spirit of 'one country, one constitution,'" Modi said to cheers during a rally in Maharashtra before local elections.

To Pakistan, the situation looks rather different. "The red line has been crossed on Aug. 5," says Masood Khan, president of Azad (Free) Kashmir, one of two territories in Kashmir administered by Pakistan. A career diplomat who worked in Washington and Geneva as part of Pakistan's permanent mission to the U.N., Khan grew up in Azad Kashmir and describes himself as a "son of the soil." On a recent trip to Washington, D.C., he urged the international community to intervene and start talks with India. "We're in a state of war," he told TIME.

But while the rhetoric on both sides remains hostile, Pakistan can ill afford a full-scale conflict, analysts say. On Oct. 18, the Financial Action Task Force, the global terrorism-finance watchdog, ruled Pakistan would stay on its "greylist" until

Security forces patrol in Srinagar, Kashmir's biggest city, on Aug. 10

February 2020 as it was doing too little to tackle its funding of violent extremism. Pakistan was also bailed out by the IMF this summer for the 13th time in 30 years, inflation is predicted to surge, and the World Bank recently cut its economic-growth forecast. "There's a realization that without an economy, Pakistan is not going to have a military," says Gareth Price, senior research fellow at the London think tank Chatham House.

A greater security risk seems to be the anger and resentment simmering within the Valley. Nearly 4,000 people, including politicians, activists and journalists, have been arrested, according to a Sept. 6 government report seen by Reuters, and thousands remain in custody. On Sept. 24, the National Federation of Indian Women highlighted claims that 13,000 boys had been picked up and detained, some for up to 45 days. "These incidents instill a fear that goes very deep," Bhasin says. "Kashmir is not a monolith; there will be a creative response, a peaceful response—and a violent response."

A rise in homegrown terrorism in the Valley is highly likely, Khan suggests. "There's lots of anger there. It is sharp and fierce," he says. "But when people are defending their homes against Indian attacks, we don't call it militancy. We would call them freedom fighters."

Violence has already risen as India dismantles the "iron wall" in Kashmir. Cell-phone services were restored on Oct. 14 (the Internet is still restricted), but peaceful protesters are still being arrested. On Oct. 16, five were killed: two civilians, in attacks by suspected militants, and three alleged rebels, by Indian forces. Four days later, shelling on both sides of the boundary between India-administered Kashmir and Pakistan-administered Kashmir led to the deaths of at least nine soldiers and civilians.

ATUL LOKE—THE NEW YORK TIMES/REDUX

THE REPEAL OF ARTICLE 370 "opens the door to rejuvenate a moribund economy," the Indian ambassador to the U.S. wrote in a September New York *Times* column. But the clampdown has hit hard; the Kashmir Chamber of Commerce and Industry estimates the shutdown has already cost the region over $1.4 billion. Although tourists are now allowed in, the precarious security situation means the tourism and handicrafts sectors are unlikely to bounce back fast. Classes have not resumed at many schools and colleges. "We are helpless. I want to teach, but I can't teach," says a 46-year-old professor, who asked for anonymity out of safety concerns. "For some, it feels criminal to go to school and study because there's so much anger and resentment."

And Kashmir's $1.5 billion apple trade, which employs more than 3 million people, suffered during the blackout, which cut traders off from buyers. Now, militants are targeting apple sellers, pickers and drivers; within three days in October, two people were shot and another injured in two insurgent attacks on the apple trade.

Yet the violence in the Valley hardly represents a significant escalation, says Ajai Sahni, executive director of the Institute for Conflict Management in New Delhi. "Kashmir has been a theater of terrorism for over 30 years, and the idea that the government's recent moves were going to bring violence to an abrupt and sustainable end was visibly absurd," he says. Ultimately, he adds, a long-term political solution is needed, one that allows the people of Kashmir to address their grievances.

On Oct. 11, the state government took out a full-page ad on the front page of the newspaper *Greater Kashmir*. "CLOSED SHOPS, NO PUBLIC TRANSPORT? WHO BENEFITS? Are we going to succumb to militants? Think!!!" it pleaded. But most Kashmiris are not returning to business as usual, either too afraid of violence or determined to disobey New Delhi. "There's a collective sense of fear, humiliation, hurt and anger," Bhasin says. "The natural fallout is that this will erupt in different forms. The only question is when." —*With reporting by* SANYA MANSOOR/NEW YORK

A law protecting gunmakers faces a fight in court

By Melissa Chan

ORLANDO POLICE OFFICER ADAM GRULER WAS IN CHARGE OF security at the Pulse nightclub on June 12, 2016, when he heard gunfire on the dance floor, followed by a chorus of screams in the dark. He sprang into action, authorities say, exchanging gunshots with the shooter and calling for backup. He was instantly dubbed a hero, receiving a valor award and an invitation to the State of the Union address. Praise came from all over.

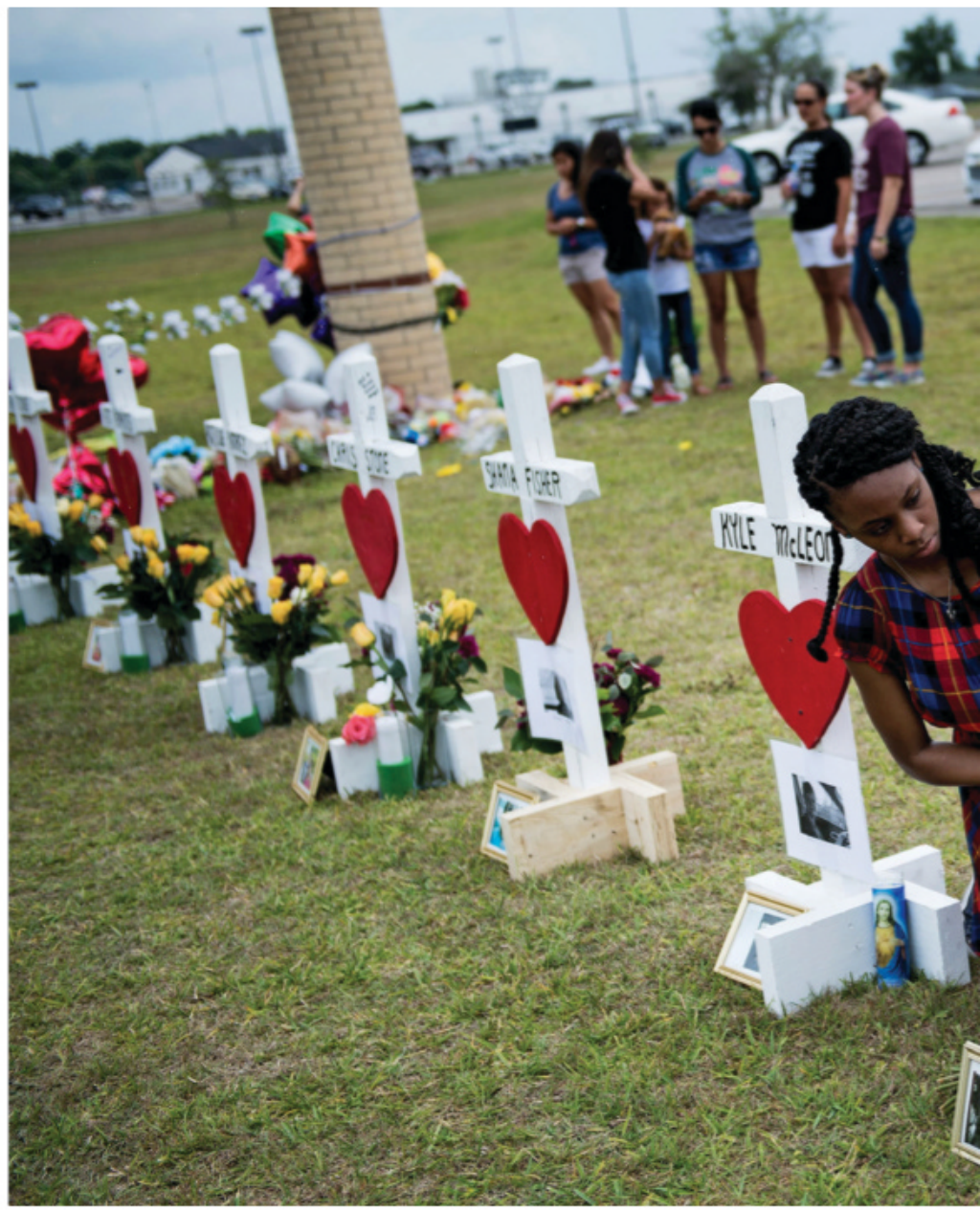
Then Gruler was sued. Nearly two years after the massacre, a group of survivors claimed in federal court that Gruler didn't do enough to stop the gunman, Omar Mateen, who killed 49 people and injured 53 others. The victims said Gruler "abandoned his post" at the front door, allowing Mateen to stroll into the crowded nightclub with a handgun and a semiautomatic rifle. The suit also named the city and 30 police officers, accusing them of not entering the club fast enough to "neutralize" Mateen, who died in a shootout with police. "We deserved better," survivor Keinon Carter said at a news conference in June 2018 when the lawsuit was announced.

Family members of slain Pulse victims and survivors also sued Google, Facebook, Twitter, the gunman's employer, his wife and Pulse owner Barbara Poma in separate lawsuits. "I know that she is not a bad person," Aryam Guerrero, whose brother was killed at Pulse and whose family is among those suing Poma, says of the club owner. "But in this day and age, with all the mass shootings, there should have been more security there. She should have known better."

A flurry of lawsuits were also filed after 58 people died at a music-festival shooting in Las Vegas in 2017. More than 450 survivors sued the owners of the Mandalay Bay Resort and Casino, where Stephen Paddock opened fire into the crowd; the promoters of the country-music festival; and Paddock's estate. On Oct. 3, MGM Resorts International, which owns Mandalay Bay, said it would pay up to $800 million to families of those killed and hundreds who were injured.

Notably absent from any of the defendants were makers of the weapons used in the deadly rampages, who are shielded by the Protection of Lawful Commerce in Arms Act (PLCAA). The federal law largely safeguards firearm and ammunition manufacturers and sellers from liability when their products are used in crimes, but in what could prove a precedent-setting case, relatives of victims of the Sandy Hook school shooting are suing Remington Arms, which made the Bushmaster rifle used in the killing of 20 first-graders and six educators in Connecticut in 2012. They allege Remington violated state law in its marketing tactics and hence is not protected by the PLCAA.

Josh Koskoff, an attorney for the Sandy Hook families, says the PLCAA has opened the door to "scapegoating" of people who bear no blame for mass shootings. Robert Spitzer, a gun-policy expert and chairman of the political-science department at the State University of New York at Cortland, agrees. While America is a famously litigious society, he says, lawsuits such as those filed after the Pulse and Las Vegas shootings are not frivolous. Instead, they're by-products of the lack of legislation that might prevent mass shootings. "The legal avenue becomes a way to try and at least hold people responsible when the political system has failed to a great degree to act," Spitzer says.



Jai Gillard visits a memorial on May 21, 2018, for the 10 victims of a shooting three days earlier at Santa Fe High School in Texas

The PLCAA was enacted in 2005 following pressure from the firearms industry after a series of lawsuits against major gunmakers, including a groundbreaking 1999 case in which a Brooklyn jury decided that more than a dozen gun manufacturers were liable in shootings because of negligent distribution practices. The verdict was overturned on appeal in 2001, but the case shook gunmakers.

Since becoming law, the PLCAA has deterred families from suing gunmakers even when they feel they're the biggest culprits in a loved one's death. That was the case for Christine Leinonen, whose only child, Christopher "Drew" Leinonen, 32, died in the Pulse shooting. "I had to look at what exactly happened and why did it happen and who had a duty to my son and who reneged on that duty," Leinonen says. The gunman was dead, so she focused blame on his weap-

BRENDAN SMIALOWSKI—AFP/GETTY IMAGES

ons. But when Leinonen saw the challenge of taking on the gun industry, she sued Google, Facebook and Twitter instead, alleging the Internet giants played a role in the shooter's untempered radicalization. "We can sue almost everybody for anything, yet we cannot touch gunmakers," Leinonen says. "That's a big reason we have a gun problem."

A federal judge dismissed the suit in March 2018, which Leinonen expected. "The argument with the Internet was a weak argument but possible," she says. "The argument against the gun manufacturer was impossible."

On Nov. 14, 2018, a federal judge dismissed the civil suit against Gruler, the city and the unnamed officers. The plaintiffs have appealed. Gruler, 43, declined comment because of the pending litigation. His attorneys did not return requests for comment.

FAMILIES IN MOURNING have many reasons for pursuing litigation after tragedies. A hunger for justice propels most of them. So does the desire to change laws. After Rhonda Hart's 14-year-old daughter Kimberly Vaughan died at Santa Fe High School in Texas on May 18, 2018, Hart sued the parents of Dimitrios Pagourtzis, who's accused of killing eight students and two teachers with a shotgun and a revolver. The lawsuit says the parents knew their son was a possible danger but "did not do even the bare minimum" to keep him from accessing his father's weapons, an allegation denied by the parents' attorney, Ron Rodgers. "As far as they knew, he was a responsible and well-adjusted kid," Rodgers says.

Hart's main goal in suing is to strengthen gun-storage laws. "That would be a way bigger victory," she says. The family of Sabika Sheikh, a 17-year-old exchange student from Pakistan who also died in the massacre, is also suing the parents. Sabika, an aspiring diplomat, hid in a classroom closet, where she was shot nine times in the head and right shoulder. "She was really unassuming because she did not grow up in a culture of gun violence in school," says her cousin Shaheera Albasit.

Albasit, Hart and Leinonen say the massacres that ripped their loved ones from them were sparked by multiple failings. When that's the case, they say, all parties should answer for them. "There are good reasons for lawsuits to take place," says Leinonen. "You have to look at the entire puzzle."

Major automobile companies have shelled out billions of dollars in settlements over design flaws and defective airbags and other faulty parts. In cases of accidental death or injury on international flights, airlines must pay families a minimum liability, regardless of fault, of about $170,000 per victim, according to the international Montreal Convention agreement. Yet despite roughly 265 million civilian-owned firearms in circulation in the U.S. and tens of thousands of shooting deaths every year, no other U.S. industry is as guarded from liability as the gun industry, critics say. Taking on manufacturers and sellers of firearms and ammunition is technically possible in a few circumstances: if a defective weapon causes death or injury, for example, or if a seller or manufacturer is found to have violated a law in the marketing or sale of a product. But it's not easy. Families that try face years in court and risk financial ruin. When Sandy and Lonnie Phillips sued an online company that sold the ammunition a gunman used to murder their daughter and 11 others in a movie theater in Aurora, Colo., in 2012, they lost the case and went bankrupt after a judge ordered them to pay more than $200,000 to cover the defendant's legal fees—a consequence unique to Colorado.

In March, the Sandy Hook plaintiffs won a victory when the Connecticut supreme court ruled that Remington could be sued over its marketing tactics. The suit is on hold while the U.S. Supreme Court decides whether to grant Remington's request for a review of the lower court's decision. According to Lawrence Keane, a senior vice president for the National Shooting Sports Foundation, a gun trade group, allowing Remington to be sued for the Sandy Hook shooter's actions is as senseless as holding an automaker responsible for a drunk driver's actions. "The person who engages in that criminal conduct is responsible," Keane says, not the product manufacturer.

Koskoff hopes the Sandy Hook lawsuit encourages more people to go after gun companies, which he calls the "root cause" of the gun-violence problem, instead of suing perceived "easier" targets like security guards. "Whenever victims sue in mass shootings everyone and anybody but the gun industry, it's nothing but a win for the gun industry," he says. ☐

'We can sue almost everybody for anything, yet we cannot touch gunmakers. That's a big reason we have a gun problem.'

CHRISTINE LEINONEN, whose son died in the Pulse shooting

Author **Christopher McDougall** wrote a seminal book on running. Now he turns to donkeys

By Sean Gregory

I SUBMIT: ONE HAS NEVER *REALLY* GONE OUT FOR a proper run unless one has shuffled through a cornfield in Amish country, dodging a donkey who's trying to kick you with its hind legs while passing gas in your face. That's where I've found myself on this bright late-September morning in Peach Bottom, Pa., on a trot with author Christopher McDougall, his wife Mika and a trio of asses. McDougall is the author of this century's seminal book on running, the 2009 best seller *Born to Run,* which tracked an indigenous group of ultramarathoners from the remote canyons of northern Mexico; their minimalist style helped spark the barefoot-running craze. *Born to Run* has sold over 3 million copies, popped up in episodes of *Orange Is the New Black* and *Big Little Lies,* and made McDougall a star on the lecture circuit.

His newest book, *Running With Sherman,* touts the benefits of burro racing. Yes, burro racing; runners hold onto a rope attached to a donkey's halter and sprint alongside the animal. Sometimes the donkey cooperates. Other times, it kicks and farts. McDougall insists this flatulent burro attempting to punt me across the stalks is actually having a grand time. I'm not so sure.

Netflix has already optioned the rights to the book's story, which begins some four years ago when McDougall—who moved in 2002 from Philadelphia to a farm in Pennsylvania Amish country—takes in Sherman, a donkey neglected by an animal hoarder. Sherman arrives with dung-crusted fur, rotten teeth and hooves "so monstrously overgrown," McDougall writes, "they looked like a witch's claws." A friend has to trim them with a hacksaw. "He was catatonic, stunned and spiritless," McDougall says now. "He looked like a stuffed animal."

McDougall determines that if Sherman is going to survive, he'll need a mission: training for the world championship of donkey running, which takes place in Colorado in less than a year. "Today, movement-as-medicine is a biological truth for survivors of cancer, surgery, strokes, heart attacks … you name it," McDougall writes in *Running With Sherman,* which came out on Oct. 15. "So why wouldn't it also be true for Sherman, with the blood of wild African asses in his veins?"

Along the way to the donkey race, a rash of calamities befall the humans training Sherman: a broken hand, foot and vertebrae—none caused by a donkey—even a broken marriage. Despite these painful hiccups, Sherman and his brethren wind up helping their handlers just as much, if not more, than they aid the animals. Donkey running offers therapy for a depressed college student, and happiness for kids with autism and epilepsy. Sherman approached running on his own terms, so a stubborn donkey taught McDougall how to adjust to those around him. "If he wants to walk, he's going to walk," says McDougall, 57, during a break in our donkey workout. Tall and fit, he's bare-chested—though not barefoot—and wearing a red bandanna. "Breathe in, breathe out, man," he says. "Not everything is on your clock."

MCDOUGALL DIDN'T RUSH his way to nonfiction superstardom. After rowing for Harvard in the mid-1980s, he taught English in Spain for a few years before returning home to Philadelphia, where he played too much pickup basketball and considered law school. He declined a legal life, and once he realized his fondness for recreational hoops was impeding a return to Europe, he hustled back overseas. "I was on the fence about it because I really liked these courts and my pickup game on South Street," says McDougall. "I finally said to myself, Really?"

An Associated Press editor in Madrid hired him as a correspondent, despite a clear lack of qualifications. Soon enough, the AP dispatched him to Angola, then Rwanda, before he returned to Philly again to try his hand at freelance writing. He got stories published in places like the New York *Times* Magazine and *Runner's World,* and had a steady gig at *Philadelphia Magazine* before clashing with an editor. "I told him if you want to fire me, fire me," McDougall says. "You can't tell a guy from Philly to fire you more than twice."

With his second daughter a week old, McDougall lost his health care benefits and two-thirds of his income. Luckily he had already gotten wind of the Tarahumara tribe of superathletes while reporting another story. McDougall's dire circumstances sparked him to pursue a book on the Tarahumara; in the end, his firing was quite fortuitous.

While barefoot running caught hold after *Born to Run,* Americans are unlikely to start donkey trotting en masse if *Running With Sherman* catches on. McDougall, however, hopes some broader lessons break through. He's convinced, for example, that it's no coincidence that his Amish neighbors are generally healthier and happier than average Americans. We're not going back to the horse and buggy. But a closer communion with animals and nature can only bring us benefits. "By actually focusing on another creature, you can take that compassion and attention into your own

MCDOUGALL QUICK FACTS

Old McDougall had a …
On his farm in Pennsylvania Amish country, he has cats, chickens, goats, sheep, geese, ducks and donkeys.

Get me rewrite
McDougall spent a year writing a draft of *Born to Run.* An editor told him to start over; he spent another year reworking it.

Weight of the world
He keeps a 30-lb. dumbbell near his desk that he occasionally pumps during writing breaks.

BRIAN FINKE FOR TIME

life, and the other people you're talking to and dealing with," says McDougall.

When our run continued down a road, a driver pulled up to ask McDougall, who was holding Sherman with his rope, for directions to a local welder. He then tried to hand McDougall a religious pamphlet. McDougall told him to bug off, taking none too kindly to the proselytizing. "I think Sherman would look at me," he says, "and say, 'We've got some work to do.'"

NOW IT WAS MY TURN to try my hand running with the book's protagonist. (Matilda, one of Sherman's pals, was the donkey kicking me.) McDougall told me to stay behind Sherman and lightly tap his gray fur with my rope, while sort of growling a command—"Grrrreup!"—to get him moving. "Grrrreup!" I yelled, with little conviction. "Grrrreup." My barks seemed inadequate, but McDougall told me I had a "refined growl." He may have just been buttering up a visiting writer, but "refined donkey growl" is a compliment I never expected, and will gladly take.

'I think Sherman would look at me and say, "We've got some work to do."'

CHRISTOPHER MCDOUGALL, psychoanalyzing his donkey

Despite my growling expertise, Sherman still wasn't moving. It takes a while to earn his trust. But once he saw Matilda and his other donkey running partners ahead of him picking up the pace, Sherman's ears perked up; he finally started moving. I clutched my rope before sprinting alongside the donkey, thinking Sherman and I were in lockstep. But the donkey stopped cold: I had forgotten McDougall's directive to stay behind the burro. Just because Sherman would run with me didn't mean he wanted to see me.

Sherman turned his head and stared, as if to say, "What the hell is wrong with you?" It's a look McDougall knows all too well. Sherman's message is as clear as the Pennsylvania sky. "I'm the donkey, goddammit," says McDougall. "And now I have to teach *you* what to do?" ◻

An exit and an escape

A U.S. military vehicle crosses paths with a Syrian family leaving the Ras al-Ain area on Oct. 20, the day U.S. forces pulled out of their base in the northern Syrian town of Tal Tamr. More than 160,000 civilians have fled since President Trump ordered U.S. troops to leave the region, clearing the way for Turkey's attack on the Kurdish forces who were America's essential ally against ISIS. On Oct. 22, Russia and Turkey said they would take joint control of land there that had been held by U.S. and Kurdish forces.

Photograph by Delil Souleiman—AFP/Getty Images

For more of our best photography, visit time.com/lightbox


H100

AMERICAN CRUISE LINES®

ON THE TRAIL OF *Lewis & Clark*

COLUMBIA AND SNAKE RIVERS

Follow Lewis and Clark's epic 19th-century expedition along the Columbia and Snake Rivers aboard the newest riverboats in the region. Enjoy unique shore excursions, scenic landscapes, and talented onboard experts who bring the region to life.

Small Ship Cruising Done Perfectly®

Call
1-800-913-2493
to request a
★ FREE ★
cruise guide

NATION

CHARACTER IS DESTINY

By David French

Throughout the 2016 presidential primaries and presidential campaign, those of us who were classified as "Never Trump" or "anti-Trump" conservatives repeated the same mantra, time and time again. Character is destiny. A man's temperament, knowledge and integrity inevitably shape his conduct.

INSIDE

WHAT CHILE'S PROTESTS REVEAL ABOUT THE WORLD

DAVID SHULKIN'S JOB INTERVIEW WITH PRESIDENT TRUMP

MARC BENIOFF ON WHY THE TRUTH MATTERS TODAY

While we have seen the consequences of Trump's character throughout his presidency, no series of crises has demonstrated his profound flaws more thoroughly than the twin foreign policy scandals in Ukraine and Syria. All the character traits that Trump's critics most feared are present—including his petty corruption, his temperamental unfitness and his rank incompetence.

Let's begin with Trump's incompetence. There is no question that Trump faced a difficult strategic and diplomatic challenge in northern Syria. He inherited command of a complex military conflict, and then proceeded to make terrible decisions that had immediate and profound consequences.

In early October, America enjoyed an alliance with the Kurds, who had borne the brunt of ground combat (and taken horrific casualties) in the successful fight against ISIS. America also enjoyed a long-standing (though increasingly difficult) alliance with Turkey. In mere days, however, Trump's abrupt and shocking retreat after a single call with Turkish President Recep Tayyip Erdogan destroyed our nation's alliance with the Syrian Kurds, granted ISIS a lifeline and put our alliance with Turkey under unprecedented strain. Americans watched in shame and embarrassment as Russian mercenaries and media toured a hastily abandoned American base.

President Trump at a Presidential Medal of Freedom ceremony for Edwin Meese III on Oct. 8

The Syrian disaster temporarily shoved Ukraine from the headlines, but the impeachment inquiry further reveals Trump's corruption and unfitness.

Evidence continues to emerge that Trump was attempting to coerce Ukraine to investigate Joe Biden and his son. Beyond the blindingly obvious quid pro quo revealed in the summary of the conversation between Trump and Ukrainian President Volodymyr Zelensky, messages show that an American diplomat believed that Trump was conditioning military aid on Ukrainian assistance.

Even the most defensible of Trump's requests—that Ukraine helped investigate foreign interference in the 2016 presidential election—is tainted. He is obsessed with fringe conspiracy theories, including the bizarre idea that there exists a server in Ukraine that either proves Russia didn't interfere in the 2016 election or contains Hillary Clinton's missing emails. There is absolutely no evidence any such server exists.

While Trump's entire presidency has been marred by his chaotic behavior, his defenders have repeatedly noted that many of his policies—on taxes, abortion rights, court appointments—have been squarely in the Republican mainstream. They've also noted that many of his advisers tempered his worst impulses. But all that is changing. The guardrails have collapsed.

Trump's character chased off his best advisers. General Jim Mattis is long gone. He resigned after Trump's first attempt to destroy the American alliance with Syrian Kurds. White House counsel Don McGahn is long gone. He arguably saved Trump's presidency by refusing to fire special counsel Robert Mueller. John Kelly is gone. H.R. McMaster is gone.

THERE WAS a time when Republicans believed that character counted. GOP officials warned America that Bill Clinton was a lying lothario whose personal conduct was reckless. And they were correct. Not even the great weight of the Oval Office (much less his marriage vows) could keep him from a tawdry affair, nor could an oath keep him from illegally lying about his misconduct.

But the partisan mind is capable of endless contortions and rationalizations in the pursuit of power. For the GOP partisan, character is no longer destiny. It's an increasingly irrelevant factor in the quest for power—even when the exercise of that power consistently results in outcomes and policies that Republican stalwarts once opposed.

While it's gratifying to see a number of Republicans in Congress condemn Trump's Syrian retreat, few are acknowledging the full truth of the moment that this is Trump unleashed. This is the man in full, and he is demonstrating that he's just as corrupt, unfit and incompetent as his critics feared.

French is a TIME columnist

SHORT READS

Highlights from stories on **time.com/ideas**

Charting a course

In *Sailing True North,* TIME columnist retired Admiral James Stavridis looks at what 10 admirals can teach us about character. **"The nature of any human is not how they do when the choices are easy, and the metaphorical sun is shining," he writes in an excerpt, "but rather what they do when the options are morally ambiguous, and the seas are rough."**

Fighting stigma

When Thinx, the maker of reusable underwear intended to replace other period products, made its first national TV ad, networks refused to air it unless the company removed a tampon string from a scene. **"About half of the world's population will experience a period in their lifetime, so what's wrong with an ad depicting them?"** asks CEO Maria Molland.

Law and order

Hong Kong Chief Executive Carrie Lam used the Emergency Regulations Ordinance to enact a ban on face masks. But according to Jan Wetzel, a senior legal adviser for Amnesty International, it's **"a colonial-era law whose implications are far-reaching and alarming."**

TRUMP: JABIN BOTSFORD—THE WASHINGTON POST/GETTY IMAGES; CHOPRA: GETTY IMAGES

THE RISK REPORT

Chile's protests reflect our unequal times

By Ian Bremmer

AROUND THE world, 2019 has been a year of public protest, and in some countries it's not hard to understand why. In Hong Kong, demonstrators want to preserve the city's autonomy within a repressive Chinese political system. In Algeria and Sudan, the issue is frustration with decades of dictatorship. In Ecuador, Nicaragua and Haiti, it's poverty and bad governance. In Iraq and Lebanon, the protest focus is endemic corruption.

But what's going on in Chile, one of South America's most peaceful and prosperous countries? Earlier in October, a team of government technocrats announced that a weakening currency and higher fuel costs demanded an increase from 800 to 830 pesos in the cost of rush-hour public-transit fares in Santiago, Chile's capital. That's a rise of about 4 U.S. cents. In protest, younger commuters began dodging the fares, prompting a police crackdown and a wave of arrests.

The public anger, and the protests, then boiled over. Demonstrations spread to other cities, and some turned violent. Shops were looted, fires were set, and the government declared a state of emergency. Curfews were established in the country's largest cities. Startled Chileans have seen nothing like this since the end of the Pinochet dictatorship nearly three decades ago, and President Sebastián Piñera seems slow to recognize the public anger as legitimate.

THIS SURGE OF PUBLIC FURY didn't come from nowhere. Chile's new middle class has expectations for improving living standards. There have been protests in recent years over the cost and quality of education and health care and over pensions that don't help the elderly make ends meet, but little has changed in response. There is also the reality that Chile has one of the widest gaps between rich and poor of all the Organisation for Economic Co-operation and Development countries. But to understand why Chile's unrest is especially worrisome for other middle-income countries, look to the larger problem of unfairness.

In 2017, three Yale University scholars published a report in which they argued that concerns about inequality miss the mark. "There is no evidence," they wrote, "that people are bothered by economic inequality itself. Rather, they are bothered by something that is often confounded with inequality: economic unfairness." In other words, their study found that people will accept that some within society have more than others if they believe the better-off have earned their wealth and, crucially, if those less well-off have a fair chance to do better in the future.

Chile is a sign of protests to come in places where you might not expect to see unrest

That would mean Chileans, and those who live in other relatively peaceful and prosperous countries, are angered by doubts that the political system that governs their lives can provide a fair shot to get ahead. Why, they might ask, should poorer people who rely on public transit have to pay the price for a strong dollar and higher diesel costs? Particularly at a time when the wealth gap continues to grow. This is not a preference for one political party over another. It's an explosion of anger at an entire system that some consider hopelessly rigged.

In that sense, Chile is a sign of protests to come in places where you might not expect to see unrest. Widening wealth gaps are a global phenomenon, and a future in which new technologies eliminate lower-skilled jobs and make life better for the highly educated is likely to widen the divide still further.

And though Chile's government has backed down on the fare increases, the protests continue. ◻

QUICK TALK

Deepak Chopra

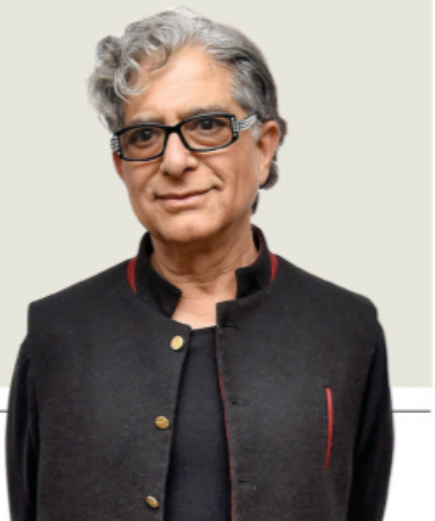
In his 90th book, *Metahuman: Unleashing Your Infinite Potential,* Deepak Chopra advises readers to "go beyond" human constructs and connect with their innate beings. He calls this becoming "metahuman" and says it's necessary for creating a better world.

Why did you write this book after so many others? The impetus was looking at what our collective mind has created: climate change, extinction of species, poison in our food chain, nuclear weapons, biological warfare, interference with democracies through Internet hacking. Seriously, it looks like we're planning our extinction.

How can being metahuman help? We have the technologies to reverse these trends already. But do we have the collective will? I think that requires a spiritual shift.

What's the first step in becoming metahuman? A simple contemplative meditation practice. Also a little bit of contemplative inquiry: "Who am I?" "What do I want from my life?" "What is my purpose?" "What am I grateful for?" When people start a journey of self-inquiry, it immediately leads to deeper insight.

—Annabel Gutterman



I served in Trump's Cabinet. My interview was a window into the chaos

By David Shulkin

AROUND 11 A.M. ON SATURDAY, JAN. 7, 2017, I RECEIVED A call telling me I was expected at Trump Tower in New York City at 2 p.m. that day. After about an hour of panic, driving with my wife Merle on snow-covered roads from Philadelphia, my cell phone rang. It was Reince Priebus. "Sorry not to have called sooner, but we're all set. You'll be meeting with the President-elect on Monday at 2 p.m." Monday, not today.

On Sunday, still mystified but intrigued, I took a train to New York. The next day, I headed over to Trump Tower. I wasn't quite sure what to expect, but I wanted the chance to tell the President-elect where progress was being made at the Department of Veterans Affairs and what direction his new Administration should take.

In 2014, when Obama Administration officials first approached me about going to the VA, many of my colleagues warned that it was simply too big and complex to change. They felt it was a surefire way to ruin my career in leading large hospital systems. But I took the job because I felt a sense of responsibility to our nation's veterans. There are more than 20 million U.S. veterans, and more than 9 million of them rely on VA health care, a system that is spread across the entire country, with approximately 1,300 facilities and more than 340,000 employees. It's the largest health care system in the U.S. and one of the most complicated organizations in the government.

I arrived in 2015 as Under Secretary of the Veterans Health Administration amid chilling reports of excessive wait times for VA medical care. There was also a breakdown in delivery of mental-health and addiction care, which left veterans to fend for themselves during epidemics of traumatic brain injuries and posttraumatic stress—neglect that led to suicides and overdoses. But after 17 months, I felt optimistic, energized and more responsible than ever, which is why, when presented with the chaotic swirl of events that were my introduction to Donald Trump and his team, I went in headfirst.

JUST INSIDE TRUMP TOWER, I was met by several Republican National Committee staffers, who escorted me to the lobby restaurant for lunch with Priebus. We ordered chicken Caesar salad, and discussed our families and nonpolitical interests. I gleaned no explanation for why I had been summoned.

As we approached the inner sanctum after lunch, Steve Bannon came out to escort me into Trump's office, familiar to millions from *The Apprentice*. As we shook hands, Trump announced, "He's a good-looking guy." Taken aback, I could think of nothing better to say than, "Nice to meet you, Mr. President-elect."

Most of Trump's inner circle were milling about in the room behind me—Jared Kushner, Kellyanne Conway, Michael Cohen, Bannon and Priebus. Kushner and Conway were having a side conversation, which they took outside. Trump turned to me and asked, "So what's the best hospital in the city?"

"Well, Mr. Trump, I think it depends on—"

'The generals … now, they fit the bill. But can they fix health care?'

"You know, I used to think well of this one place, but I know a guy who went in there feeling O.K., and they just chopped his thing right off! They chopped it off! I wouldn't go there for anything now."

Once again, I wasn't quite sure what to say. "Yes. Well … no hospital is good at treating every condition," I managed.

"So if you were sick, where would you go?" Before I could answer, he looked over at Cohen. "So, Michael, what do you think of this guy?"

"Donald, he's the best in his field."

"You really think so, huh?" Looking back at me, Trump asked, "So what do you think of McDonald?" Bob McDonald, the current VA Secretary and my boss, had been appointed by President Obama to replace General Eric Shinseki.

"I think he's one of the best leaders in the country," I answered truthfully. "He's been making really good progress, and I think he should stay."

"Yeah, I've heard good things, but there is no way we can keep him, just not possible. What do you think we need to do?" Then, answering his own question, Trump said, "I'll tell you what we need to do: we need to make sure our veterans

BRENDAN SMIALOWSKI—AFP/GETTY IMAGES

aren't waiting for care."

"Mr. Trump, you're absolutely right."

"We have to fix this thing. It's a mess. Do you think we can fix it?"

"We've been making big improvements on the wait times. We've developed same-day access, and we're getting more veterans—" He cut me off again.

"I want our veterans to get the best." Then he repeated, "They really created a mess here. Can we fix it?" Once again, I assured him that I was committed to doing just that.

Trump ruffled through a few papers, then looked up. "The VA's an important place, but there are some good ones and some bad ones. But I'll tell you what's messed up. They come back with PTSD. You know what's really bad? They come back, and their wives or girlfriends didn't wait for them." I swallowed.

He paused for a moment and then looked up as if actually seeing me for the first time. "You know, you don't really fit the bill. The generals . . . now, they fit the bill. But can they fix health care?" Not waiting for my response, he continued. "Who do you think would make a good secretary?"

Trump and Shulkin at a Department of Veterans Affairs event at the White House in August 2017

"Well, Mr. Trump, Bob McDonald is doing a great—"

Trump cut me off to ask about a certain African-American candidate from the Navy. I said I did not know anything about the gentleman. "What about this CEO of ExxonMobil?" Before I could answer, he moved on to, "What are you . . . like, the No. 2 or No. 3 guy at VA?"

"I'm No. 3, sir." Kushner and Conway came back in, passing a paper back and forth. Soon Priebus, Bannon and Trump were drawn in. It was about Kushner's role in the Administration. When they reached a resolution, Trump turned back to me. "So why is it so broken? The VA."

"Well, there are many reasons, starting with—"

"I think we need to let the veterans go wherever they want."

"Well, there needs to be a coordinated effort—"

"I'll tell you what: we're going to fix this thing. If you were in charge, what would you do first?"

"I would make sure that we had—"

"Do you think we can fix this thing?"

"Yes, Mr. President-elect, I do."

We went on like this for another 30 minutes or so. Finally, Trump turned to Priebus, Bannon and Cohen, and asked, "So what do you guys think?" Heads nodded in approval.

Then the President-elect turned to Cohen and said, "Next time you see him, you can call him Mr. Secretary." Confused, I stood, shook Trump's hand and left the office.

ON JAN. 11, 2017, when Trump announced that he had selected me as VA Secretary, I was as surprised as anyone. But I was pleased, as it meant I got to keep serving veterans. We made real progress during my time at the VA. The morale of the workforce was growing. We were passing new legislation. We were working with community partners and making structural changes to ensure sustainable improvements. I had found a way to get things done despite the turmoil within the Trump Administration, and things seemed to be running smoothly. Until they weren't.

Trump fired me by tweet in March 2018. It was clear to many that I had been pushed out by political insiders trying to privatize the VA, but some press reported I was let go in response to accusations of improperly accepting gifts and misusing taxpayer funds for personal travel. I am telling my story because the VA is still in grave danger. Its doctors, its administrators and, most important, our veterans are at risk as never before. We cannot expect our sons and daughters to risk their lives and fight for our freedom unless we keep our promise to care for them if and when they return home broken, injured or traumatized. The mission set forth by President Abraham Lincoln to care for those who have "borne the battle" is a sacred duty.

The time I spent in government changed me, and my family, forever—but it also gave me a renewed sense of purpose, as well as a belief that systems in government can be improved. It is important that Americans understand what the VA system is, how it works and why it exists. If we are willing to commit to our veterans as they have to us, we can all work together to build a safer, healthier and prouder country.

Adapted from the book It Shouldn't Be This Hard to Serve Your Country

WORLD

Dear Spain, let's talk about Catalonia's future

By Carles Puigdemont i Casamajó

FRANCESC PUJOLS, ONE OF THE LAST CENTURY'S MOST renowned Catalan philosophers, said, "Catalan thought will always grow anew and survive those who would foolishly bury it." It still rings true today.

Two years after Spain began a campaign of repression against the Catalan pro-independence movement, the resurgence of protests and civil-disobedience actions has been overwhelming. In Barcelona, tens of thousands took to the streets after the Supreme Court sentenced nine people, some for up to 13 years, on Oct. 14 for their roles in organizing a vote for Catalan self-determination against the wishes of the Spanish government.

No, the Catalan independence movement was not just a flash in the pan. It has not been quashed, as claimed by those in the government who seek to bury it. The movement has always existed and will exist until the political conflict is resolved.

The reaction to the convictions is impossible to understand for those who still ascribe to the belief that the referendum held in October 2017 is a "crime" punishable by harsher sentences than those given for manslaughter. But surely no society would stand in solidarity with the masterminds behind such a crime, or revolt over a fair sentence. The people know the sentence is not fair and those convicted are guilty of no crime.

Separatists in Barcelona light up their cell phones at an Oct. 20 protest

JOAN MATEU—AP

THE CRISIS THAT WE ARE EXPERIENCING is not regional or internal, but international. It affects a Europe that has so far remained silent in the face of violations of human rights committed by an E.U. member state. For the first time ever in modern Europe, members of a legitimately elected government and parliament have been imprisoned because of their political decisions. The damage to fundamental European values, which have always been based on the will of the people, may be irreversible.

For the past two years, I have been living in exile in Belgium. I now face a third arrest and extradition warrant for my role in the independence vote, after the first two were withdrawn by Spain. I have brought a claim to the European Court of Justice based on my rights as a Member of the European Parliament. Yet the Spanish state refuses to formally notify the European Parliament of my election in Catalonia in May, ignoring the will of more than a million voters.

This is not a crisis that can be swept under the carpet any longer. The value we attach to the vote is at stake, the value of the will of the people as the basis of the European way of life.

I am often asked why I think the Spanish state systematically refuses to meet us to discuss and find a political solution to the conflict. Why, they ask, is there so much hostility toward our movement in Spain as a whole? To me, it is because in the mind-set of Spanish politicians, resolving the problem means eliminating it—whether by imprisoning its leaders or intimidating its supporters. The idea of recognizing the other party's point of view and reaching compromises is completely alien to Spanish political culture, which is influenced by the weight of the colonial empire that spread around the globe through violence and extermination. Compromise is seen as synonymous with cowardice. Empires do not concede; they impose conditions.

You can see this mind-set in Spain's inability to form coalition governments. On Nov. 10, the country will head to the polls for the fourth national elections in four years, all because of its politicians' inability to concede, adjust their positions or build alliances. The system is incapable of coming together to ensure political and economic stability.

But now it is more urgent than ever before that the Madrid government sit down and talk. Prime Minister Pedro Sánchez has to pull his head out of the sand and deal with reality, even if it is a reality he does not like. Sentencing people to 13 years in prison, using repression as the only method of response and assigning the work of politicians to the courts has already proved not to work over the past two years. Their remedy has proved far worse than the illness. I ask Prime Minister Sánchez to sit down and talk.

Puigdemont i Casamajó is a former president of Catalonia's regional government

MEDIA

We need journalism to elevate humanity

By Marc Benioff

IT'S A PARADOX OF THIS MOMENT IN HUMAN HISTORY—we have a vast universe of information at our fingertips, yet we still struggle to understand the forces that shape our world.

The very technologies and social-media platforms that were supposed to bring us together have been used to sow division and undermine our democracy. Power comes from "we the people," yet public trust in institutions continues to decline. The free press that ensures transparency and accountability is under attack, here in the U.S. and around the world. We're surrounded by unprecedented prosperity but also shocking inequality, leading to calls for a new, more equitable and sustainable form of capitalism. Artificial intelligence can make us smarter, wealthier and healthier, yet algorithms increasingly decide which articles we read.

In moments of transformation like this, how do we ensure that we're elevating humanity and not undermining it?

MORE THAN EVER, the truth matters. Facts matter. Values matter. Whatever organization, business or institution we're a part of, we need to realize that we are not separate from the larger social issues that surround us. We have a responsibility not simply to make a profit but to make the world a better place. We have an obligation to serve all our stakeholders, including employees, communities and our planet. When we do, each of us can be a platform for change and a force for good.

This includes a free and vibrant press, which helps us understand our world and the stories of our fellow human beings. We are inspired—and moved to action—by families grappling with the injustice of economic inequality, by entrepreneurs striving to use technology ethically and humanely, and by young activists demanding that we address the climate crisis that imperils our planet.

That's why my wife Lynne and I decided to become the owners of TIME one year ago. For nearly a century, TIME has been trusted by millions of people around the world to tell the stories that matter most and to help us see one another. We see this commitment to telling the stories that matter and that shape our lives in TIME's coverage, led by editor-in-chief and CEO Edward Felsenthal and a global team. Every week, that red-bordered cover is a call to action to shake off our complacency and face squarely the most pressing issues confronting our world.

Today, TIME is a leading publisher on digital and social platforms, with a global audience of well over 100 million, reaching more people every day than its founders could have imagined. With five Emmy nominations in the past three years, TIME has taken readers deep into the Amazon rain forest and far into outer space through cutting-edge digital storytelling. Next year, TIME will use sophisticated virtual-reality filmmaking to re-create Martin Luther King Jr.'s historic March on Washington. We're investing in TIME's newsroom and its business to ensure that both continue to thrive for the next century.

A free and vibrant press helps us understand our world and the stories of our fellow human beings

Lynne and I also have a deep appreciation for the power of a free and vibrant press on a more local level, in our own community of San Francisco. Eight years ago, we read a story in the San Francisco *Chronicle* about a boy named Rudy, a homeless fourth-grader. With his parents and older brother, he spent nights in homeless shelters, huddled in bus stops and in city parks. In the mornings, he got up and took two buses to elementary school, tired and hungry. Rudy's story shocked us and galvanized us, and we have since made support for homeless families a focus of our personal philanthropy.

Last year, I supported a ballot measure to levy a tax on San Francisco's largest companies, including my own, to address the city's homelessness crisis. A free press played a vital role during the public debate. When misinformation and false narratives began to surface, the press sought out the truth. Armed with the facts, voters were able to make more informed decisions, and we were thankful that the measure ultimately passed by more than 60%.

OUR WORLD HAS UNDERGONE countless transformations since the first TIME magazine hit the newsstands in March 1923, for a price of 15¢. In our hometown of San Francisco or wherever you're experiencing TIME, none of us can know what changes will come in the decades that lie ahead.

What we do know is that the changes we seek won't just happen on their own. They'll occur only when we truly listen to one another and recognize that everyone—including a little boy, homeless on the streets of San Francisco—matters and deserves an equal chance to succeed and to live with dignity and opportunity.

These are the stories that need to be told. These are the stories that we need to hear—and that should inspire every one of us to do what we can to serve all our stakeholders and to improve the state of our world.

Marc and Lynne Benioff are the owners of TIME. Marc is also the chairman and co-CEO of Salesforce and the author, with Monica Langley, of Trailblazer: The Power of Business as the Greatest Platform for Change

Health

INNOVATION
44

ACCESS
62

PREVENTION
84

There was a time, not so long ago, when medical discoveries still struck like thunderbolts, specific and dramatic. Alexander Fleming realized on Sept. 28, 1928, that the spores growing in his lab were penicillin, the first antibiotic. In 1953, Jonas Salk explained the vaccine against polio on a radio show.

It is a paradox of our age that medical advances now accumulate at such a rate that a significant challenge for the health community lies in just keeping up. The technology for editing the human genome was discovered only in 2012, and is already being used to snip out the genetic mutation responsible for sickle-cell anemia in patients. For decades, harnessing the immune system to fight cancer was a tantalizing idea, yet over the past 10 years, nearly 20 new treatments relying on novel ways to train immune cells to target tumors have been approved, saving lives

and quietly racking up victories in what was once known as the War on Cancer. Big Data and artificial intelligence are revealing approaches to health care long out of reach of human comprehension—and also exposing the blind spots of research too long focused on the white, wealthy and Western.

Medicine is a matter of science. But it's also a matter of income, geography and justice. Access to health care is still impeded in much of the world—by neglect, by distance, by governance, by prejudice and by fixed ideas of the possible. Scientific advances become medical progress only when they reach the people who need them most.

Where Well Goes Next.

Medical science's age of discovery

By DR. FRANCIS S. COLLINS

OUR WORLD HAS NEVER WITNESSED A TIME OF greater promise for improving human health. Many of today's health advances have stemmed from a long arc of discovery that begins with strong, steady support for basic science. In large part because of fundamental research funded by the National Institutes of Health (NIH), which traces its roots to 1887, Americans are living longer, healthier lives. Life expectancy for a baby born in the U.S. has risen from 47 years in 1900 to more than 78 years today. Among the advances that have helped to make this possible are a 70% decline in the U.S. death rate from cardiovascular disease over the past 50 years, and a drop of more than 1% annually in the cancer death rate over the past couple of decades. As one more dramatic example, thanks to remarkable advances in antiretroviral drugs, most Americans with human immunodeficiency virus (HIV) can now look forward to an almost normal life span.

Yet, despite this astounding progress, much more remains to be done. Among the many efforts now poised to change the future of health are those to harness the power of gene editing, expand the reach of cancer immunotherapy, map the human brain and build a solid foundation for a more individualized approach to health care, often called precision medicine. And along with the bright promise of preventing, treating and curing some of humankind's most feared diseases come some crucial questions about how to ensure such breakthroughs are applied both ethically and equitably.

ONE OF THE GREAT THINGS about basic science is that it is impossible to predict where it might lead. For example, no one could have imagined that relatively routine efforts to sequence bacterial genomes and to improve yogurt production would lead to development of a revolutionary new gene-editing tool. But it did! In the late 1980s, scientists found strange repetitive DNA sequences called Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) in bacteria, and a couple of decades later, other researchers discovered that the CRISPR system helped yogurt's beneficial bacteria fend off viral invaders, by detecting and snipping their DNA. After CRISPR's exact mechanism was figured out, this exquisitely precise gene-editing technology was quickly put to work in a wide range of biomedical settings.

Researchers think CRISPR and related gene-editing technologies hold tremendous potential for treating or even curing the thousands of diseases for which we understand the molecular mechanism but treatments are limited or unavailable, such as sickle-cell disease, muscular dystrophy, Huntington's disease and a long list of others. All of these exciting treatment opportunities involve editing the DNA of specific cells that can help the intended patient but are not passed on to future generations. Here is where gene-editing technology encounters a critically important ethical boundary. NIH and virtually all credible international bodies remain opposed to clinical applications of heritable gene editing, which involve using gene editing on human embryos, sperm or eggs. These interventions are difficult to justify medically and would irreversibly alter the DNA blueprint of future generations of humankind.

Another rapidly emerging field, cancer immunotherapy, is also the fruit of decades of basic research. In fact, one fascinating study showed that a successful immunotherapy approach, called checkpoint inhibitors, arose from a century of cumulative work by more than 7,000 researchers, including 2018 Nobel laureates James Allison and Dr. Tasuku Honjo. Other pioneers in the effort to enlist a patient's own immune system in the fight against cancer include Dr. Carl June and Dr. Steven Rosenberg, who are now looking to extend and fine-tune their cell-based strategies so they benefit more people with many more types of cancer.

While cancer immunotherapy is still in its infancy, some impressive reports of its ability to save lives are beginning to roll in. For example, new survival data from one of the longest-running immunotherapy trials—a combination approach using checkpoint inhibitors for metastatic melanoma—showed that 52% of patients were still alive after five years. Before the advent of immunotherapy, the five-year survival rate for this deadly form of skin cancer was only about 5%.

Perhaps no basic science endeavor has a more ambitious goal than the NIH-led Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative: developing the tools needed to understand how the human brain's roughly 100 billion cells, each with about 1,000 connections, interact in real time. As a result, we will have a much better grasp of how the brain works to produce our motor activities, memory deposition and retrieval, cognition, emotions and behaviors.

Brain diseases still pose some of the greatest mysteries in modern medicine. So the aim of the upwards of 500 investigators at more than 100 institutions supported by the BRAIN Initiative is to spur progress in neuroscience, much as the international Human Genome Project did for genetic research. Such understanding will open new avenues to treat Alzheimer's disease, autism, depression, epilepsy, Parkinson's disease,

Collins is the director of the National Institutes of Health (NIH)

ILLUSTRATION BY JUSTIN METZ FOR TIME

schizophrenia, stroke, traumatic brain injury and many other neurological disorders.

Basic science also plays an important role in prevention. Currently, most recommendations about how to prevent disease are based on the expected response of the average person. Precision medicine is an innovative approach to the diagnosis, management and prevention of disease that takes into account individual differences in genes, environments and lifestyles.

To realize the full potential of precision medicine, the NIH launched the All of Us Research Program in May 2018 to build a diverse research cohort of 1 million or more volunteers from across the U.S. Among other things, All of Us will aim to do for all diseases what the Framingham Heart Study has done for the prevention of cardiovascular disease. Begun in 1948, the Framingham study initially enrolled more than 5,000 residents of this small Massachusetts town and, over time, their children and grandchildren, eventually reaching 15,000 volunteers. Because of them, we now know much more about high blood pressure, high cholesterol, smoking and other modifiable risk factors for cardiovascular disease—knowledge that has helped to save millions of lives.

70%

Decrease in the death rate due to cardiovascular disease in the U.S. in the past 50 years

Until recently, most studies and clinical trials have been conducted with participants largely of ancestral European origin. As a result, there are many new drugs being developed to treat cancers and other serious diseases—but often their effectiveness has not been established in African Americans or other racial and ethnic groups because they were not included in research studies. That needs to change.

To make sure that people of all backgrounds benefit from advances in precision medicine, All of Us has made it a priority to enroll volunteers from groups that are traditionally underrepresented in medical research, including African-American, Hispanic and Latino, American Indian, lower-income and rural communities. So far the results have been encouraging. More than half of the nearly 210,000 people fully enrolled to date are racial or ethnic minorities, and nearly 80% are from groups underrepresented in medical research.

We will apply the latest methods and approaches in data science to merge, integrate and analyze information from a wide variety of sources—biological, environmental, socioeconomic and geospatial. By combining data into one large resource, with proper security and privacy safeguards, the process of conducting research will become easier, faster and ultimately less expensive.

All of Us is just one of many innovative steps that biomedical research is taking to build the next generation of resources that will help to tackle many of the complex and difficult issues facing health care today. What we learn using these transformative tools and technologies may help reduce costs by shortening the translational timeline from scientific discovery to real-world therapies, as well as provide valuable new insights into how to set about addressing socioeconomic disparities in health status both here and abroad.

Such insights can then be used to ensure that people from all walks of life, all around the world, will be healthier than ever. And is that not the aim of all biomedical research, be it basic, translational or clinical? We look forward to the time when the long arc of scientific discovery finally makes it possible to vanquish many of the chronic diseases that devastate far too many lives today. ☐

Innovators

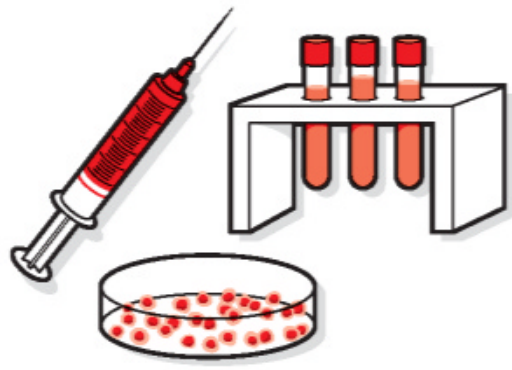
The future of health and medical science

The new frontier

Pocket-size ultrasound devices that cost 50 times less than the machines in hospitals (and connect to your phone). Virtual reality that speeds healing in rehab. Artificial intelligence that's better than medical experts at spotting lung tumors. These are just some of the innovations now transforming medicine at a remarkable pace.

No one can predict the future, but it can at least be glimpsed in the dozen inventions and concepts on the pages that follow. Like the people behind them, they stand at the vanguard of health care. Neither exhaustive nor exclusive, the list is, rather, representative of the recasting of public health and medical science likely to come in the 2020s.

—Elijah Wolfson



Doug Melton

A stem-cell cure for diabetes

Type 1 diabetes affects 1.25 million Americans, but two in particular got Harvard biologist Doug Melton's attention: his daughter Emma and son Sam. Treatment can involve a lifetime of careful eating, insulin injections and multiple daily blood-glucose tests. Melton has a different approach: using stem cells to create replacement beta cells that produce insulin. He started the work over 10 years ago, when stem-cell research was raising hopes and controversy. In 2014 he co-founded Semma Therapeutics—the name is derived from Sam and Emma—to develop the technology, and this summer it was acquired by Vertex Pharmaceuticals for $950 million. The company has created a small, implantable device that holds millions of replacement beta cells, letting glucose and insulin through but keeping immune cells out. "If it works in people as well as it does in animals, it's possible that people will not be diabetic," Melton says. "They will eat and drink and play like those of us who are not."

—Don Steinberg

INNOVATION INDEX

WALMART'S TAKE ON PRIMARY CARE
page 47

MEDICAL DELIVERY DRONES
page 50

ILLUSTRATIONS BY BROWN BIRD DESIGN FOR TIME

Abasi Ene-Obong

A more diverse global bio bank

A major limitation threatens to hamper the era of personalized medicine: people of Caucasian descent are a minority in the global population yet make up nearly 80% of the subjects in human-genome research, creating blind spots in drug research. Dr. Abasi Ene-Obong, 34, founded 54gene to change that. Named for Africa's 54 countries, the Nigeria-based startup is sourcing genetic material from volunteers across the continent, to make drug research and development more equitable. 54gene is conscious of the ugly history of colonial exploitation in Africa. If companies are going to profit by developing marketable drugs based on the DNA of African people, Africa should benefit: so, when partnering with companies, 54gene prioritizes those that commit to including African countries in marketing plans for any resulting drugs. "If we are part of the pathway for drug creation, then maybe we can also become part of the pathway to get these drugs into Africa," Ene-Obong says.

—Corinne Purtill

Shravya Shetty

Cancer-diagnosing artificial intelligence

Symptoms of lung cancer usually don't appear until its later stages, when it's difficult to treat. Early screening of high-risk populations with CT scans can reduce the risk of dying, but it comes with risks of its own. The U.S. National Institutes of Health found that 2.5% of patients who received CT scans later endured needlessly invasive treatments—sometimes with fatal results—after radiologists erroneously diagnosed false positives. Shravya Shetty believes artificial intelligence may be the solution. Shetty is the research lead of a Google Health team that in the past two years built an AI system that outperforms human radiologists in diagnosing lung cancer. After being trained on more than 45,000 patient CT scans, Google's algorithm detected 5% more cancer cases and had 11% fewer false positives than a control group of six human radiologists. The early results are promising, but "there's a pretty big gap between where things are and where they could be," says Shetty. "It's that potential impact that keeps me going."

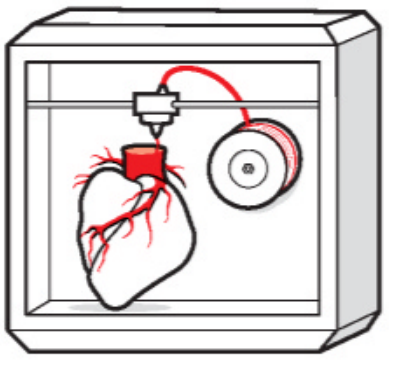
—C.P.

Charles Taylor

3-D digital hearts

For too many people with suspected heart problems, invasive catheterization is necessary to diagnose blocked or narrowed arteries. Doctors must then choose the best method for improving blood flow from a handful of options, including balloon angioplasty and stenting. Charles Taylor, a former Stanford professor, started HeartFlow to help patients avoid invasive diagnostic procedures and improve treatment outcomes. The company's system creates personalized 3-D models that can be rotated and zoomed into, so doctors can simulate various approaches on screens. In some cases, it can help avoid invasive procedures entirely. "By adding the HeartFlow . . . to our available resources for diagnosing stable coronary disease, we are able to provide patients with better care as we evaluate risk," said Duke University cardiologist Manesh Patel, at the American College of Cardiology's annual meeting in March.

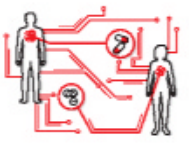
—Jeffrey Kluger



CANCER-RESEARCH DISRUPTION
page 57

VIRTUAL-REALITY REHAB TOOLS
page 67

A HANDHELD ULTRASOUND DEVICE
page 71



AI THAT CAN FIND NEW DRUGS
page 77

DEMOCRATIZED DATA PLATFORMS
page 79

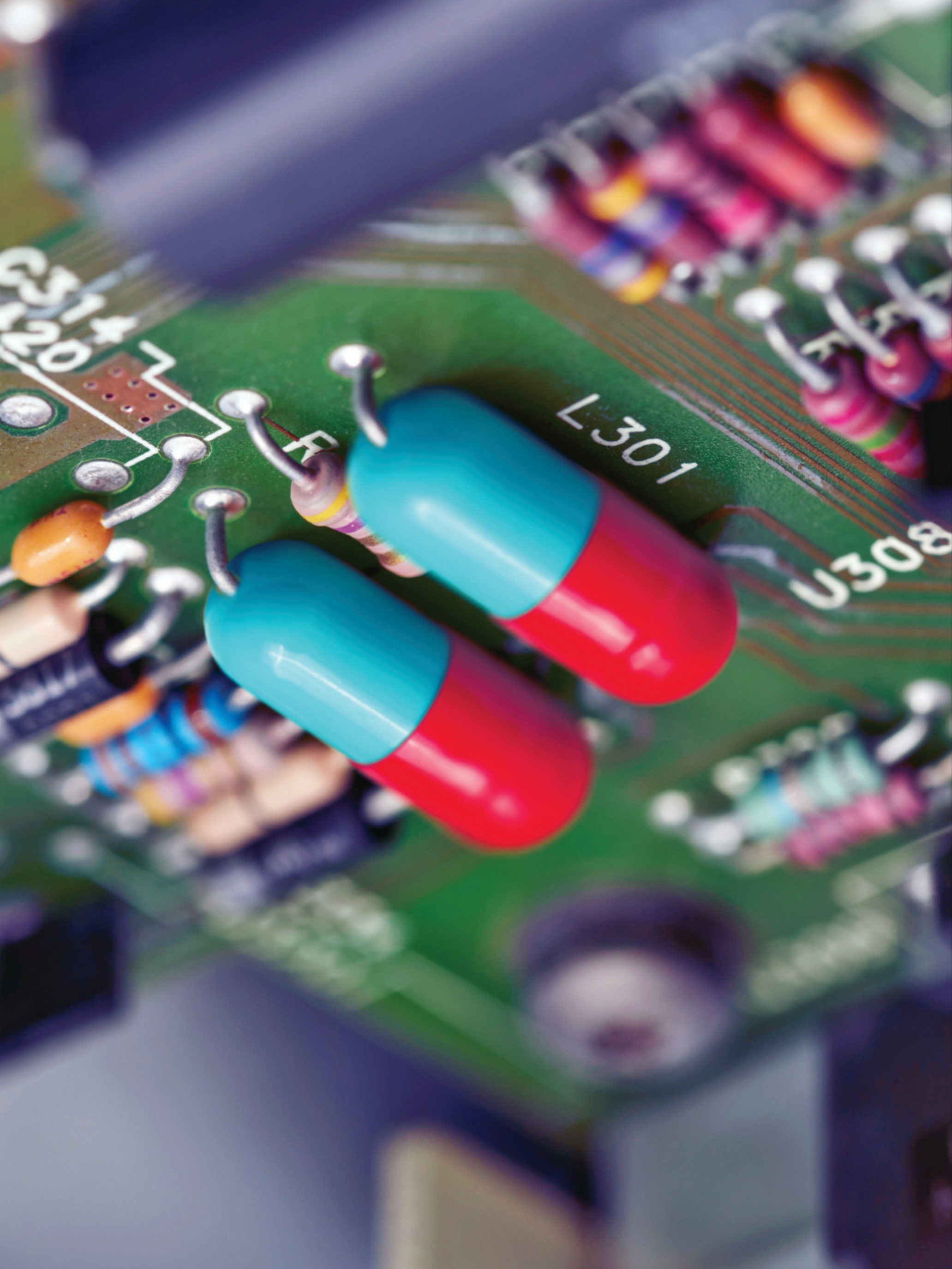
BRAIN-COMPUTER INTERFACES
page 87

innovation

Tapping Electricity for New Therapies

By ALICE PARK

ILLUSTRATIONS BY JUSTIN METZ FOR TIME


C314
C120
L301
J308

WHEN THE DISEASE PLAGUing her digestive system was at its worst, Kelly Owens once had to rush to the bathroom 17 separate times in the course of a few hours. By the time she was 25, her crippling case of Crohn's disease had given her arthritis from her ankles all the way up to her jaw and fingertips. The dozens of drugs she took helped a bit, but the brutal side effects included nausea, fatigue and weight gain. Nights were the worst. On good nights, Owens woke up to excruciating pain and couldn't fall asleep again, trying in vain to find a comfortable position. On bad nights, the diarrhea and vomiting made her so dehydrated, she needed to be hospitalized. "My body was at war with me," she says. Worse, the powerful drugs she took were weakening her bones: at 25 years old, she had the frail and weakened skeleton of an 80-year-old. There is no known cure for Crohn's, an inflammatory bowel disease that affects nearly 800,000 people in the U.S. Available medication provides only temporary relief. Owens, who was diagnosed at age 13, eventually developed resistance to all of the drugs she tried, and in February 2017, she says, her doctors told her, "We are out of [treatments] to try; there is nothing left because you have been on them all."

Hope for Owens and millions of others experiencing a broad range of previously untreatable, or unsatisfactorily treated, diseases may be near, thanks to a breakthrough that seems more science fiction than medical reality. The remarkable convergence of advances in bioengineering and neurology has resulted in a fast-developing way to treat chronic diseases, known as bioelectronic medicine. These advances allow scientists to identify specific nerves and implant devices that can be activated when needed to stimulate or dial down their activity; that in turn controls cells in organs targeted by those nerves that regulate the body's many immune and metabolic responses. While some bioelectronic, or electroceutical, therapies already exist to treat conditions such as headaches, certain cases of depression, as well as chronic and sinus pain, the new wave of electricity-based strategies could expand to help people with some of the most widespread chronic diseases in the world, including high blood pressure, arthritis, diabetes, some forms of blindness and even dementia.

For Owens, the new approach has been life-changing. After getting an electrical regulator implanted in her chest, she is now living pain-free for the first time in decades. Two weeks after she received the implant, doctors turned it on to a frequency customized to stimulate a specific nerve at just the right energy level to keep her immune system under control. That evening, she forgot to take her pain medication because she wasn't in pain.

$40 billion

The estimated size of the market for bioelectronic therapies by 2025, if current development continues

Such promise is already attracting scores of startups and major drug companies. Even with the still rudimentary efforts at stimulating some of the larger nerves in the body to treat, for example, headaches and chronic pain, financial analysts expect the market to reach $7 billion by 2025. Companies like Abbott already have neuromodulation devices designed to stimulate nerves, approved by the Food and Drug Administration, for treating chronic pain. The potential of the electroceutical field is part of a profound shift in the pharmaceutical

industry, which has long been focused primarily on developing new pills. But as blockbuster drug development has stalled in recent years, established pharmaceutical companies like GlaxoSmithKline see electroceuticals as a way to mine a new source of therapeutic possibility—through nondrug treatments that rely more heavily on device- and procedure-based methods, such as gene therapies and the recently approved CAR T-cell treatments for certain cancers. The appeal of these new approaches lies in their ability to bring precise and personalized treatment to patients like Owens. Drugs that are taken by mouth end up in nearly every cell in the body and eventually make their way to their intended target, which dilutes their effectiveness and increases the chances they can cause adverse reactions in tissues where they aren't supposed to be. The pharma industry and patients are eager for more customized approaches. Drug developers are capitalizing on genetic information that can help them better match the right therapies to the right patients—especially for cancer treatments where specially designed drugs are chosen to home in on particular mutations in tumor cells. Isolating certain nerves to stimulate or inhibit represents another promising extension of that bespoke focus.

"There has been frustration that for many diseases for which we make new drugs, there hasn't been tremendous progress," says Dr. Brian Litt, professor of neurology and director of the Penn Epilepsy Center at the University of Pennsylvania. If more of the chronic diseases that continue to command the most prescriptions and health care services can be treated with bioelectronic approaches, the market for the field could approach $40 billion. Electroceuticals "are the next wave of new treatments we will have to treat disease," says Kris Famm, president of Galvani Bioelectronics, a biotech collaboration between GlaxoSmithKline and Google's Verily that is focused on developing electricity-based therapies.

THE IDEA OF TAPPING into the body's electrical network is centuries old. In the late 1700s, Italian scientist Luigi Galvani was walking through an open market during a lightning storm when he noticed that frog legs for sale were still twitching. Intrigued, he conducted among the first studies of electrical stimulation, using an electrode to pass a current through a frog leg and observing that the signal prompted the muscles to move.

It turns out that many cellular functions—producing hormones, for example, or contracting or expanding muscles—are regulated by electrical signals that pass through nerves between the brain and the organs where the cells are located. The frequency of those currents determines how active the cells are in performing their assigned function.

Medicine's attempts to exploit this system grew more refined with time. The earliest were as likely to be hit or miss. In the 1930s, nerves in the brain were stimulated to understand and alleviate some of the symptoms of epilepsy. Electroconvulsive therapy destroyed or compromised nerves to address psychiatric disorders such as schizophrenia and bipolar. In recent decades, with better understanding of how electrical signals work in the body, more effective bioelectronic devices focused on refined modulation of electrical signals—including pacemakers for the heart, cochlear implants, as well as devices to control urinary incontinence and strategies for helping paralyzed muscles to move—have made it to market.

As researchers have learned more about how cells communicate electronically with one another, they are fueling a more sophisticated surge in bioelectronic devices that is delving deeper into more complicated neural networks. Innovations in engineering that are packing chips and other electronic components into tinier and tinier kits to implant in the body, with more power to communicate, charge, stimulate and record, are also expanding the range of diseases that might be treated with a bioelectronic therapy.

Owens could be at the vanguard of a new generation of patients who no longer have to treat chronic conditions by relying on pills that provide temporary and often unsatisfactory relief while exposing them to side effects. In the not too distant future, for example, scientists anticipate that patients with rheumatoid arthritis will no longer suffer from excruciating pain in their joints, but may be able to turn on an implanted electrical device to quiet the immune response that drives their painful inflammation. Or someone with high blood pressure could get an electrical device that would control how well the kidneys filter fluids, alleviating the need to pop pills every day. Or a diabetic could avoid the constant cycle of blood checks and pills or insulin shots, with an electroceutical device at the pancreas that protects their insulin-producing cells. At Massachusetts General Hospital, researchers are working on ways to activate nerves in the eye to restore vision in people with retinal disease, while scientists at Johns Hopkins are convinced that manipulating electrical signals in the brain in just the

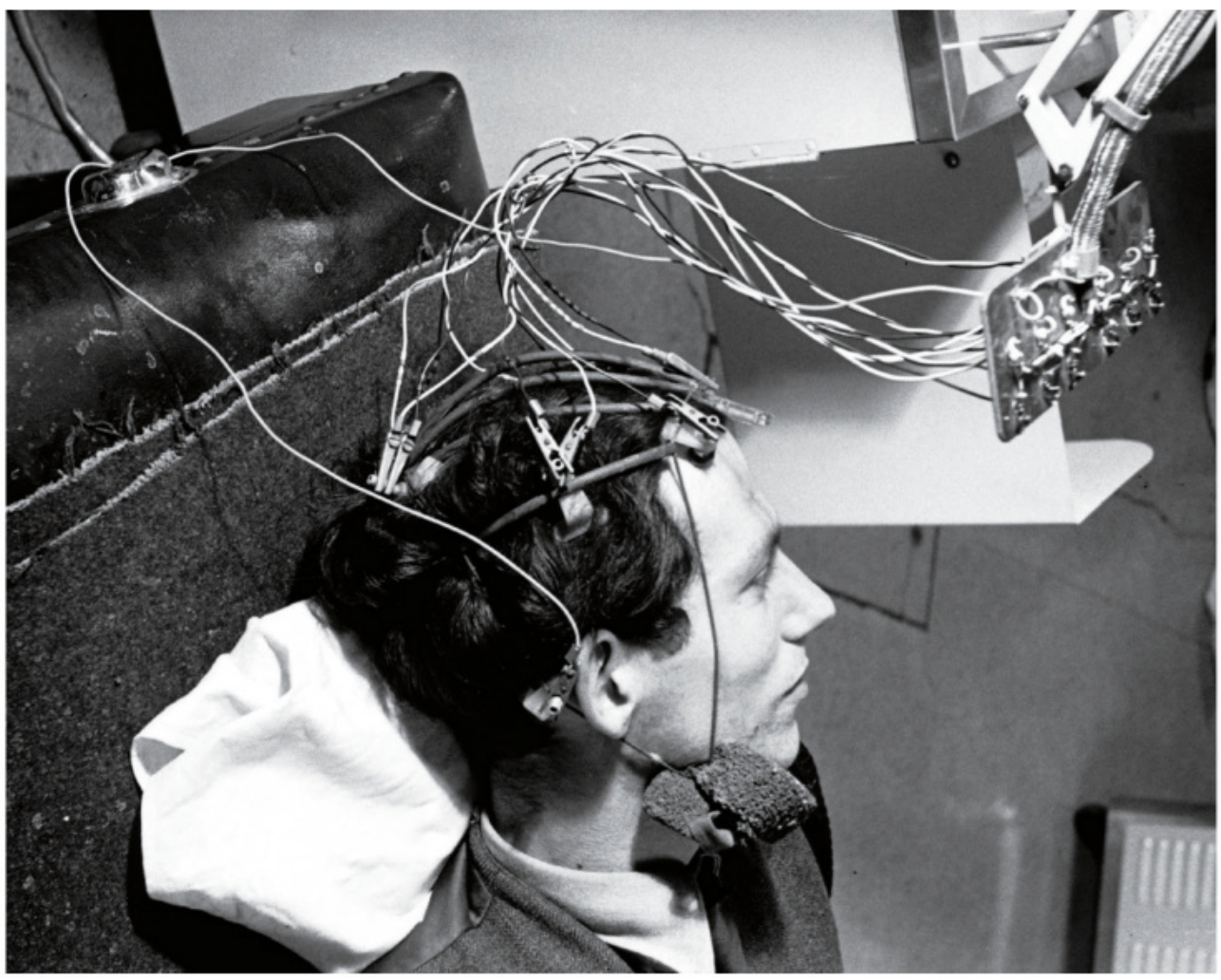
HEALTH CARE INNOVATORS

Sean Slovenski

Walmart-ification of health care

Whenever the world's biggest retailer aims its gigantic footprint at a new market, the ground shakes. In September, Walmart opened its first Health Center, a medical mall where customers can get primary care, vision tests, dental exams and root canals; lab work, X-rays and EKGs; counseling; even fitness and diet classes. The prices are affordable without insurance ($30 for an annual physical; $45 for a counseling session), and the potential is huge. In any given week, the equivalent of half of America passes through a Walmart. "When I first started here … [I] thought, That can't be true," says Sean Slovenski, a former Humana exec who joined Walmart last year to lead its health care push. If the concept spreads, repercussions await in every direction. Like Walmart's merchandise suppliers, doctors and other medical pros may need to adjust to the retailer's everyday low prices. Still, cautions Moody's analyst Charles O'Shea: "Health care is multiple times harder than selling food."

—Don Steinberg



1950

1973

right way could address conditions from depression to dementia.

THAT'S THE VISION of the future promised by electroceuticals. Nerves in the body that regulate specific organs—really specific cells in those organs—could be controlled with the precision of an orchestra conductor calling on specific instruments to generate just the right harmony. "The nervous system really uses electricity as its language," says Robert Kirsch, chair of biomedical engineering at Case Western Reserve University and executive director of the Cleveland FES Center. "So electrical stimulation can be used theoretically just about anywhere in the nervous system. We need to learn how to speak that language."

For now, researchers are beginning that decoding project with well-defined nerve systems. For example, the biotech company Neuros Medical, based in Cleveland, is targeting the nerve trunk that runs along a person's legs as a way to potentially treat phantom pain in amputees. These neural thoroughfares make up a relatively simple network, extending the entire length of the limb. After an amputation, the nerve continues to grow, sending out new extensions that, with nowhere to target, begin to clump into a mass of tangled—and painful—nerve endings called a neuroma.

1950

A machine measures the electrical brain activity of a man with epilepsy

1973

A nuclear-powered pacemaker stimulates more consistent and regular heartbeats for people with heart disease

2010

A patient receives deep brain stimulation to treat the tremors of Parkinson's

Zi-Ping Fang, chief scientific officer at Neuros, developed a potential solution for treating such pain. The device includes a surgically implanted electrode that wraps around one or two nerves in the leg. The electrode is connected to a waveform generator implanted in the abdomen that produces a high-frequency current whenever a patient presses a button on a remote control, before shutting off automatically after 30 minutes.

Each time the patient activates the device, it produces a preset current of energy that blocks the pain signals sent by the nerve to the brain. Fang initially thought the relief would be temporary, lasting only as long as the device was activated. But surprisingly, patients in the first pilot study reported feeling pain-free for hours and even days after a treatment session. The researchers still don't fully understand why, but, Fang says, they hypothesize that besides directly blocking the pain, the electrical therapy may also help to desensitize the nervous system to the pain sensation. "If we give the patients 30 minutes of pain-free time, clinically, some doctors call that a 'pain vacation.' It's not a cure for pain, but for many people in

FROM LEFT: CORBIS/GETTY IMAGES; DENVER POST/GETTY IMAGES; PHANIE/ALAMY

2010

our pilot study they were able to significantly reduce or quit their use of narcotics and improve their quality of life." The company is now expanding its study beyond the first 10 patients with amputation-related pain to include 180 people in order to further test the device for safety and efficacy.

Other companies, like SetPoint Medical, which conducted Owens' trial, are focusing on the vagus nerve. Named after the Latin word for wandering, the vagus is rooted in the brain stem and branches into the neck, chest and abdomen. It controls everything from sensory functions to swallowing, digestion, respiration and heart rate. Scientists are taking advantage of the fact that the vagus serves as something like a volume control for the nervous system, and because of the relative ease in accessing the nerve—it's the longest one in the body extending from the brain—it's an obvious target for those eager to wade into the world of electrical stimulation. But researchers are treading carefully to ensure they trace the vagus' myriad fringelike connections to the right tissue and the right function. While it starts out as a discrete trunk, the vagus, like many of the other large neural networks in the body, eventually dwindles into brushlike bundles of nerve endings that tap into different organs, different tissues within those organs, and finally different cells within those tissues. "It's like trying to make a telephone call by putting the call over every single line that is available," says Kirsch. "It goes to the right line, but it goes to all the other places too."

'Electroceuticals are the next wave of new treatments we will have to treat disease'

There's more. These connections are piled on top of one another at the tissue level, a chaotic jumble of nerves and nerve endings that are nearly impossible to tease apart. So in trying to trace one fiber, doctors may end up disturbing others, triggering unwanted side effects. The metaphor used by Kip Ludwig, associate professor of biomedical engineering at the University of Wisconsin, is of playing the piano not with your fingers but with your forearms.

SO SCIENTISTS ARE WORKING on a better road map, building a detailed picture of the major nerve networks in the body. The project, called SPARC, is funded by the National Institutes of Health and aims to map out every nerve of the human nervous system outside the brain. That could illuminate new ways to manipulate electrical signals to control cells connected to those nerves—including what they make and how active they are. Researchers at universities across

HEALTH CARE INNOVATORS

David Abney

Drone-delivered medical supplies

Since March, UPS has been conducting a trial program called Flight Forward, using autonomous drone deliveries of critical medical samples including blood or tissue between two branches of a hospital in Raleigh, N.C., located 150 yards apart. A fleet-footed runner could cover the distance almost as fast as the drones, but as a proof-of-concept program, it succeeded, and in October the FAA granted the company approval to expand to 20 hospitals around the U.S. over the next two years. "We expect UPS Flight Forward to one day be a very significant part of our company," says UPS CEO David Abney of the service, which will deliver urine, blood and tissue samples, and medical essentials like drugs and transfusable blood. UPS is not alone in pioneering air deliveries. Wing, a division of Google's parent company Alphabet, received similar, but more limited, FAA approval to make deliveries for both Walgreens and FedEx. And in Ghana and Rwanda, drones operated by Silicon Valley startup Zipline are already delivering medical supplies to rural villages. —*Jeffrey Kluger*

the country are assigned different major organ systems, and the resulting nerve map will be available to any scientist interested in finding ways to tap into those neural networks to develop a potential electroceutical treatment.

But a neural GPS is only one part of an effective electroceutical. In order to control signals in the right nerves near the organ in question with the right patterns, a device needs to be small enough to be implanted and interface with the target nerve, remain there safely for decades, and be powerful enough to modulate the flood of electrical chatter occurring along that neural circuit. It also needs to communicate with external devices that the patient and doctor use to control the therapy. At Galvani, Famm's team has spent the past three years designing and building such a system, which he hopes will serve as a platform for applying in a range of different chronic diseases. Within the next couple of years, he says, it will be ready for its first safety and efficacy tests in human patients. "We are more confident than ever that this is possible," Famm says. "What is beautiful about electroceuticals is that they can get on a nerve right by the organ you are interested in, and it has exquisite potential for precision."

Kyrana Tsapkini, assistant professor of neurology at Johns Hopkins, is relying on that ability to target nerves to tap into complex functions of the brain, from language to memory. For the past decade, she and her team have been building one of the world's largest databases on the ways electrical stimulation can affect a variety of neurodegenerative disorders, and the results are already encouraging. In a study of 36 people with Alzheimer's disease, those who received electrical stimulation showed improvement in their ability to remember words, compared with people who did not get the treatment. Tsapkini is building a database of patients with not just Alzheimer's but also other neurodegenerative disorders to get a better sense of who might benefit most from a bioelectronic strategy to keep their cognitive functions intact.

FOR PATIENTS LIKE OWENS, the early results have been transformative, and she hopes her experience as one of the first to test her device changes the way diseases like hers are treated. Desperate for more options after she'd exhausted the available treatments, she was scouring Facebook for any advice about new therapies when she came across a video interview with Dr. Kevin Tracey, a neurosurgeon at the Feinstein Institute for Medical Research in Manhasset, N.Y. It was 2017, and he had just published his discovery that the body's inflammatory response was regulated by the vagus nerve. Tracey had founded SetPoint Medical to test the idea that manipulating the electrical signals running along the vagus could control inflammation in autoimmune disorders like Crohn's.

Since Crohn's is caused by an overactive inflammatory response in the gut, the goal is to inhibit that inflammation by dialing down the electrical impulses zipping between immune cells around the gut so that the inflammatory response dies down and aggravated gut tissue can start to heal, leading to fewer symptoms and less pain.

Though intriguing, this idea was still an untested theory. But Owens figured it was worth a try. The therapy was not being tested in the U.S., so she and her husband started a GoFundMe campaign to raise money to join SetPoint's first trials to treat Crohn's in Amsterdam.

Owens is now in her second year of clinical remission. She no longer takes any medications for her Crohn's disease and has gone from needing her husband's help to put on deodorant and button a shirt to working out regularly at the gym and going on long runs. She is back to work as director of education and outreach at the Feinstein Institute, helping patients like her learn more about new therapies such as bioelectronic therapy for treating their autoimmune diseases. Her latest colonoscopy showed that half of the damaged tissue in her colon had healed; without the constant barrage from the immune system, her digestive system is gradually recovering and functioning the way it should. "Now my body just works and I don't have to think about using it; it just does what it's supposed to do," Owens says. "That's still mind-blowing for me."

She now turns on the regulator in her chest for only five minutes in the morning and five minutes before going to bed. She started with four sessions of electrical stimulation a day, but found herself forgetting the ones at noon and dinnertime and realized she didn't need them. She's aware that the technology is still nascent and still has to prove itself in more trials. But to anyone who might hear that and become skeptical that electroceutical treatments can actually work, she says, "Patients are just really eager to have a new option. And if it's a placebo effect, all I can say is that it's a hell of a placebo." □

LOVE YOUR HEART

Drinking unsweetened Lipton Green tea every day ***can help support a healthy heart.**** It's also a delicious way to hydrate. Grab a cup today. And tomorrow. And the next day!

Lipton

*Daily consumption of 2-3 cups of unsweetened brewed tea providing between 200-500mg of flavonoids can help support a healthy heart as part of a diet consistent with dietary guidelines. Unsweetened Lipton 100% Natural Green tea contains 150mg of flavonoids per cup.

The Robot Will Help You Now

By CORINNE PURTILL

IT'S KARAOKE-REHEARSAL TIME AT KNOLLWOOD MILITARY RE-tirement Community in Washington, D.C. Knollwood resident and retired U.S. Army Colonel Phil Soriano, 86, has hosted the facility's semimonthly sing-alongs since their debut during a boozy snowstorm happy hour in 2016. For the show in late August 2019, he'll share M.C. duties with a special guest: Stevie, a petite and personable figure who's been living at Knollwood for the past six weeks.

Soriano wants to sing the crowd-pleasing hit "YMCA" while Stevie leads the crowd through the song's signature dance moves. But Stevie is a robot, and this is harder than it sounds. "We could try to make him dance," says Niamh Donnelly, the robot's lead AI engineer, though she sounds dubious. She enters commands on a laptop. In response, Stevie stretches its peglike arms. A grin flashes on its LED-screen face.

Stevie's hosting gig is part of a collaboration between the Robotics and Innovation Lab at Trinity College Dublin and Knollwood, a nonprofit retirement home for military officers and their spouses. A handful of Trinity researchers—and Stevie—moved into Knollwood for months-long stretches this spring and summer. Their goal was to understand what aging people and the staff who care for them might want from a robot, and how AI could bridge the widening gap between the number of older Americans in need of care and the number of professionals available to care for them.

People 65 and older make up the fastest-growing age demographic in the U.S. The growth of the eldercare workforce is not keeping pace. By 2030, there will be an estimated shortfall of 151,000 paid care workers in the U.S. By 2040, that gap is projected to rise to 355,000. In the absence of qualified professional caregivers, family members and friends must step in to help older loved ones with their daily living—often at great cost to their own financial and physical health.

PHOTOGRAPHS BY GREG KAHN FOR TIME

Stevie, and robots like it, could fill the staffing gap in the eldercare industry

It's no small feat to craft a technological fix for this problem that is cost-effective; supports human care workers without taking their jobs; and reliably attends to the social, emotional and physical needs of aging people in a way that respects their dignity and privacy. But if you were going to try, the starting point might look a lot like what's happening at Knollwood.

SOME 300 RESIDENTS live at Knollwood, in wings organized by the level of assistance required. Those with more serious physical and cognitive impairments live in hospital-style rooms with round-the-clock nursing care. Those in generally good health come and go as they please from a wing of apartments known as Independent Living. With its decorated unit doors and bulletin boards crammed with notices for outings and special events, the Independent Living wing evokes a college dorm whose residents are partial to walkers and coifs reminiscent of the late Barbara Bush. A placard on the door of apartment 232 bears the current occupant's name: Stevie.

There are as many different kinds of robots currently used in care settings as there are tasks for them to perform. Already there are robotic exoskeletons that help staff lift patients, and delivery robots that zip around hospital hallways like motorized room-service carts. Doll-like therapy robots comfort and calm patients agitated by the disorienting symptoms of dementia. Not far from Knollwood, pharmacists at Walter Reed National Military Medical Center in Bethesda, Md., work alongside a robotic dispensing system when filling prescriptions.

Stevie is a "socially assistive" robot, designed to help users by engaging with them socially as well as physically. The 4-ft. 7-in. robot is equipped with autonomous navigation. It can roll through Knollwood's hallways unassisted, though for insurance reasons—and to avoid even the remote risk of a collision in a community where falls can be life-threatening—Stevie never leaves its room without a handler. The voice command *Hey Stevie* activates the robot, similar to how the wake word *Alexa* activates Amazon's home assistant. Stevie responds to other words with speech, gestures and head movements. Tell the robot you're sick, for example, and it slumps forward with a sorrowful frown on its LED-screen face and says, "I'm sorry to hear that." Pay Stevie a compliment, and the screen reverts to a smile. When at rest, its head tilts gently and its digital brown eyes blink, patiently waiting for the next command.

A robot like Stevie can be useful in care homes in a number of ways. Some are fairly simple and practical: for example, its face could double as a video-conferencing screen, and it could go door-to-door taking meal orders on the touchscreen attachment that can be mounted to its body. Other functions could mean the difference between life and death. The robot can recognize voice commands like *Help me* and, were it fully integrated into Knollwood's IT system, could alert staff to a resident in distress.

'Ha ha. That is a good one. I might use it.'

The prototype made for Knollwood was deliberately designed as a bot-of-all-trades. The idea was for researchers to observe how residents interacted with the current iteration of Stevie, then go back to the lab and perfect the functions people seemed to want from it most. Conor McGinn, an assistant professor at Trinity College Dublin and Stevie's lead engineer,

Stevie speaks with a somewhat hard-to-place British accent that users in early tests found easier to understand than the Irish lilt of its creators

says the assumption of staff and researchers alike was that people would want the robot to do manual chores. But most residents didn't want to give Stevie a verbal order and be left behind as it scooted down the hall. They wanted the robot to stay and interact with them. They wanted the robot to keep them company.

"When we went into conversations with people, especially after they met the robot, [and] asked them what are the things you liked most about it, they'd say, 'It made me laugh' or 'It made me smile,'" McGinn says. "We didn't expect to go there. We thought our trajectory would be to put arms on this and have it as, like, a servant robot." The final version of the machine will still be able to make deliveries. But "having a tool that's useful is different from having something that's enjoyable," McGinn says. The enjoyable things "are probably more important to get right in the short term, because those are the things that seem to affect people's quality of life."

151K

Estimated shortfall of paid care workers in the U.S. in 2030

355K

Estimated shortfall of paid care workers in the U.S. in 2040

29%

Projected annual growth in demand for "social robots" from 2019 to 2022

IN A LOUNGE with the same kind of sturdy rattan furniture and warm-toned floral upholstery that the Golden Girls had in their living room, nine women and one man gather on a sunny August afternoon for happy hour, a weekly social event that takes place on every floor of the Independent Living wing. This week, the third floor has extended an invitation to Stevie.

"Hi, Stevie!" several of the women call as the robot rolls up from the elevator, an entourage of Knollwood staff and Trinity researchers trailing in its wake. "This is the third floor," a woman says loudly and slowly to the robot, as if it were hard of hearing. "Third-floor social hour." After waving hello to the group, Donnelly takes a seat on a chair outside the circle. Stevie can recognize and respond with canned answers to about 100 common questions—"How are you?" and "Where are you from?"—but unscripted conversations require Donnelly or a colleague to type furiously in response.

Donnelly has Stevie tell a joke ("What did the left eye say to the right? Between you and me, something smells"), which encourages another resident to tell one about a group of college kids. "Ha ha," Stevie says in its robotic monotone after hearing the punch line ("Either you like Picasso, or you don't"). "That is a good one. I might use it." Stevie's jokes are intentionally cheesy, McGinn says. Humor is an icebreaker, and Stevie's awkward delivery has an endearing quality that tends to make people feel more generous toward the machine.

Stevie is the star of happy hour. It sings the Irish tune "Danny Boy." It recounts an Irish folktale. Everyone wants to tell Stevie a story about their grandparents who came from County Mayo, or of a long-ago visit to Ireland. "The experience was wonderful," a woman named Mary Ellen says of kissing the Blarney Stone, a popular tourist destination near the city of Cork. "I would rather kiss a man," another woman calls out from a corner of the room. "It's been a long time." A third woman excuses herself and makes her way back down the hall, an empty wineglass rolling around in the basket of her walker.

One thing we are learning as robots join us on this planet is that just as there are situations in which it's easier for people to bond with an animal than with another person (hence the value of pet therapy), there are also situations in which some people feel more comfortable

bonding with an artificially intelligent companion than with a human one. It's not uncommon to feel gratitude or warmth toward a person or thing that helped you through a difficult situation. U.S. troops deployed in Iraq and Afghanistan who were issued an IED-finding robot grew very attached to the machines, naming them, awarding them medals and becoming distraught when they were damaged beyond repair in combat. It could be that a tool that comforts people through the upheavals of aging may elicit a similar response.

IRENE LENARD MOVED plenty of times during her husband's years in the Army. But her relocation to Knollwood in 2018 was the first she had to make without Stanley, who died in 2014. It hasn't been easy. Lenard grew up in Germany, and a lot of her new neighbors' cultural references zoom over her head. Her daughter lives nearby and visits frequently, but it's been hard to make connections in a place that hasn't felt like home. Then Stevie came along.

When Lenard talks about Stevie, her face lights up. She sits up straighter at the cafeteria table with the zest of a schoolgirl who knows the answer to a question. Stevie is easy to talk to, she says—easier, in fact, than most of the people she's met at Knollwood so far. With Stevie, she says, "I'm more comfortable. [Conversation] just comes out. One silly word leads to another." The ability of social robots to engender that kind of intimacy may be their greatest asset. The artificial element of that intimacy, however, is also the thing that most worries critics of caregiving robots.

"People are capable of the higher standard of care that comes with empathy," writes psychologist and MIT professor Sherry Turkle in her 2011 book *Alone Together.* A robot, in contrast, "is innocent of such capacity." Turkle watched one elderly research subject speak warmly to a robotic baby seal named Paro, designed as a therapy tool for people with dementia, and noticed a problem. "Paro took care of Miriam's desire to tell her story—it made a space for that story to be told—but it did not care about her or her story," she writes. "Although the robot understood nothing, Miriam settled for what she had."

Ethicists who see potential for positive human-robot encounters argue that robotic assistance doesn't have to come at the cost of human interaction. Just as science develops new drugs to treat conditions that don't respond to existing medicines, these new tools may be a vital resource for people who struggle with traditional modes of communication.

Some residents have been fascinated by the details of the robot's construction, quizzing the Irish team on specifics. There's also a small but vocal contingent who feel they've lived perfectly good lives without using robots and see no reason to start now

In 2018, the global market for robots designed to assist the elderly and disabled, including social robots, was $48 million. The market for rehabilitative robots, which include everything from Paro seals to robotic exoskeletons, was $310 million, according to the International Federation of Robotics, a Frankfurt-based trade group. The market for social robots is expected to grow 29% annually from 2019 to 2022, while demand for rehab robots is projected to grow 45% per year in the same period.

The current version of Stevie costs between €20,000 ($22,000) and €30,000 ($33,000) to make, though a retail version would likely be less costly. At current market conditions, a monthly service contract for the robot—the model the Trinity team expects to take to market—would

likely run between 50% and 60% of the cost of hiring a human to do the same tasks. After all, unlike a human employee, a robot can be on its feet—well, its wheels—all day and all night, moving placidly from room to room, with the same level of energy and attention whether in its first hour or 12th hour of work.

These characteristics make Stevie seem, to some current human caregivers, a threat. "The majority of our staff … work multiple jobs, are older women, sometimes older men, who speak English as a second language and work their butts off … They see this [as] competition," says Jessica Herpst, deputy director of operations and technology at the Army Distaff Foundation, the nonprofit that operates Knollwood. Neither Stevie's creators nor Knollwood's management say they want to displace human employees with an army of robots. The challenge is distributing the abundant work available in a way that benefits both the carers and the cared-for.

Menbere Gebral is an activities assistant in the long-term-care unit, and she adores her residents. They remind her of her late parents back home in Ethiopia. Making her residents happy is extremely important to her, and their weekly bingo game is very important to them, so when Stevie and his handlers showed up at a recent bingo session, she was a little wary. Normally Gebral spends bingo hour toggling back and forth between the laptop that calls out the numbers and the players seated at the tables, who need help with everything from placing the plastic caps on their bingo cards to adjusting their oxygen tanks. Dealing with a robot initially seemed like one more admin task.

After one session, though, Gebral was a convert. Stevie called out the bingo numbers, freeing Gebral from the laptop program and leaving her able to interact with residents. Even with Stevie at her side, Gebral was on her feet and constantly busy during bingo hour. But she was busy with the parts of her job that she likes best and that most affect her residents' well-being. "I love it," she says of the robot. "When the robot [does] something, you [can be] up and helping the residents."

Next year, the roboticists will return to Knollwood with a new version of Stevie, upgraded based on the research they've done at the facility this year. When McGinn's team returns to Dublin, Stevie will stay behind in D.C. for the staff to operate independently. Meanwhile, the group is speaking with other institutions interested in their own custom robot. After a pit stop back at the lab at Trinity, the current version of Stevie and the researchers will deploy to a care home in southern England for several weeks for a trial similar to the one at Knollwood. They are also in talks with a major nursing-care company in Europe. Maybe the residents of homes in different countries and cultures will want entirely different things from Stevie than Knollwood has. Models for ongoing human-robot relationships are relatively few and far between, and every new community that invites the robot in will help define this new kind of partnership.

In the end, "YMCA" did make the set list at karaoke night. Long-standing M.C. Soriano led the audience through the lyrics, while Stevie's arms swiveled around in the best approximation of the dance moves its custom programming could allow. It was no Village People. But the audience was happy. ◻

HEALTH CARE INNOVATORS

Sean Parker

A disruptive approach to cancer research

One of the original disrupters of the new economy is bringing his approach to medical research. The Parker Institute for Cancer Immunotherapy, established by Napster co-founder and former Facebook president Sean Parker, is a network of top institutions including Memorial Sloan Kettering, Stanford, the MD Anderson Cancer Center and more. Its goal is to identify and remove obstacles to innovation in traditional research. For example, all of its scientists share a single Institutional Review Board, which "allows us to get major clinical trials off the ground in weeks rather than years," says Parker, and at lower costs. Perhaps most important, Parker wants to infuse the project with his market sensibility: "We follow the discoveries coming from our researchers and then put our money behind commercializing them," he says, either by licensing a product or spinning it out into a company. Since its founding in 2016, the institute has brought 11 projects to clinical trials and supported some 2,000 research papers.

Where neighbors provide health care, pay them

By Dr. Raj Panjabi

ILLNESS IS UNIVERSAL, HEALTH CARE IS NOT. OVER HALF OF the world's 7.3 billion people, including 1 billion in rural communities, lack access to health care. Approximately 13 million children still go without a single dose of any vaccine. Nearly 9 million newborns, children and mothers still die each year from preventable or treatable conditions.

Compounding this crisis is a massive health-worker shortage, forecast to grow to 18 million by 2030. Training more doctors is necessary, but because doctors are concentrated in cities, they alone are insufficient to close this gap. What if the residents of rural communities—even those without a high school degree—could become a vital part of our health care team?

I recently visited Ruth Tarr in an isolated community in Liberia, the country where I was born and have worked with my team at Last Mile Health for 12 years. In sixth grade, Ruth was forced to drop out of school because her parents could no longer afford it. As an adult, she could not find work—until 2016, when she was hired as a community health worker. Over a few weeks, a nurse trained Ruth, equipped her with medicine and supplies—like a handheld test for malaria, antibiotics to treat pneumonia, and contraceptives—and gave her a smartphone with video lessons on topics like assessing a child for malnutrition. Ruth now serves the daily health needs of her neighbors. When a patient has a condition Ruth can't care for—like a patient we diagnosed with a damaged heart valve from rheumatic heart disease—she works with outreach nurses to refer her to a network of clinics and hospitals.

If we scaled this globally, 3 million deaths could be prevented each year

Community health workers save lives. A few years ago, when Ebola was spreading like wildfire across West Africa, community health workers teamed up with nurses to go door-to-door to bring patients into care. Later, Liberia's government created a national program to put a community health worker in every rural community. Those workers have now identified over 4,000 potential epidemic events, improved vaccination coverage and increased the rate of children receiving medical care by over 50%. Community health workers also lower health care costs. One of every three children with malaria is now diagnosed and treated at home, avoiding expensive hospitalization. For every $1 a country invests in community health workers, $10 is returned to society.

LIBERIA IS NOT ALONE. In September, 15 countries made commitments to invest in community health workers. If this were scaled globally, 3 million deaths could be prevented each year. We've built an online academy through which anyone, anywhere, can learn to create similar programs in their own regions. Americans enrolled in the academy are sharing lessons from places like rural Alaska, where community health workers are caring for patients with diabetes, opioid addiction and dental cavities, who were previously out of reach.

But to realize this future of health for all, we must confront an injustice. Though Ruth is an exception, most community health workers remain unpaid. A recent World Health Organization report found that the poorest women in the world subsidize health care with their unpaid work to the tune of $1 trillion—a figure that's larger than the economies of over 150 countries. As a doctor, I'm not expected to go without fair pay for my work, so why aren't community health workers paid fairly for theirs?

Now is the time to join arms with people like Ruth and demand our governments invest in community health workers. In her speech at last year's Global Conference on Primary Health Care, Ruth recast her childhood dream: "Because I am paid, I feel proud. I am saving for my daughter's education … I have a dream that one day I will finish my high school education and become a professional nurse." It is possible to realize Ruth's dream and bring modern medical care within reach of every last family. No person has to be left behind if we're willing to go as far as it takes.

Panjabi is the CEO of Last Mile Health and an assistant professor at Harvard Medical School. He is a 2016 TIME 100 honoree

AI and health care are made for each other

By Geralyn Miller

ARTIFICIAL INTELLIGENCE HAS THE POTENTIAL TO RADICALLY change health care. Imagine a not too distant future when the focus shifts away from disease to how we stay healthy.

At birth, everyone would get a thorough, multifaceted baseline profile, including screening for genetic and rare diseases. Then, over their lifetimes, cost-effective, minimally invasive clinical-grade devices could accurately monitor a range of biometrics such as heart rate, blood pressure, temperature and glucose levels, in addition to environmental factors such as exposure to pathogens and toxins, and behavioral factors like sleep and activity patterns. This biometric, genetic, environmental and behavioral information could be coupled with social data and used to create AI models. These models could predict disease risk, trigger advance notification of life-threatening conditions like stroke and heart attack, and warn of potential adverse drug reactions.

AI works only when it is inclusive

Health care of the future could morph as well. Intelligent bots could be integrated into the home through digital assistants or smartphones in order to triage symptoms, educate and counsel patients, and ensure they're adhering to medication regimens.

AI could also reduce physician burnout and extend the reach of doctors in underserved areas. For example, AI scribes could assist physicians with clinical note-taking, and bots could help teams of medical experts come together and discuss challenging cases. Computer vision could be used to assist radiologists with tumor detection or help dermatologists identify skin lesions, and be applied to routine screenings like eye exams. All of this is already possible with technology available today or in development.

But AI alone can't effect these changes. To support the technical transformation, we must have a social transformation including trusted, responsible, and inclusive policy and governance around AI and data; effective collaboration across industries; and comprehensive training for the public, professionals and officials. These concerns are particularly relevant for health care, which is innately complex and where missteps can have ramifications as grave as loss of life. There will also be challenges in balancing the rights of the individual with the health and safety of the population as a whole, and in figuring out how to equitably and efficiently allocate resources across geographical areas.

DATA IS THE STARTING POINT for AI. And so we need to invest in the creation and collection of data—while ensuring that the value created through the use of this data accrues to the individuals whose data it is. To protect and preserve the integrity of this data, we need trusted, responsible, inclusive legal and regulatory policies and a framework for governance. GDPR (General Data Protection Regulation) is a good example: in the E.U., GDPR went into effect in May 2018, and it is already helping ensure that the health care industry handles individuals' information responsibly.

Commercial companies cannot solve these problems alone—they need partnerships with government, academia and nonprofit entities. We need to make sure that our computer scientists, data scientists, medical professionals, legal professionals and policymakers have relevant training on the unique capabilities of AI and an understanding of the risks. This kind of education can happen through professional societies like the American Society of Human Genetics and the American Association for the Advancement of Science, which have the necessary reach and infrastructure.

Perhaps most important, we need diversity, because AI works only when it is inclusive. To create accurate models, we need diversity in the developers who write the algorithms, diversity in the data scientists who build the models and diversity in the underlying data itself. Which means that to be truly successful with AI, we will need to overlook the things that historically set us apart, like race, gender, age, language, culture, socioeconomic status and domain expertise. Given that history, it won't be easy. But if we want the full potential of AI to be brought to bear on solving the urgent needs in global health care, we must make it happen.

Miller is a director of artificial intelligence and research at Microsoft, where she focuses on genomics and health care

ILLUSTRATIONS BY JON STICH FOR TIME

Sound Bites

From the TIME 100 Health Summit

'The problem is the system is still entirely too complex.'

BILL CLINTON, 42nd President of the United States

'The poorest women on earth subsidize health care globally to the tune of $1 trillion with their unpaid and underpaid work. That's larger than the economies of over 150 countries.'

DR. RAJ PANJABI, CEO and co-founder of Last Mile Health

1.3

trillion dollars

The annual budget of the Centers for Medicare and Medicaid Services, accounting for almost one-third of all federal spending, of which spending on drugs is the fastest-growing portion, according to administrator **SEEMA VERMA**

GETTY IMAGES (6)

‘Women are dying, not because we don’t know how to save them. They’re dying because we have yet to decide they’re worth saving. And as a man, I’m ashamed.’

DR. NAVEEN RAO, senior vice president of health at the Rockefeller Foundation

“When I went in for my appointment and was diagnosed with invasive cancer, it took my breath away in horror—and like, ‘Oh my God, this is hilarious.’ Of course, it wasn’t hilarious, but something has to break the tension.

“When you’re in these places of despair and pain, sometimes you need to be able to speak in that space … and for people to be able to sit in that moment with somebody and accept that and not try and suffocate them with ‘You’re going to be O.K.’”

TIG NOTARO, comedian, who showed her surgery scars in her 2015 comedy special *Boyish Girl Interrupted*

‘We don’t want to be diagnosing people who already have dementia. We don’t even want to be diagnosing people who already had mild cognitive impairment. We want to make sure we address it as very mild, subtle symptoms start to happen, perhaps in our 50s.’

MARIA CARRILLO, chief science officer of the Alzheimer’s Association

Process

THEN: NOV. 14, 2018

The Face

By JAMIE DUCHARME

In July, Robert Chelsea became the first African-American face-transplant recipient

PHOTOGRAPHS BY JOHN FRANCIS PETERS FOR TIME

NOW: OCT. 11, 2019

# of Change

February 2019

July 2019

ROBERT CHELSEA TURNED DOWN THE FIRST face he was offered. It was a fine face, one that could have taken him off the transplant waiting list after just a couple months. But Chelsea—severely disfigured after a catastrophic car accident five years earlier—was in no hurry. He'd gotten used to tilting his head back so food and water wouldn't fall out of his nearly lipless mouth. He knew how to respond compassionately to children who stared in shock and fear. The face, offered in May 2018, had belonged to a man with skin that was much fairer than what remained of Chelsea's—so light that Chelsea, who is African American, couldn't bear the thought of becoming "a totally different-looking person."

Chelsea's doctors understood his hesitance. Face transplants in general are rare. Since the first partial one was performed in France in 2005, fewer than 50 have been completed worldwide. A new patient joining the ranks is always noteworthy, but Chelsea's case carries even more weight than usual. Because he is the first African American to receive a full face transplant, Chelsea's treatment is expected to have ripple effects that transcend his case. Disparities in the medical system that cause black Americans to die at higher rates than whites of so many things—like heart disease, cancer diabetes and HIV/AIDS—have also produced gaps in organ donation and transplantation. Widespread mistrust of the medical system has made many African Americans wary of tissue donation, contributing to donor shortages; in turn, only 17% of black patients awaiting an organ transplant got one in 2015, compared with about 30% of white patients.

Chelsea's accidental role as the literal and figurative face of black organ transplantation is likely to help chip away at those disparities. "Having a visible, tangible reference, especially for African Americans … is so needed," says Marion Shuck, president of the Association for Multicultural Affairs in Transplantation (AMAT). Sharing personal experiences publicly, Shuck says, could inspire potential donors with a clear example of a transplant's positive impact. Though facial donation is rare, Chelsea's story could encourage black Americans, and their families, to donate kidneys, livers or lungs, saving lives and reducing wait times across the country.

It took more than a year for Chelsea to get a second call—the one that would land him in a bed at Boston's Brigham and Women's Hospital, receiving a new face that was a near perfect

February 2019

Robert Chelsea shops for groceries at a local market near a friend's apartment where he was temporarily staying in Los Angeles

July 2019

"I'm more excited than nervous," Chelsea says on the day of his face-transplant surgery at Brigham and Women's Hospital in Boston

October 2019

Chelsea consults with Dr. Bohdan Pomahac, the lead surgeon who performed his transplant, at Brigham and Women's

skin-color match, and that made him both the first African American to undergo a face transplant and, at 68, the oldest recipient ever. "Morning by morning, new versions [of me] unfold," Chelsea said on the day he was discharged from the hospital in August, nearly a month after surgery. "[But] I feel like myself."

CHELSEA WAS HAVING car trouble one Monday night in August 2013, so he pulled onto the shoulder of a highway outside his home near Long Beach, Calif. Soon after, a drunk driver slammed into his car, and it burst into flames. Chelsea, a sales manager for a rubber-stamp business, was rushed to a hospital with third-degree burns covering almost half his body.

After being transferred to the University of California Irvine Medical Center, Chelsea spent four months drifting in and out of consciousness as doctors fought to save his life. He had 18 surgeries in that time—mostly skin grafting for his burns, but also abdominal operations to treat serious gastrointestinal complications that had developed as his body struggled to stay alive. Blood-pressure medications shunted blood flow to his heart and away from his extremities, leading to tissue death in his lips, nose and fingers. One of his surgeons, Dr. Victor Joe, called him "one of the sickest patients we've had."

'African Americans still do not believe the health care profession will take care of them.'

Chelsea left UC Irvine in December 2013 with his life—but by the end of his recovery he would lose his lips, the end of his nose, several fingertips and two-thirds of his intestines. His face was severely scarred, and his hands were covered in cadaver skin that matched Chelsea's skin tone but never quite mimicked its texture; Chelsea called it his "snakeskin." All told, he would eventually carry the skin of three different people. An organ donor himself before the accident, he had no idea how difficult replacing his skin would prove to be.

The barriers went up long before Chelsea was born. In 1932, researchers from the U.S. Public Health Service launched a study at Alabama's Tuskegee Institute that would change the American medical system for decades to come. The trial was covertly designed for researchers to observe the effects of untreated syphilis over the course of four decades. Six hundred black men, mostly sharecroppers, enrolled in the trial, lured by the promise of free transportation, meals and medical care. About two-thirds of the men had syphilis, and half were given the then standard treatment of arsenic and mercury. The other

infected men were given no treatment at all—even after penicillin was discovered to be an effective syphilis therapy in the 1940s. They were left to die; pass the disease on to partners and children; or develop complications like heart failure, mental instability and blindness.

When the Associated Press exposed the study in 1972, public outcry was immediate. Survivors and the families of deceased patients won roughly $10 million in a 1974 settlement. Two decades later, in 1997, President Bill Clinton apologized for Tuskegee, calling it "deeply, profoundly, morally wrong." But the wound was deep, and it would scar. "African Americans still do not believe the health care profession will take care of them," Shuck says.

That mistrust wasn't built on Tuskegee alone. In the 1800s, enslaved people were commonly drafted as unwilling, unanesthetized subjects for medical experiments, and their deceased bodies were frequently dissected. Even after slavery was abolished, black patients were often turned away by white doctors and hospitals. When they did get treatment, it wasn't always ethical. Henrietta Lacks famously had her fast-replicating, cancerous cervical tissue taken without consent in 1951; the cells eventually became a lucrative cornerstone of medical research, kick-starting a decades-long debate over informed consent and who profits from scientific advancement. Such incidents, and numerous others like them, still loom large, especially in a world where many physicians, according to one 2017 research review, implicitly favor white patients. "The whole medical system follows along with the racism that the country was built upon," says Dr. Vanessa Grubbs, a nephrologist at the University of California, San Francisco.

Famous historical examples mix with families' more contemporary, personal stories of mistreatment, leaving many African Americans skittish of doctors, says Dr. Damon Tweedy, an associate professor of psychiatry at the Duke University School of Medicine and the author of *Black Man in a White Coat*. "There's some remnant of that that you internalize," he says. Though he's black himself, Tweedy says patients have asked if his hospital is "experimenting" on them or using them as "guinea pigs."

It's perhaps no surprise, then, that many African Americans are hesitant to volunteer for medical studies—often an important first step in developing effective treatments. A ProPublica analysis of Food and Drug Administration data found that in many trials for drugs approved from 2015 to 2018, less than 10% of research participants were black. (The research community is working to close such gaps through initiatives like the National Institutes of Health's All of Us trial, a million-person study trying to recruit under-researched populations.) As a result, doctors today know far more about white bodies than about black bodies, even though black Americans report higher rates of conditions like Type 2 diabetes, heart disease and many cancers—largely because of centuries of structural inequities that have, among other consequences, left more than 10% of black Americans without health insurance compared with about 6% of whites, and 21% of black households without secure access to quality food compared with less than 10% of white households.

Understanding that complicated history is crucial to understanding the state of organ transplantation in the U.S. today. Black patients, on average, face longer waits for major

Chelsea with his daughter Ebony at home in California in February 2019, months before his transplant surgery

organs like kidneys, lungs and hearts than white patients, meaning more may die before they get the surgeries they need. That's in part because African Americans, who make up about 13% of the U.S. population, account for roughly 30% of the transplant waiting list, according to federal data. By contrast, about 65% of deceased donors are white, and white Americans make up only about 40% of the waiting list.

Higher rates of chronic disease among African Americans mean both that a disproportionate number need transplants, and that fewer have living family members healthy enough to donate organs like kidneys and livers. Even if they do, Shuck says, "we don't want to ask our family because we don't want to put them at risk, so we languish longer."

Religious and philosophical beliefs may also play a role, says Dr. Charles Bratton, a transplant surgeon at Loma Linda University Health who has studied donation disparities. Jehovah's Witnesses, 27% of whom are black in the U.S., do not accept blood transfusions, which can also dissuade them from being involved with organ transplants. Members of some religions that believe in resurrection, like Southern Baptists, may also want their bodies to be whole when they die, even though most religions allow organ donation. Finally, people in the U.S., unlike those in some European countries, have to actively opt in to organ donation rather than opting out, further depressing donation rates. All told, according to the most recent federal survey on attitudes toward organ donation, only 39% of black Americans' driver's licenses marked them as organ donors, compared with almost 65% of white Americans.

"DO YOU SEE the way they look at me? It's cute. They're curious," Chelsea said the first time we met, in November 2018, months before his surgery. He'd told me to drive straight from the airport to his gym in Victorville, Calif.—it was Monday, and he always worked out on Mondays. From there, we went on an errand to MetroPCS, then to pick up tacos for lunch. People stared, but Chelsea was good-natured about it. "I don't blame them," he said. "It's scary. It's like I'm wearing a Halloween mask."

Five years after his accident, Chelsea insisted that his appearance didn't bother him, in large part thanks to the deep-seated Christian faith that helped him through his recovery. He also joked that he was "no knockout looker" before the accident, though friends and family remember it differently. His acceptance was so unflinching, in fact, that when Dr. Bohdan Pomahac, director of plastic-surgery transplantation at Brigham Health, first approved him for a face transplant, Chelsea wasn't sure he wanted one at all.

Chelsea's attitude was exceptional. Losing one's face—a person's introduction to the world—is psychologically scarring for most who experience it. Face-transplant recipients are required to undergo extensive counseling to ensure they're prepared to accept their new appearance. It can be especially difficult when one's racial identity is also at stake. While a black patient awaiting a kidney or heart doesn't need a black donor, a complexion match is considered crucial for visible transplants, to preserve as much of one's identity as possible.

Physical appearance is far from the only determinant of racial identity, but it's certainly a factor, says Jessica DeCuir-Gunby, a professor at North Carolina State University who studies the topic but has not worked with Chelsea. Accepting a face from a donor with a much lighter skin tone could present a nuanced set of emotions, she says, since black identity exists across a spectrum of colors, hair textures and facial features. A drastic change in appearance can unmoor someone from his or her identity, potentially resulting in psychological trauma, she says. Dr. Sheila Jowsey-Gregoire, a transplant psychiatrist at the Mayo Clinic who has not worked with Chelsea, says that while most face-transplant patients have done the hard work of accepting that they'll never look exactly like they once did, altering their racial identity could lead to unforeseen negative consequences.

The need for a precise color match further shrinks an already small pool of potential donors: in the federal survey on organ donation, only about 41% of black respondents said they'd be at least "somewhat" willing to donate a face, vs. about 61% of Caucasian respondents. Even Chelsea, who is largely uninterested in the superficial aspects of appearance, balked at the prospect of accepting a face so much lighter than the one he knew.

It wasn't just the possibility of a stranger in the mirror that gave Chelsea pause. Organ-transplant patients need to take immune-system-suppression drugs for the rest of their lives to keep their bodies from rejecting their donor organs. His health had been stable in the years after his recovery from the accident, and the transplant would take him back to a world of constant doctor's appointments and medications. And while Chelsea's surgery would be performed for free, thanks to a grant Brigham and Women's received from the Department of Defense to test a less cumbersome

JOHN FRANCIS PETERS FOR TIME

HEALTH CARE INNOVATORS

Isabel Van de Keere

Rehab in virtual reality

Isabel Van de Keere was at work one day in 2010 when a steel light fixture pulled loose from the ceiling and fell on her. The accident left Van de Keere, a Belgian-born Ph.D. in biomedical engineering, with a cervical spine injury and severe vertigo that required three years of intense neurological rehabilitation. She practiced the same tedious exercises dozens of times in a row, with progress so slow it seemed undetectable. Now 38, she's the founder and CEO of Immersive Rehab, a London-based startup whose goal is to change the neurological-rehab experience using virtual reality. By expanding the range and type of exercises patients can try, VR creates more opportunities to harness the brain's plasticity and repair neural pathways; increases the amount of data caregivers can use to measure progress and adapt programs; and improves the monotonous, frustrating experience of rehab. Feedback from volunteer patients and therapists has been promising; the company is now preparing to run clinical trials in the U.S. and Europe.

—Corinne Purtill

posttransplant immune-suppression regimen, his family would still have to pay some travel and caretaker expenses associated with the surgery. When NYU Langone last year performed the first face transplant covered by commercial insurance, the hospital estimated it would have cost about $1.5 million out of pocket. Even without taking on any of those costs, Chelsea's family had to launch a GoFundMe to pay for miscellaneous expenses, raising more than $75,000. Even more conventional transplants can be expensive. Tweedy says the financial burden of becoming a living donor and recovering from an invasive surgery, which often requires time off from work, discourages lower-income patients—who tend to be disproportionately of color—from participating in transplants.

Chelsea's 30-year-old daughter Ebony was even more concerned than her father. Seeing him in critical condition after his accident was like "going to a movie theater and watching the scariest movie that they had out, and you replayed it over and over and over," she says. "You went through all that, and all of a sudden you want to go over here and [have another procedure]? Any surgery has complications."

But Chelsea ultimately wanted to eat and drink normally, to spit, to swallow a pill, to close his mouth—and, most of all, he said, to kiss Ebony on the cheek. Eventually he decided those promises outweighed the risks.

It took a while, he says, to recognize the significance of becoming the first African-American face-transplant recipient. When the realization came, it was tinged with discomfort. "There is a degree of pride, admittedly, and yet I'm not sure that it's something to be proud of," Chelsea said about six months before his surgery. "To celebrate an individual because they haven't done anything any more than anybody else, they just happened to be there at the right time … there's nothing holy about those actions." Still, Chelsea could recognize that the surgery came with a higher purpose: providing a positive example of how transplantation can change lives, especially for black Americans. "We are a lot more hesitant to be a donor," he says. "It causes us to lose out when we need a kidney or a liver or a lung."

CHELSEA'S SURGEON WAS UNDAUNTED by the year-plus search for a donor, even after coming so close with the first face last spring. "All it takes is one. Sooner or later you will find one," Pomahac said about six months before ultimately finding the donor face that would become Chelsea's. Last year, less than 7% of the organs procured in overwhelmingly white New England, where Brigham and Women's is located, came from African-American donors. While Pomahac and his team could theoretically accept a donor organ from any region, the hospital's policy dictates that travel to the donor site cannot exceed four hours, in part to preserve the function of the organ. To look outside New England—as Pomahac and his team eventually did—would require finding a location within easy flying distance of Boston.

Chelsea never second-guessed his decision to turn down that first face—but he also couldn't have guessed how long the search would drag on. He and Pomahac had used a 1-to-18 scale to discuss potential donors' complexions—1 being the lightest—on which Pomahac says Chelsea is a 15 or 16. They originally looked for donors falling from 8 to 16 but, after months of no luck, Chelsea eventually agreed to consider donors as light as 5. Even that didn't work.

Then, this spring, Pomahac encouraged Chelsea to consider a full facial transplant instead of the partial one they'd planned to replace just the lower portion of his face. Pomahac was mostly focused on cosmetics, but Chelsea and his family hoped the decision would also speed up the search process by eliminating the need to blend exactly with Chelsea's surviving skin, making imperfect matches less obvious. Chelsea agreed to the full transplant—and finally, more than a year after he joined the transplant waiting list, he got the call in July. His doctors had found a match with a near identical skin tone. He had 24 hours to make the biggest decision of his life, based only on descriptions of the donor's complexion, age and medical risk factors, then fly from Los Angeles to Boston for the surgery. "I had to believe," he said that day. "I was just hoping that it was a legit call."

'All it takes is one. Sooner or later you will find one.'

In another state, another man had just received a very different phone call. Shortly after learning that his 62-year-old brother had died suddenly, James, 51, was approached by the Gift of Life Donor Program about donating his brother Adrian's internal organs—and his face. James didn't know his brother's wishes but was staunchly in favor of organ donation himself after serving in the Air Force, where he says the practice was valued. He knew that Adrian—a talented athlete and guitarist who loved to play Hendrix, worked in construction and was always "ready to light up a room"—would want to help someone else. "He would give the shirt off his back for anybody," James says. After calls to his five other siblings, James decided to move forward with donation, com-

In the weeks after surgery, Chelsea's doctors at Brigham and Women's said his recovery was unusually smooth

JOHN FRANCIS PETERS FOR TIME

forted by the fact that part of his older brother would be "still here and on this earth, [so] he lives on." He had no idea that his brother's would be the first African-American face ever to be transplanted.

To Chelsea, the face he would receive was anonymous. But the loss another family had to suffer to give him a new beginning was the only subject that made him grow somber in the chaotic hours before surgery.

"Losing a loved one and being asked something like this … I can't imagine," he said. "I do feel hopeful that I can pick up some of the pieces that the family may have lost."

THOSE 24 HOURS began a well-rehearsed dance of more than 45 surgeons, anesthesiologists, nurses, pharmacists, research fellows, social workers and a chaplain. Pomahac, who with his team had performed eight previous face transplants, boarded a plane with three other doctors to get Adrian's face, which they carefully removed and placed on ice. In Boston, the Brigham and Women's staff prepped Chelsea for surgery, exposing the nerves and vessels that would soon be attached to the donor's tissues using hair-thin sutures so tiny that Pomahac had to sew them under a microscope.

When Chelsea emerged from the 16-hour surgery, his godson, Everick Brown, could focus on only one thing. "I was like, 'Look at those juicy lips,'" Brown laughed. "'He's going to be happy.'" Even in the early hours of Chelsea's recovery, before the swelling had gone down, Brown could tell Pomahac and his team had done a good job. Aside from his lips, Brown said, his godfather looked shockingly similar to the way he did before. "It was a joy," Brown said. "It's the first time I've used the word *miracle*."

By the second day post-op, Chelsea's heaviest pain medication was Tylenol. Within 10 days, he was eating, talking and breathing on his own—and though Pomahac says the nerve-rich lips never regain full function after a transplant, Chelsea's dream of kissing his daughter on the cheek is within reach.

It's not only Chelsea's life that will change. Tweedy says stories like his can help rebuild trust with the medical system. "Sharing," he says, "can go a long way to healing." Research bears that out: a 2013 study on encouraging organ donation found that successful approaches typically "comprise a strong interpersonal element that focused on the particular population's concerns, delivered by members of the local community." A number of awareness days and weeks—including National Minority Donor Awareness Week in August—are meant to boost donation rates, as are initiatives like the United Network for Organ Sharing's ambassador program, which encourages donors, recipients and those on the waiting list to speak publicly about their experiences. James recently decided to take on the role informally, after learning of the historical significance of his brother's donation. "I think it'd be a disservice to stay anonymous," he says."Hopefully this story can put that in a light for others to donate." Changes meant to bring medical equality are also taking root more broadly. A growing number of medical schools, for example, are waiving tuition to attract a more diverse pool of doctors in training, among other goals.

Before his surgery, Chelsea began establishing Donor's Dream, a nonprofit meant to encourage and provide information about organ donation. Even in the grueling weeks after surgery, as the swelling came down, his speech and vision improved and his new skin started to glow and sprout hair, he felt that the experience was bigger than him—one that would evolve into a future he couldn't yet imagine.

"I was concerned about humanity way before this surgery," he said about 10 weeks after the operation, after moving into a temporary apartment in Boston, where he would complete weeks of follow-up care. "We must help one another. That's the way I felt, and this experience has only validated that even more." ◻

Doctors for Medicare For All

BY ABIGAIL ABRAMS

MIRIAM CALLAHAN REMEMBERS THE PATIENT who clarified her decision to become a political activist. He was homeless, suffered from severe arthritis in his hip and was self-medicating with fistfuls of Advil. That gave him a bleeding gastric ulcer that landed him in the emergency room at a public hospital. Callahan, who is a medical student at Columbia University, and her colleagues patched him up and sent him back to the shelter, where he began self-medicating once again. He was stuck in a horrific cycle. Arthritis isn't a disease that should kill people, Callahan says, but in this case, it was becoming a real possibility. "It's immoral," she says, "the way that we treat people in this country."

In the months since seeing that patient, Callahan has channeled her frustration into political organizing—and she's hardly alone among her fellow medical professionals. With roughly 27.5 million Americans uninsured and nearly 80 million struggling with medical bills, doctors, nurses, medical students and other patient-facing professionals are finding themselves on the front lines of a broken system. Like Callahan, many are looking for ways to fix it. The result is that the medical field, which was once one of the most conservative professions, is becoming an unlikely hotbed of progressive political activity. One of these advocates' top goals? Single-payer health care, now known most often by its politically charged nickname: Medicare for All.

"I don't think I can just be a patient advocate at the bedside," says Deb Quinto, a 38-year-old nurse in California who has canvassed in support of Medicare for All. "It's our job to protect our community and to protect any threat to their health."

Single-payer health care was once considered a fringe idea in the U.S. But so were the ideas that led to Medicare and Medicaid, through which the government pays for qualifying citizens' medically necessary services. And over the course of the past few years, proposals for a universal single-payer plan have entered the mainstream political lexicon, at least that of one major party. Large majorities of Democratic voters now say they support some version of Medicare for All, and Senators Elizabeth Warren and Bernie Sanders, two of the three top-polling Democratic presidential candidates, have made the policy central to their campaigns. There are two Medicare for All bills currently pending before Congress. Medical professionals are central to this growth in popularity. From 2008 to 2017, the share of physicians who favor single-payer health care increased from 42% to 56%, according to Merritt-Hawkins, a physician-recruitment firm.

While Medicare for All remains deeply controversial among many Americans—and a nonstarter among most Republicans—physician-activists insist the tide is beginning to turn. "There's been a sea change in the way we talk about health care reform," says Dr. Adam Gaffney, an instructor at Harvard Medical School and president of Physicians for a National Health Program, which supports single-payer health care. He notes that as a growing number of doctors advocate for Medicare for All, the policy stands a better chance than it has in a generation. "Whatever reform we achieve," he says, "we need them—us—to be a part of it and make it work."

Nurses push Medicare for All at a Washington rally in April

FOR MOST of the 20th century, physicians were a staunchly Republican group. Overwhelmingly white and male well into the 1990s, many ran their own practices and operated as small-business owners. Their leading trade group, the American Medical Association, reflected its members' politics: it helped sink attempts by Presidents Franklin Roosevelt and Harry Truman to pass universal health care, and in the 1960s it waged a pitched, if losing, battle against Medicare on the grounds that the safety net for older Americans amounted to creeping socialism.

But over the past generation, both health care and the job of being a doctor have fundamentally changed. As the insurance industry expanded, physicians have moved from running their own private practices to being employees

WIN MCNAMEE—GETTY IMAGES

of hospitals and health systems. Instead of building their own patient bases, doctors nowadays often receive fixed salaries. "What that allowed physicians to do is basically look at the system in a more altruistic way," says Travis Singleton, executive vice president of Merritt-Hawkins. "It doesn't mean the independent physician 15 years ago didn't care about every patient who walked in the door. They simply knew that if they didn't control their payer mix, then they couldn't keep the doors open."

Meanwhile, other macroeconomic shifts have affected where doctors live, how they work and who chooses to join the profession in the first place. Beginning in earnest in the 1990s, hospitals and medical groups began consolidating, pushing once rural and suburban doctors into big cities. And as medical schools became more expensive, aspiring doctors began taking on ever larger debt loads. In 2018, medical-school graduates carried a median $200,000 in student debt, a burden heavy enough to reshape expectations. "If you want to make a lot of money, maybe go into finance or business consulting," says Courtney Harris, a Chicago medical student, who will have $300,000 in student loans when she graduates.

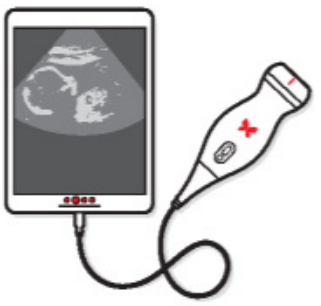
As the economics of medicine have shifted, so have the underlying demographics of the profession. Over the past two decades, more women and people of color have entered the profession. Medical schools, meanwhile, have expanded their curricula to include information about gun violence, climate change and how social determinants, like class and race, affect people's health. "These are not just our patients, but our parents, our cousins, our uncles, our grandparents," says Yoseph Aldras, a medical student whose parents are Honduran and Palestinian.

Singleton, whose firm conducts a biennial survey of doctors' opinions, says that while there are myriad reasons for an uptick in political involvement, one of the most compelling is simple: doctors see the dysfunction of the health care system on a daily basis. As health care costs ballooned and the private insurance industry expanded, the job of being a doctor changed. Instead of just treating patients, doctors today must battle with insurance requirements, manage arcane reimbursement systems and juggle enormous administrative costs, Singleton's firm found. "We've heard so many horror stories from doctors who have come before us about spending hours on the phone negotiating with insurance companies," says Scott Swartz, a 28-year-old medical student in San Francisco. "That's not how we want to spend our time."

All these factors have combined to shift doctors' politics to the left. In 1994, 67% of political campaign contributions by doctors went to Republicans, according to research by Adam Bonica, Howard Rosenthal and David Rothman. By 2004, donations to Republicans dropped below 50%. And by 2018, the ratio had more than flipped: Democrats captured more than 80% of physician donations last year. "There is an absolutely notable shift over 25 years away from Republicans," says Rothman, a professor of social medicine at Columbia University's Vagelos College of Physicians and Surgeons. "And it's persisting."

A decade ago, many physicians' groups supported the Obama Administration's effort to pass the Affordable Care Act, which aimed to extend access to health insurance to nearly all Americans. While the law failed to keep insurance costs low for many Americans, Republicans also failed to present a workable alternative to American voters. Though Republican lawmakers maintained control of the House and Senate in 2017, their attempts to repeal or replace the flawed Obamacare failed, leaving millions of Americans to continue to struggle with sky-high health care costs. This fruitless political maneuvering galvanized many in the physician-activist community. It was clear

HEALTH CARE INNOVATORS



Jonathan Rothberg

An ultrasound in your pocket

There are more than 4 billion people globally who don't have access to medical imaging—and could benefit from Butterfly iQ, a handheld ultrasound device. Jonathan Rothberg, a Yale genetics researcher and serial entrepreneur, figured out how to put ultrasound technology on a chip, so instead of a $100,000 machine in a hospital, it's a $2,000 go-anywhere gadget that connects to an iPhone app. It went on sale last year to medical professionals. "Our goal is to sell to 150 countries that can pay for it. And [the Gates Foundation] is distributing it in 53 countries that can't," Rothberg says. For example, the foundation is funding a project bringing Butterfly iQ to rural Uganda, to scan children for pneumonia. The device isn't as good as the big machines are and won't replace them in prosperous parts of the world. But it could make scanning more routine. "There was a time when the thermometer was only used in a medical setting, when a blood-pressure cuff was only used in a medical center," Rothberg says. "Democratizing [health] happens on multiple dimensions."

—Don Steinberg

that Obamacare, which was designed to safeguard access to quality insurance, wasn't doing enough, they argued. Why not push for a system that skips insurance entirely and instead offers access directly to quality care? "There's a growing recognition among physicians that the current system, even with the ACA, costs too much, leaves too many people behind," says Bob Doherty, senior vice president of governmental affairs and public policy at the American College of Physicians (ACP).

Enter: renewed interest in single-payer plans. In 2016, the American Academy of Family Physicians, which has supported the idea of "health care for all" since 1989, launched a study of various payment models, hoping to inform discussions of how to reform the health care system. The American College of Physicians, which supports a government-funded option for health insurance, is developing its own recommendations too.

The AMA, which has maintained its opposition to Medicare for All, began softening its rhetoric. "The AMA has and always will welcome debate at our House of Delegates on moving forward on health care reform," says AMA president Dr. Patrice Harris. Bonica, who led the research on physician partisanship, says that incremental shift makes a difference. "There's potential for physicians to organize among themselves," he says. "Conditions are very ripe for that."

AT THE AMA'S ANNUAL MEETING in June, members voted on a proposal to remove the organization's opposition to single-payer health care. It lost, but narrowly—just 47% to 53%. Outside the meeting, a group including doctors, nurses and medical students held a rally and shared stories about why they wanted to fight for universal health care. Two months later, advocates for a government-backed health care option scored another victory when the AMA pulled out of Partnership for America's Health Care Future, the industry coalition aimed at stopping single-payer and public-option plans.

Meanwhile, more doctors are joining activist organizations. Physicians for a National Health Program, an advocacy group of doctors that has been pushing for single-payer since the 1980s, now has 23,000 members across the country and has added 14 new chapters since 2017. PNHP's student arm, Students for a National Health Program (SNaHP), has grown rapidly as well, says Dr. Richard Bruno, who helped found SNaHP in 2011. It has nearly doubled its membership over the past three years and now has 85 chapters at campuses across the country. Peter Lorenz, a second-year student at Rosalind Franklin University's Chicago Medical School who helped start a SNaHP chapter this fall, says the base is energized. The old guard "know things are changing," he says. He's now working with his school's student chapter of the AMA, which wants to get Illinois's state physician group to drop its opposition to single-payer health care.

It's not just aspiring physicians joining the fight. At Columbia, the SNaHP chapter includes students studying dentistry, physical therapy and nursing. Nurses are also out in force, says Bonnie Castillo, the executive director of National Nurses United, whose members have long advocated for single-payer health care. Beginning in February, NNU knocked on 20,000 doors and held nearly 2,000 events talking to voters about Medicare for All. During the congressional recess in August, 1,200 activists organized in 49 House districts. "We're thrilled that we have this surge of youth and of activism," she says.

But the path forward is uphill. Part of the struggle, PNHP's Gaffney says, is educating people about what health care reform actually means. Aside from repealing the ACA, Republicans have not offered a coherent plan for the future of health care, but most of the Democratic presidential candidates are also vague on details of how their health care proposals would work. Whether the public supports Medicare for All depends on how pollsters describe the policy. Some universal health care proposals would eliminate all private insurance while others would offer voters the option of choosing to access government health care. In the meantime, medical students, doctors and nurses are still debating exactly what the nuts and bolts of an ideal policy would be.

Callahan, the medical student at Columbia, sees education as central to the fight. This semester, she is creating a workshop to help her fellow medical students translate their frustrations into political action. To her, advocating for Medicare for All is, at its heart, a moral fight. Doctors and nurses are consistently ranked among the most trusted professions in the U.S.—and that, she says, comes with an obligation to reform a system that too often leaves families in bankruptcy or forces patients to forgo care that they need but can't afford. "The idea that things have to be done a certain way because that's the way they've always been done—in the Trump era, that doesn't hold a lot of water," says Callahan. "If we gain enough power we can actually make that change and bring about the world we want." □

56%

Percentage of physicians who support single-payer health care as of 2017, up from 42% just 10 years earlier

23%

Percentage of professional time physicians spend on nonclinical paperwork

66%

Percentage of doctors who say that external factors such as third-party authorizations, treatment protocols and electronic health records hurt patient care

VIEWPOINT

Human health is in the hands of bacteria

By Martin J. Blaser

IN THE BEGINNING, THERE WERE SINGLE-CELL BACTERIA. They were the only life on earth for billions of years, then larger cells evolved, then multicellular organisms, and then plants and animals. But the bacteria never went away, and all organisms, including us humans, have had to learn to live with them. Today, the lessons they are teaching us could change the trajectory of human health for generations.

When bacteria were first discovered more than three centuries ago, most attention was on the ones we fought, which caused diseases like cholera, typhoid and tuberculosis. Through vaccines and antibiotics, we have made amazing progress in conquering these scourges. Now, through the combined tools of DNA sequencing and computer-based analysis, we have a first approximation of the innumerable other bacteria with which we cooperate daily.

Our microbiome is a diverse array of microbes—bacteria, as well as viruses, fungi and protozoa—that are more or less unique within each of us. We now understand that many are inherited, mostly from Mom, and this represents a continuity of life going back millennia. We know that the microbiomes of peoples living in the forests and savannas—who have had few of the benefits of modern medicine—have much more diverse microbiota than those in industrialized countries do. These comparisons strongly suggest that as the world modernized, we lost much of our microbial heritage.

As the world modernized, we lost much of our microbial heritage

And there's increasing evidence that those changes are linked to the rise of modern diseases like obesity, diabetes, asthma, food allergies and inflammatory conditions of the intestine and of the brain. The same progress that has made us healthier in some ways has had unintended collateral effects on our ancient microbiome, putting it under great stress. These advances include, among others, food preservatives and, most important, the very thing we've long used to fight disease-causing bacteria: antibiotics.

AS A SOCIETY we have become addicted to antibiotics. They are great drugs for serious illnesses, but are being used more and more to treat ever milder conditions, in which their net positive effects are marginal. Even transient antibiotic exposures, especially in early life, can lead to long-term consequences like obesity—or, paradoxically, an increased risk of infection in subsequent months. Exposures of women before the birth of their children can lead to consequences in the next generation, and exposures of adults can enhance risk of diabetes, kidney stones and certain cancers. We clearly have to restore our lost microbes.

Meanwhile, my colleagues and I have been working to create a microbiota vault, where we can preserve our ancestral microbes for future generations, before many other important ones become extinct. Thankfully what we've learned in recent years about the microbiome may enable us to live more collaboratively with bacteria. In the not so distant future, for example, pediatricians may examine both babies and their diapers to determine whether that infant has an ideal microbiota, based on their genes and other markers. If not, they will be able to administer the "missing microbes" to optimize the baby's health trajectory.

To fully harness the microbiome for therapy with true scientific basis will take time; in the interim, we need to educate people to avoid modern "snake oils" ranging from so-called probiotics to microbiome mapping that doesn't actually tell you anything.

Imagine it's 1950 and someone says to you, "There is a new field out there that is going to change how we do things, how we live … and the name of the field is 'electronics.'" Today, we see how broad the implications of that have been, affecting virtually every aspect of modern life. That is how I believe we will be thinking about the microbiome some years from now; it is that big—maybe bigger—with the potential to make real improvements in our health.

Blaser is a professor at Rutgers University and director of its Center for Advanced Biotechnology and Medicine

ILLUSTRATION BY JON STICH FOR TIME

HEALTH CARE • ACCESS

The Price Of Insulin Has Soared.

These Biohackers Have a Plan To Fix It

By GRANT BURNINGHAM

PHOTOGRAPHS BY CAYCE CLIFFORD FOR TIME

IN A HIP OAKLAND, CALIF., NEIGHBORHOOD, just blocks from cocktail bars and swanky Mexican restaurants, is an enormous warehouse, home to Counter Culture Labs, ground zero for an audacious challenge to the high cost of prescription drugs. In the entryway stands a 1½-story cardboard *T. Rex,* and inside it's a bit as if Dr. Frankenstein shared his lab with a hoarder: cluttered shelves hold piles of drying mushrooms, Clorox wipes, wires, kitchen pots, motor oil, two books about Darwin, ropes, a broken alarm clock, a telescoping magnifying glass, a heat gun, a 3-D printer and several jars of clear liquid with tubes running between them. One shelf holds plastic bins labeled LAB COATS, PAINT & BRUSHES and EBOLA SUITS.

A group of professional scientists and amateur tinkerers founded Counter Culture Labs in 2013 with the goal of bringing biotechnology to the masses. At any time, it hosts dozens of projects; when I visit in July, there's one whose objective is to make "vegan cheese" using yeast.

The Open Insulin Project has bigger plans. The group wants to reverse engineer how the world's largest pharmaceutical companies produce insulin and then turn over the instructions to the public. In theory, anyone with a bit of cash could then build a DIY lab in their garage and make open-source insulin.

Currently three companies—Eli Lilly, Novo Nordisk and Sanofi—control most of the world's $27 billion insulin market, using a complicated web of regulations and patents to keep a hold on it. Open Insulin wants to rebuild it with no megacorporations and no profit. The project is probably months, if not years, away from actually making medical-grade insulin, but its objective is as much political as it is production-oriented: bringing a sharp focus to the stratospheric price of insulin and, more broadly, the predatory pricing of prescription drugs in the U.S.

Over the past 60 years, the list price of a vial of insulin has gone from about 75¢ to $250—an increase nearly 43 times the rate of the U.S. Consumer Price Index inflation. "High drug costs exist throughout the system, but insulin is the poster child of this broken marketplace," says Representative Tom Reed (R., N.Y.), one of the chairs of the Congressional Diabetes Caucus. Some, in fact, think that the project is already working as a kind of provocation: a way to force the issue on what is really a policy problem. "If the price of insulin gets regulated, the project will just go away," says Jean Peccoud, a professor of chemical and biological engineering at Colorado State University.

For now, the project seems to be in a regulatory safe space, but that may change as it gets closer to making actual medicine. In an email, a Food and Drug Administration (FDA) spokesperson acknowledged that the agency is aware of the Open Insulin Project, but noted, "We cannot comment on hypothetical situations or potential future states of regulation."

Di Franco, founder of the Open Insulin Project, works with yeast at Counter Culture Labs in Oakland, Calif.

Predatory pricing in the U.S. isn't unique to insulin. A study of the world's top 20 medications found that Americans pay an average of three times as much as patients in the U.K. do for a given drug. The science behind making insulin is old, which makes it a good first target for the disruption of the pharmaceutical industry.

Anthony Di Franco, one of the Open Insulin Project's co-founders, has diabetes himself, and has watched as the price of managing his disease has gone up and up. He has a dual undergraduate degree in physics and math/computer science from Yale University and is currently on leave from pursuing his Ph.D. in computer

science at the University of California, Davis. He lives on contracting jobs, doing data science and researching machine learning and programming languages. Like many freelancers, he doesn't have employer-sponsored insurance. But unlike most with the disease, he knew enough about science to start thinking there might be a better way—and so, in 2015, he launched the Open Insulin Project.

"The current system was built to exploit people with diseases," Di Franco says. "Historians will look back and say, 'How could they have done such a terrible job?'"

DIABETES IS CAUSED when the pancreas can no longer make enough or any insulin, a hormone that regulates blood sugar, or when a person's body builds up a resistance to the hormone. Insulin, which helps the body use sugar for energy and lowers its levels in the blood, was first used to treat diabetes in the early 1920s. Physician Frederick Banting and medical student Charles Best were working with dogs, inducing diabetes by removing their pancreases and then trying to figure out a cure. The two eventually extracted a substance from cow pancreases; purified it with the help of biochemist James Collip; and proved it worked by injecting it themselves and noting that they got dizzy, a sign of low blood sugar. By 1922, doctors were using insulin from cow pancreases to treat diabetes patients.

People with severe diabetes need insulin injections to stay alive. Without it, your blood turns acidic, your body dehydrates, your vision blurs, you get weaker and start to vomit. Over days, you slowly—and painfully—die.

This fact, coupled with the inefficiencies of the American health system, as well as a manipulable patent framework, has enabled pharmaceutical companies to steadily increase the price of the lifesaving drug, even as it's become easier and less costly to produce. Generally speaking, drugs are cheap to make. The costs are mostly to pay for the research and development required to discover them. For example, one 2016 study that looked at 106 recently approved drugs from 10 different companies found that the average R&D cost for each was $2.78 billion, compared with only about $19 million per drug in costs of actual clinical trials.

Much of the industrialized world has some form of single-payer health insurance and strict price controls on drugs, usually determined by a board of doctors and experts. In the U.S., the pull of the free market was supposed to keep prices down, but instead has led to a complex system of profit-driven corporations, from manufacturers to insurance companies, who add cost at every juncture.

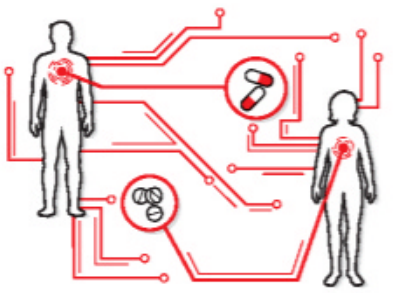
It wasn't meant to be this way, especially not with insulin. Banting, who shared a 1923 Nobel Prize for his work on insulin, demanded his name not be put on the patent, believing profiteering off a medicine was unethical. His co-discoverers agreed, transferring their patents to the University of Toronto for $1 each.

The pharmaceutical corporation Eli Lilly and Company of Indianapolis offered to help the university develop the medication, and the school eventually agreed to license the technology. Eli Lilly contracted with slaughterhouses to receive pig pancreases by railroad car in order to squeeze out the insulin. It was crude, but effective—and cheap. Ads from the 1960s show vials of insulin available for 84¢ in the U.S., just $7.36 in today's dollars. And then came a real breakthrough.

In 1982, Eli Lilly introduced insulin made by genetically modified *E. coli* bacteria. The new insulin was less likely to cause allergies than the animal version, and it could be grown in vats. Novo Nordisk started making its own bioengineered insulin in 1991, and it looked like the drug was about to get really affordable, thanks to the competitive marketplace. Instead, prices went up. A congressional report written in 2018 found the list price of competing insulin formulations "appeared to rise in tandem," doubling from 2012 to 2018. According to the report, that was most likely due to limited market competition, and to the fact that "each part of the insulin delivery chain is controlled by a small number of entities." The marketplace never became competitive.

In theory, the U.S. patent system, which gives manufacturers sole rights to a drug formulation for 20 years, should eventually enable other drug producers to bring cheaper versions of the same medication to the market. But as Reed and the co-chair of the Congressional Diabetes Caucus, Diana DeGette (D., Colo.), note, companies skirt this by "evergreening" their drugs—tweaking drug formulas slightly, often making incremental improvements, to renew the patent and prevent generics from ever entering the market. Lantus, a long-acting insulin patented by Sanofi in 1994, was due to enter the public domain in 2015, but instead the company filed 74 patents for newer versions of the drug, which delayed that until 2031. Novo Nordisk has done something similar with one type of insulin by upgrading the mechanics of its injection pen. These insulins are touted as improvements, although there is evidence these are typically minimal.

HEALTH CARE INNOVATORS



Joanna Shields

AI to read every science paper

Every year, more than 2 million peer-reviewed research papers are published—far too many for any individual scientist to digest. Machines, however, don't share this human limitation. BenevolentAI has created algorithms that scour research papers, clinical trial results and other sources of biomedical information in search of previously overlooked relationships between genes, drugs and disease. BenevolentAI CEO Joanna Shields was an executive at companies such as Google and Facebook, and then the U.K.'s Minister for Internet Safety and Security, before joining BenevolentAI. A frequent critic of the tech industry's lapses in protecting young people from exploitation and abuse online, Shields sees BenevolentAI as an opportunity to harness technology's power for good. "All of us have family members, friends who are diagnosed with diseases that have no treatment," she says. "Unless we apply the scaling and the principles of the technology revolution to drug discovery and development, we're not going to see a change in that outcome anytime soon." *—Corinne Purtill*

"People with diabetes experience different issues and complexities that can't be covered by one solution, which is why we continue to bring forth programs that will directly benefit even more patients and work toward much needed longer-term systemic reform," said a Novo Nordisk spokesperson in an email.

An Eli Lilly spokesperson told TIME in an email that the company does not evergreen. "None of our insulins is patent-protected and our most commonly used insulin, Humalog 100, lost patent protection in 2014," the spokesperson said. While the patent for Humalog 100 has expired, because of the complexities of entering the market, only one manufacturer jumped in to make a version of the drug: Sanofi, which already makes its own formulation. Sanofi's "generic" version of Humalog sells for just 15% less than its original price. Eli Lilly is also manufacturing an "authorized generic" version, currently selling for 50% of the price.

A Sanofi spokesperson, meanwhile, writes that the company's original patent on Lantus has expired and subsequent patents "are related to new and unique inventions." They also point out that despite increases in the listed price for Lantus, the actual price customers pay is lower than it was in 2006, a result of other inefficiencies in the market. The spokesperson added that "we also support a robust and competitive marketplace, including efforts by other organizations to develop new technologies and medicines—including Open Insulin Project."

For insured diabetics, the high costs of insulin are borne primarily by their insurers, and so remain more or less hidden. But for those without insurance or for people on high-deductible plans that require them to pay for their own care until they hit a predetermined amount, these prices take lives. Alec Smith, a 26-year-old restaurant manager, couldn't afford the $1,300 a month it took to manage his diabetes. In 2018, Smith was three days from a paycheck when he died alone in his apartment; investigators later found an empty insulin-injection pen in Smith's home. The case made headlines, but the human price of the high cost of insulin isn't hard to find. Some 13.2% of the 2.9 million people who take insulin in the U.S. do not take it as prescribed, and 24.4% asked their doctor for a lower-cost medication, according to the CDC.

Huon de Kermadec, lead scientist of the Open Insulin Project, at Counter Culture Labs

IT'S NOT GOING to take a Nobel Prize to make DIY insulin, just persistence. The good news for the Open Insulin Project is that it has the accomplished 33-year-old French biochemist Yann Huon de Kermadec as its lead scientist. He's in the U.S. right now because his wife Louise Lassalle is studying for a Ph.D. at Berkeley. Huon de Kermadec donates his time, showing up at the lab five to six times a week to work long hours designing a new form of life: a yeast cell genetically engineered to produce a form of insulin people could use.

On his side is the fact that biotech is getting cheap. The same pressures that brought down the cost of total gene sequencing from a taxpayer-funded $2.7 billion project to a $200 drugstore test in under two decades mean you don't need millions of dollars to start a biotech project anymore. The Open Insulin Project is able to do what it does because equipment has become so cheap—especially in the Bay Area, where high turnover in the biotech industry leads to a glut of second-hand, lab-quality gear—and, like your home computer, more powerful. There are now several companies

that market vast databases of genes, searchable by utility, all of which are economical. Huon de Kermadec picked two sequences of genes: one that produces a protein that can be cut to make insulin, and one that makes the yeast resistant to a specific antibiotic.

Using these genes, he and the team created a formula for a plasmid, a tiny circular piece of DNA. Then he hired a company to manufacture a small quantity of these plasmids, which they sent to Counter Culture Labs in a tiny plastic vial. Dozens of companies offer this sort of service in the U.S., at prices as low as a few hundred dollars. Next, the team jammed the plasmids into yeast cells, and added an antibiotic solution to the cell cultures. That's where the antibiotic-resistance gene comes in handy—the ones that successfully adopt the plasmid into their own DNA will survive, and those that don't will die out. The next step would be to grow the surviving cells, which should contain the genes to produce both antibiotic resistance and the precursor protein for insulin.

The team thinks they've gotten this far. They know the yeast produces a molecule the size of insulin—which is a pretty good sign it is, in fact, insulin. But they're scientists, so they're not popping the champagne yet. They want to confirm that the molecule is indeed insulin by using mass spectrometry, a precise technique that allows scientists to identify specific proteins, before they say for sure.

Then they will have to prove their insulin is pure enough to inject into a person. They'll also have to demonstrate they can make medical-grade insulin every time with their process. Then, to get it to the people, they'll need to standardize the equipment so other people can manufacture or buy it.

When asked if he thought his team would eventually create a yeast that could produce insulin, Huon de Kermadec responded confidently. "Yes, of course," he says, "it isn't rocket science." But then there are the regulatory hurdles.

DI FRANCO HAS BEEN reading up on the history of democracy in ancient Athens and is trying to craft his organization's bylaws in the spirit of the world's first democracy. He also wants its product to be democratically affordable: Di Franco thinks roughly $10,000 should be enough to get a group started with the equipment needed to produce enough insulin for 10,000 people. Each of these $10,000 setups would be somewhere between a middle-school science experiment and an industrial laboratory, requiring rooms of equipment; think something closer to a medical-grade brewery than to a counter-top bread machine. The resulting product, he says, would cost someone with diabetes dozens of dollars a month instead of hundreds.

That's noble, in theory, but there's a reason why the FDA puts a lot of effort into certifying the labs that make our medicines: mistakes can be fatal. The U.S. drug-development system may be expensive, but it does guarantee quality.

The Open Insulin Project falls into a black hole outside of FDA regulation, according to Peccoud, the Colorado State professor. For one thing, the project may skirt some regulations by being a nonprofit. Also, the FDA allows individuals to largely do whatever they want to themselves. "If you want to inject yourself with home-brew beer, there's no law to stop that," says Peccoud.

If it does reach a production phase, Open Insulin would have to conform to Good Manufacturing Practice, the FDA rules for factories that make medicine, food, cosmetics and medical devices. And because the group plans to share its insulin-production framework online, crossing state lines, there may be other legal issues on the horizon. One solution might be to partner with other players in the health care system, like hospitals and pharmacies, which create custom versions of everything from acetaminophen to opioids in a process called compounding and navigate the demands of the U.S. system already. However, that's likely to make the final product more expensive.

Ultimately, it's not clear that the Open Insulin Project's real goal is to facilitate insulin minilabs across the U.S. The group intends to put the plan for their designer insulin-producing yeast online as soon as it's done, but only for "research purposes," says Di Franco. And without brewing facilities or the ability to check and purify the hormone, the plans themselves are a long way—scientifically and legally—from the point where anyone will be injecting homegrown insulin. Di Franco has offered up his own body as a proving ground once the lawyers sign off: "I'd be thrilled to be the first person to take the insulin," he says.

There's ample evidence that insulin doesn't need to be as expensive as it is in the U.S., even without DIY labs. For one thing, just across the border with Canada, a vial of insulin costs $30. In January 2020, Colorado will become the first U.S. state to put a $100 cap on the co-pays insured patients pay for insulin. Minnesota is considering a similar law.

"It's an old drug," says Peccoud. "It's not hard to produce. It should not be more expensive than Tylenol. Insulin is just pure greed. And a failure of government." ◻

HEALTH CARE INNOVATORS

Christine Lemke

The biggest Big Data

There are 7.5 billion humans, and tens of millions of us track our health with wearables like smart watches, as well as with more traditional devices like blood-pressure monitors. If there were a way to aggregate all that data from even a few million of us and make it all anonymous but searchable, medical researchers would have a powerful tool for drug development, lifestyle studies and more. California-based Big Data firm Evidation has developed just such a tool, with information from 3 million volunteers providing trillions of data points. Evidation partners with drug manufacturers like Sanofi and Eli Lilly to parse that data; that work has led to dozens of peer-reviewed studies already, on subjects ranging from sleep and diet to cognitive-health patterns. For founder Christine Lemke, one of Evidation's ongoing projects, to see if new technologies can effectively measure chronic pain, is personal: Lemke has a rare genetic disease that causes frequent back pain. Evidation is partnering with Brigham and Women's Hospital on the project.

—Jeffrey Kluger

The gene-editing revolution is already here

By Jennifer Doudna

EVER SINCE THE DISCOVERY OF THE STRUCTURE OF DNA IN the 1950s, scientists have been dreaming about rewriting the code of life. What if we could correct genetic mutations that cause disease in order to radically improve human health?

Harnessed from the naturally occurring immune system that bacteria use to defend themselves against viruses, CRISPR-Cas9 is a revolutionary, once-in-a-generation tool that offers the real potential to quickly and efficiently achieve what was once thought impossible.

Ensuring responsible use of CRISPR is an ongoing challenge

Since 2012, the technology has been adopted rapidly, transforming basic research, drug development, diagnostics and agriculture. In the past seven years, over 15,000 papers containing the term *CRISPR* have been published, and hundreds of different organisms have been edited. CRISPR has become a mainstream topic of conversation, fodder for Hollywood scriptwriters and the standard genome-editing tool used globally. As we move into a new decade, it is clear that CRISPR-based applications will help us tackle societal challenges including disease, food production and environmental sustainability.

I receive daily emails from people suffering from debilitating genetic diseases asking how and, especially, when CRISPR can fix what is hardwired in their DNA and often runs in their family. For many diseases, like Huntington's and Tay-Sachs, we know the gene that causes the disease but have so far been powerless to change it. But now, thanks to the CRISPR revolution, we can shift the paradigm entirely. Sickle-cell research at the Innovative Genomics Institute, where I am executive director, and elsewhere shows we can proactively mitigate or correct the mutation that causes the illness. Gene-editing treatments for this and other diseases are beginning or will soon enter clinical testing. The gene-editing revolution has led to a rapidly growing CRISPR economy, and over the next decade, the technology will likely produce tangible and potentially wide-ranging treatments and even cures for genetic diseases.

FOR ALL THE PROMISE of CRISPR, ensuring responsible use is an ongoing challenge. Almost a year ago, scientist He Jiankui shocked the world by revealing that he had edited the embryos of twin girls. It was a medically unnecessary experiment that radically broke the global consensus that CRISPR should not currently be used in clinical human-germline editing—that is, making genetic changes that can be passed down to future generations. The scientific community responded by redoubling efforts to establish stronger safeguards, encourage a more deliberate approach and deepen public conversation about responsible use. The World Health Organization is now pushing government regulators to act. We need compliance, not a moratorium, as the former invites conversation, which is critical since interest in editing the human germline is not going away.

During CRISPR's teenage years, we will look to expand the types of edits we can make, focus on advancing the safe and effective delivery of CRISPR genome-engineering tools, work through the first wave of Food and Drug Administration approvals and increase our exploration of a naturally occurring way to fine-tune CRISPR-based editing to improve accuracy.

There's a possible future where genetic disease is a thing of the past, where we routinely sequence DNA and treat harmful mutations as an outpatient procedure. But we must ensure that in this future, everyone will have access to these new technologies and there's a consensus on rules to regulate whether and how this technology is applied to the human germline. This must come from a collaborative effort that includes increased private and public investment, more commercial partnerships to reduce financial risk and scale the technology, and the political and regulatory nuance to allow widespread affordable access to safe, effective cures without stifling a technology that will underpin the health of future generations.

Doudna, a professor at the University of California, Berkeley, co-discovered CRISPR-Cas9 gene-editing technology

ILLUSTRATIONS BY JON STICH FOR TIME

Your home should not determine your health

By Bernard J. Tyson

IN RECENT YEARS WE HAVE WITNESSED INCREDIBLE advances in science and technology that improve the care we deliver to patients. But if people can't take their medication because they don't have a home, or have to choose between buying food and medication, then this innovation means little. Health is about so much more than the care we provide at a hospital or medical office.

An individual's ZIP code can be a more accurate driver of health than their genetic code. In the San Francisco Bay Area, for example, Kaiser Permanente found stark evidence that select neighborhoods experience higher rates of diabetes (up to 11%) and child obesity (up to 23%). A study published in *Cancer Epidemiology, Biomarkers & Prevention* in 2017 concluded that obesity rates among breast-cancer survivors were higher among African Americans and U.S.-born Hispanics than non-Hispanic whites in part because of their social and built environments. The reality is that the enormous social and economic issues that dominate the news will prevent us from improving health if we can't resolve them and create a more equitable system. The good news is, we can make progress, and that progress will build on itself and encourage others to join the fight.

It's always made sense to me that health care organizations would be a critical partner in solving issues so directly related to health. Who knows the population better? Who better understands the impact those issues have on our communities? It is time for us to engage in the fight for health beyond our walls, beyond our care teams, and to address issues that could make a real difference in the health of the people who live in our communities.

It is time for us to engage in the fight for health beyond our walls

Those of us who lead such organizations can help by admitting where we have gaps in our capabilities and evaluating what kind of partners we need to deliver tangible progress. It's also important to recognize where our expertise, data and resources can play a role to take something from promising to reality. For instance, Kaiser Permanente has developed nearly 35 programs across all of our regions that identify members with social needs such as housing, food, safety, transportation and utilities and connect them to community resources. That made us well suited to think about what was missing: a systematic, standardized and consistent approach to addressing our community members' social needs.

SO WE LAUNCHED a social-health network called Thrive Local. Working with technology partner Unite Us, we are integrating this network into Kaiser Permanente's electronic health-record system, allowing health care workers to make referrals directly to community organizations and social-service agencies and then track referrals to confirm that patient needs have been met. It will also be made available to community-based organizations at no cost. And in May of last year, we announced an impact investment of $200 million to address housing affordability and homelessness in communities across the nation.

But to effect change at scale, we also need to persuade policymakers to focus on the issue. So we joined the Mayors & CEOs for U.S. Housing Investment coalition to advocate for major policy and funding reforms for housing and homelessness programs at the national level.

These examples are just the start. We're working on food security, climate change and other important issues. And there is plenty of room for others to contribute in a host of areas that we know impact health.

We are in a position to make real progress, and our mission requires us to try. We need to make care affordable. To continue to raise the quality of care. To make sure our employees have the training they need to deliver 21st century care. To improve the health of our communities. Everyone should have the chance to thrive; these are the steps health care organizations must take to make that happen.

Tyson is chairman and CEO of Kaiser Permanente

Sound Bites

From the TIME 100 Health Summit

‘My dream is to lie next to my son at night and be there as long as he needs me.’

SELMA BLAIR, actor, who has been speaking out about her multiple sclerosis for the past year

‘We believe you own your genome and you should do with it what you want.’

ANNE WOJCICKI, co-founder of 23andMe

‘I KNOW SOME MENTAL-HEALTH PROFESSIONALS HATE WHEN I USE THE WORD STIGMA. *BUT I SEE IT IN SPORTS.’*

ADAM SILVER

In 2018, Cleveland Cavaliers All-Star Kevin Love wrote about having a panic attack during a game and seeing a therapist in the aftermath. Former Toronto Raptors guard DeMar DeRozan, another All-Star, opened up about his struggles with depression. These revelations helped alter the conversation around mental health and sports. “Historically there was a stigma around getting help for mental-health issues,” NBA commissioner Adam Silver said. “I’ve seen a complete sea change.” This season, the league is requiring teams to hire one or two licensed mental health professionals and to retain a psychiatrist; teams must tell players and staffers how privacy and confidentiality will be insured and spell out an action plan for any mental-heath emergencies.

GETTY IMAGES (6)

‘Medicare for None.’

What Medicare for All would actually turn out to be like, according to U.S. Department of Health and Human Services Secretary **ALEX AZAR**, who also called it a “utopian” and “simplistic” approach to health care

‘Health care as a whole should not be politicized; it should not be political, because we’re, at the end of the day, talking about a basic human right.’

DR. LEANA WEN, the former head of Planned Parenthood, now a professor at George Washington University

*“If you care about this climate crisis,” said former Vice President **Al Gore**, “make sure that this election next year is a wave election in favor of saving the climate.” Gore emphasized the impact climate change has already had on human health: “The number of deaths related to the climate crisis are mostly from heat stress now … Another large source, about 9 million people die every year worldwide” from pollution related to the burning of fossil fuels.*

Prevention

‘It has been some time since you were here at the hospital, and we hope things are going well for you.’

STAFF MEMBER,
A SAMPLE NOTE SENT FROM
A PSYCHIATRIC HOSPITAL

‘You will never know what your little notes mean to me.’

FORMER PATIENT,
IN A WRITTEN RESPONSE

Solving Suicide

By MANDY OAKLANDER

THE SUICIDAL THOUGHTS started when Kristina Mossgraber was 17. A loud voice in her head told her that she was a bad person, a failure, better off dead. She cut herself in secret and told no one about the thoughts slamming around her brain, except her pediatrician, who dismissed them as normal teen angst. But her suicidal thoughts and behaviors didn't stop. "I was so good at hiding it and kind of normalizing it." She remembers thinking, "I just need to keep these to myself."

She did, all through her 20s and early 30s, until one September day in 2014 she drove three hours from her home in Rochester, N.Y., where no one would find her, and cut her neck and the veins down her arms. After struggling to hide her wounds for four days, she went to an emergency room. A doctor sent her home. "They didn't think I was suicidal enough," she says.

Mossgraber was referred to an outpatient treatment program, but she couldn't absorb any of the information; she went through the motions, all the while planning how she was going to kill herself. She withdrew from friends and skipped Sunday dinners with her family. "I was falling deeper and deeper into this despair," she says.

Three months later, she bought a jug of antifreeze, mixed it with Gatorade and woke up days later in the intensive-care unit. Once inside, she had a different experience. After doctors stabilized her, the psychiatric team helped her write a safety plan, a personalized guide for Mossgraber to follow to help her cope when she feels suicidal. They matched her with a specialist in a type of behavioral therapy that treats suicidal thoughts and actions. And they connected her to an outpatient program, where she would finally be diagnosed with bipolar disorder and given medication that worked. "I had a lot of great people who encouraged me to keep going, and get better, and go home and start this hard work of recovery," she says. "People listened to me and treated me like a human being." It saved her.

Suicide is one of the most urgent health problems facing America today. It is the 10th leading cause of death in the U.S., claiming 47,000 lives per year—and likely more, given that many suicides are not reported. Recent federal numbers indicate that the nation's suicide rates are the highest they've been since World War II; they're rising in nearly every state and across age groups and ethnicities. Alarmingly, suicide rates for young people are now the highest this century; among people ages 10 to 24, the rate increased 56% from 2007 to 2017, according to federal data from October 2019. Suicides among active-duty members of the military have also increased over the past five years, the Department of Defense reported in September, and a Department of Veterans Affairs (VA) report from the same month found that suicides by veterans are on the rise. Ten million Americans seriously considered suicide in 2018. "It's an extremely serious problem, and the fact that suicide is increasing shows that we all need to do more and do better," says Richard McKeon, chief of the suicide-prevention branch at the Substance Abuse and Mental Health Services Administration (SAMHSA), a branch of the Department of Health and Human Services (HHS).

Suicide is complex, and it's not clear what's driving the rise, but experts speculate that

Mossgraber, 39, had two very different experiences at the same hospital: after her first suicide attempt, she was sent home; after her second, clinicians saved her life and put her on the path to recovery

18+

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

Unlimited satisfaction one low price
Cheap constant access to piping hot media
Protect your downloadings from Big brother
Safer, than torrent-trackers

18 years of seamless operation and our users' satisfaction

All languages
Brand new content
One site

AVXLIVE.ICU

AvaxHome - Your End Place

We have everything for all of your needs. Just open https://avxlive.icu

NADIYA NACORDA FOR TIME

many factors may be contributing, including high rates of drug abuse, stress and social isolation. It's an expensive problem too. Attempted and completed suicides cost the U.S. up to $94 billion per year in lost work and medical expenses.

But a new approach is starting to yield positive results. For all the disparate reasons people die by suicide, they tend to have something in common: research suggests that 83% visit some kind of doctor in the year before their death. So health care facilities are logical places to prevent suicide.

Hospitals and behavioral-health centers are now redesigning their practices to include research-backed interventions that have been studied for years but haven't, until now, been widely used. In a world of high-tech, high-cost medicine, the new protocols for treating suicidal patients are surprisingly straightforward. They include thoroughly screening people, often with the help of electronic health records, in order to target those at risk; collaborating with patients to write safety plans to help them cope with suicidal episodes; quickly treating a person's suicidal thoughts and behaviors rather than waiting to treat any underlying mental illness first; removing lethal means like guns (which are used in nearly half of all suicides and 69% of suicides by veterans in the U.S.) from patients' homes; and supportively following up with patients via letters or phone calls in the days and weeks after they leave care, which is when many suicides happen.

ONE OF THE BIGGEST OBSTACLES health systems face in preventing suicide is losing touch with people when they're vulnerable. In most U.S. hospitals, a person who arrives at an emergency room after a suicide attempt is generally hospitalized, stabilized and, once deemed to be at lower risk, discharged with guidance to follow up with a mental-health professional. But many don't take that advice. Even under less acute circumstances—when they're receiving routine care—people fall through the cracks.

The new best practices emphasize putting people on the grid and not letting go. Few places do it as well as Centerstone, a large community mental-health center based in Tennessee that obsessively follows up with patients. By reprogramming its digital health-records system, Centerstone made screening for suicide risk mandatory; patients who respond a certain way are automatically designated at risk and seen more frequently. If one of these patients doesn't show up for an appointment and can't be reached within a few minutes, a 24/7 crisis team is pinged. "They're gonna come after you—in a loving, kind, gentle way, but they're going to pull out all the stops to make contact with you so that we know that you're not in any kind of major crisis," says Becky Stoll, vice president for crisis and disaster management for Centerstone. One of these routine phone calls reached a patient as he was standing on the edge of a bridge ready to jump; the caller persuaded him to return to the clinic. Within two years of making this change and others in 2014, the rate of suicide deaths at Centerstone had dropped by 64%.

Using electronic health records may even predict who's at risk for suicide attempts or deaths in the wider population. In October, Kaiser Permanente will begin using a combination of patients' health records and their

HEALTH CARE INNOVATORS

Thomas Reardon

A watch that can read your mind

A man wearing what looks like a chunky black wristwatch stares at a tiny digital dinosaur leaping over obstacles on a computer screen before him. The man's hands are motionless, but he's controlling the dinosaur—with his brain. The device on his wrist is the CTRL-kit, which detects the electrical impulses that travel from the motor neurons to the arm muscles almost as soon as a person thinks about a particular movement. "I want machines to do what we want them to do, and I want us to not be enslaved by the machines," says Thomas Reardon, CEO and co-founder of CTRL-Labs, the device maker. The hunched-over posture and fumbling keystrokes of the smartphone era represent "a step backward for humanity," says Reardon, a neuroscientist who, in a past life, led the development of Microsoft's Internet Explorer. The technology could open up new forms of rehabilitation and access for patients recovering from a stroke or amputation, as well as those with Parkinson's disease, multiple sclerosis and other neurodegenerative conditions, Reardon says.

—Corinne Purtill

answers to a short depression questionnaire to predict who's most at risk in one of their mental-health clinics. (They plan to later expand to primary care.) When analyzed together, this data—which includes strong predictors like a person's mental-health diagnoses and substance-use history—can instantly flag patients who are most at risk for suicide to a "surprisingly accurate" degree, says Dr. Gregory Simon, a psychiatrist and researcher at Kaiser Permanente Washington. Once it's implemented, when at-risk patients have a doctors' visit, their provider will be alerted to assess their risk for suicide. And if they don't show up, someone will reach out to them.

Once clinicians know whom they should be targeting, they can begin to intervene. One effective way to keep people safe from suicide is to take guns, pills or other lethal means out of their homes through discussions with patients and their families. "Most people who might be thinking of ending their lives have a particular means in mind," says Mike Hogan, a suicide-prevention expert. "Ending your life is hard—it's hard psychologically, and it's hard physically—and if you take that one means away, most people won't do something else."

Without the tools to carry out a plan, "if you can ride the wave a day or two, when the thoughts are at their most powerful, then the thoughts begin to abate," says Julie Goldstein Grumet, director of health and behavioral-health initiatives for the Suicide Prevention Resource Center. "If you can really increase the time and the distance between the thoughts and the access, then we know the rates of suicide will go down."

Knowing how to fill that time is crucial. That's where a safety plan—a guide that a patient and a provider write together, detailing what the person can do and who they can call when they're in suicidal crisis—has been shown to be valuable. "We have typically worked on the development or implementation of more complex treatments for suicidal people," says Barbara Stanley, co-developer of the safety planning intervention and professor of medical psychology at Columbia University Irving Medical Center. "And here you find something that is incredibly simple, very easy to train, pretty easy to implement, yet it seems to get just as good results in preventing suicide." Health systems are rapidly adopting safety plans because of their simplicity and efficacy. Safety planning is now standard at every VA medical center.

47,173

The number of Americans who died by suicide in 2017

$94 billion

The estimated annual cost of attempted and completed suicides in the U.S., due to lost work and medical expenses

75%

The drop in the suicide rate among patients in a system that implemented a more hands-on approach

THERE ARE SIGNS that health systems across the country will soon step up their suicide care. In July, the Joint Commission, the major accreditor of health care organizations in the U.S., imposed new rules requiring hospitals and behavioral-health centers to approach suicide prevention more systematically, with enhanced screening and improved counseling and follow-up care when at-risk patients leave care. "It used to be our standards were to refer someone to a suicide hotline, and that's just not the state of the science at this point," says Dr. David Baker, executive vice president for health care quality evaluation at the Joint Commission. The Veterans Health Administration, the country's largest integrated health care system, has long prioritized suicide prevention but is also raising the bar; in 2017 it started offering same-day access to mental-health services across the VA, and in 2018 it began screening everyone for suicide risk. SAMHSA is funding $46 million in grants to help health systems implement suicide prevention and intervention programs. And researchers are currently testing how effective these types of interventions are at reducing suicides on a much larger scale: across six health care systems, including several Kaiser Permanente sites. It is one of the largest mental-health studies of all time.

It might seem perverse that health care organizations don't already prioritize suicide care. But for the most part, they don't. "This whole notion of preventing suicide is quite radical," says Dr. Justin Coffey, chair of the department of psychiatry and behavioral health at Geisinger Health System. "For many of us, it's antithetical to what we were taught in our clinical training. Suicide is traditionally understood as this tragic yet inevitable outcome of serious mental illness." The old thinking was that you couldn't stop people who have decided to kill themselves, so most providers received no formal training on how to care for suicidal patients. "And yet now we know it is indeed preventable," Coffey says.

This shift in thinking—and the hands-on approach now gaining traction—has its foundation in work started nearly 20 years ago. In 2001, the behavioral-health department of the Henry Ford Health System in Detroit remade itself around the goal of completely eliminating suicide among its patients, using science-backed techniques like giving them quicker access to care and keeping in closer contact with them. Within two years, suicide rates among these patients dropped by more than 75% (and remained as low for over

a decade). In 2008, the program reached its goal of zero suicides, a trend that lasted for more than a year.

People in the suicide-prevention field took notice. "Nobody had ever seen results like this," says Hogan. "This was the most effective suicide-prevention program, based on the data, that had ever been seen in the world." With the Henry Ford experiment and the VA's suicide-prevention program, which launched in 2007, as examples of what was possible in health care, in 2012 HHS published a national suicide-prevention strategy that prioritized health care systems for the first time—and set the goal of "zero suicides."

The name stuck. Zero Suicide became a collection of best practices for health care systems to use to reduce suicides among people under their care. "Over 1,000 organizations are now using the skills and tools of the Zero Suicide initiative," says Goldstein Grumet, who is also director of the Zero Suicide Institute, which helps health care systems transform in this way. Baked into each step is the directive to acknowledge each patient's pain, empower them to make safe decisions and build hope for recovery.

THE TIME AFTER a person leaves care is delicate. Suicide risk rises sharply the first week after discharge from a psychiatric facility and remains high even years later. But there are opportunities to reduce suicide risk even after treatment is over. Back in the 1970s, Dr. Jerome Motto, a San Francisco psychiatrist, wanted to see whether writing patients a series of short letters to show them they weren't alone—that someone cared—helped keep them alive. "The point always was, just be there for somebody," says Chrisula Asimos, one of Motto's former researchers.

Motto and his colleagues found more than 800 people who had recently been hospitalized because they were severely depressed or suicidal, but who had refused further treatment. Half were left alone, and the others were sent a regular stream of short letters from a staff member who had met them in the hospital. "It has been some time since you were here at the hospital, and we hope things are going well for you," one of the letters read. "If you wish to drop us a note we would be glad to hear from you." They sent the letters every so often for the next five years.

"Initially I was a little skeptical, because working with these patients in the hospital when they first came in, they were just acutely depressed or suicidal," Asimos says. "But it became really clear when we started getting responses back that those contact letters were really a way to open the door."

'Those contact letters were really a way to open the door.'

The group who received letters had a lower suicide rate all five years of the study. Many wrote back. "I was surprised to get your letter," read one response. "I thought that when a patient left the hospital your concern ended there."

"You will never know what your little notes mean to me," read another.

"You are the most persistent son of a bitch I've ever encountered," read another, "so you must really be sincere in your interest in me."

This kind of follow-up contact for patients leaving care—which is also effective by phone, recent research suggests—is cost-saving and scalable through automation and electronic health records. A 2017 study found that follow-up letters and calls to people at elevated risk for suicide who left emergency departments reduced the likelihood of a new suicide in the next year by about a third and was cost-effective. "That's a huge effect from something that's super low intensity," says study co-author Michael Schoenbaum, senior adviser for mental-health services, epidemiology and economics at the National Institute of Mental Health. "The holy grail in health care is something where you get more and pay less. And caring communications overwhelmingly seems to be that."

After Kristina Mossgraber left the hospital, she slowly got better. "Recovery is the hardest job I've ever had," she says. "It's physically and emotionally exhausting. But it's worth it. My life is back to the way I've always wanted it to be." She now works as director of education and community outreach at her local chapter of the National Alliance on Mental Illness, talking to kids in schools about mental health and suicide prevention. She's also on an advisory board at the same hospital where she was once turned away—and later given tools, hope and access to a better life.

"Unfortunately, the system has been one way for so very long. And the public perception of mental health and suicide has been one way for so very long," she says. "It's going to take a while. But I'm encouraged. I really think things are changing." ◻

If you or someone you know may be contemplating suicide, call the National Suicide Prevention Lifeline at 800-273-8255 or text HOME to 741741 to reach the Crisis Text Line. In emergencies, call 911 or seek care from a local hospital or mental-health provider.

The care women really need

By Angelina Jolie

I LOST MY GRANDMOTHER AND MY MOTHER TO BREAST CANcer. I remember once holding my mother's hand, as she was receiving chemotherapy, when she started to turn purple and I had to race to get the nurse. Now there are new ways to identify which chemotherapy medication is best for each patient, resulting in fewer of the horrible side effects. Fewer. It's often still so hard on the body.

My mother fought cancer for nearly a decade. As I stood in the hallway of the hospital waiting for my mother's body to be collected and taken to be cremated, her doctor told me she had promised my mother that she would make sure I was informed about my medical options. Years later, I was able to have a genetic test that revealed I carried a gene, the so-called BRCA1, that predisposes me to cancer. The test came too late for the other women in my family.

Women typically have a 13% risk of developing breast cancer over their lifetime. I had an estimated 87% risk of developing the disease and a 50% risk of ovarian cancer. Because of my high risk, experts recommended preventive surgeries. I had a double mastectomy and later removed my ovaries and fallopian tubes, significantly reducing, although not removing altogether, my risk of developing cancer.

In the years since my surgeries, there has been further progress. Technology and science are converging in ways that will bring discoveries to clinics—and into our homes—at the most rapid pace in human history. Genetic testing has become more accessible and less expensive, although still not for everyone. Immunotherapy advances mean there are now targeted treatments like checkpoint inhibitors, which help block the "cloak of invisibility" that cancer cells put up to avoid immune attack. PARP inhibitors, when used in combination with immunotherapy, can improve the chances of survival for breast and ovarian cancer patients. In a recent visit to the Institut Curie, France's leading cancer hospital and research center, I met some of the doctors and scientists who are working to develop new treatments that will mean more people survive cancer in the future and are able to live better lives during their illness.

Medical advances are only one part of the picture

An artist friend of mine recently survived breast cancer. She had no family history of the disease but developed it in her 30s. She educated herself on all the latest advancements and procedures. She made the choice of a mastectomy, removing the breast and nipple. She froze her eggs before she had to go through chemo and then went to reconstruction. She documented her treatment through her art, finding a creative outlet to interpret her experience and share it with others.

But while stories like these should give us hope, we still have a long way to go. There's currently no reliable screening test for ovarian or prostate cancer, for example, and no effective targeted treatment for the most aggressive forms of breast cancer, known as triple negative cancers.

What I've come to understand, as I've reflected on my own experiences and those of others I've met, is that while we should continue to push for advancement, care is not just about medical treatments. It's also about the safety, dignity and support afforded to women, whether they're battling cancer or trying to manage other stressful situations. And far too often they're not given nearly enough.

I'M OFTEN ASKED how my medical choices, and being public about them, have affected me. I simply feel I made choices to improve my odds of being here to see my children grow into adults, and of meeting my grandchildren.

My hope is to give as many years as I can to their lives, and to be here for them. I have lived over a decade now without a mom. She met only a few of her grandchildren and was often too sick to play with them. It's hard now for me to consider anything in this life divinely guided when I think of how much their lives would have benefited from time with her and the protection of her love and grace. My mother fought the disease for a decade and made it into her 50s. My grandmother died in her 40s. I'm hoping my choices allow me to live a bit longer.

I have a patch for hormones, and I need to get regular health checkups. I see and feel changes in my body, but I don't mind. I'm alive, and for now I am managing all the different issues

PHOTOGRAPH BY PETER HAPAK FOR TIME

ILLUSTRATION BY JON STICH FOR TIME; HAPAK: TRUNK ARCHIVE

I inherited. I feel more connected to other women, and I often have deeply personal conversations with strangers about health and family.

People also ask how I feel about the physical scars I carry. I think our scars remind us of what we have overcome. They are part of what makes each of us unique. That diversity is one of the things that is most beautiful about human existence.

The hardest scars to bear are often invisible, the scars in the mind. All the patients I met at the Institut Curie said the care and support of their loved ones was the most important factor in their ability to cope with their illness. And here the picture is troubling globally, particularly for women.

Women are the largest group of people affected by posttraumatic stress disorder, according to the World Health Organization (WHO). Unipolar depression is twice as common in women as in men worldwide. More women than men are affected by anxiety, psychological distress, sexual violence and domestic violence. And more than half of the women killed worldwide died at the hands of a partner or family member, according to the latest statistics. Factors that account for women's poor mental health, according to the WHO, include discrimination, overwork, poverty, malnutrition, low social status and unremitting responsibility for the care of others.

1 in 400

People in the U.S. who have a BRCA1 or BRCA2 gene mutation

So I have learned that when it comes to women's health, medical advances are only one part of the picture. Mental and emotional health, and physical safety, are just as important. Without that there may be a false sense that a woman is being cared for, when in fact she is falling apart because of other pressures in her life that receive no attention at all. I understand now that we often focus on the specific cancer or illness affecting a particular woman, but miss the bigger diagnosis: her family situation, her safety and whether she is carrying stress that is undermining her health and making her days much more difficult.

No person should feel a level of worry and pressure that affects their health. But so many do. And it should not take someone getting sick to realize that caring for them and not harming them is necessary.

My mother seemed peaceful when she first knew she had cancer. I now see that in part it was because after many years of stress and struggle, people were forced to be gentle to her. During the highest years of stress in my own life, I developed high blood pressure and needed to be treated for hypertension.

When we speak of women's equality, it is often in terms of rights withheld, that ought to be given to us collectively. Increasingly I see it in terms of behavior that needs to stop. Stop turning a blind eye to the abuse of women. Stop blocking the ability of girls to get an education or access health care. Stop forcing them to marry a person you have chosen for them, especially when they are still children. Help young girls know their value. Help keep women you know safe. And before a woman is in the hospital, dying, and that reality is written on a diagnosis sheet, look into her eyes and consider the life she is living and how it might be with less stress.

All medical discoveries that extend our lives are welcome. But the bodies we are hoping to heal also need to be respected and spared preventable harm. Only if we feel safe and cared for are any of us able to reach our full potential.

Jolie, a TIME contributing editor, is an Academy Award–winning actor and special envoy of the U.N. High Commissioner for Refugees

ROSS✦SIMONS

fabulous jewelry & great prices for more than 65 years

Celebrate a special day with our sterling silver date necklace

A beautiful way to honor that day you hold so dear. Tell us your special month, day and year and we will convert it to classic Roman numerals. Crafted in our Rhode Island studio, our uniquely personal design is one you'll cherish forever.

$79

Plus Free Shipping

Sterling Silver Roman Numeral Date Necklace

18" Singapore chain with springring clasp. Pendant length is 1⅝". Specify month, day and year.
Please allow an extra 3-5 business days for personalization.
Also available in 14kt yellow gold. Item #875772 $279

Shown larger for detail.

Ross-Simons Item **#892700**

To receive this special offer, use offer code: **GREATDATE130**

1.800.556.7376 or visit ross-simons.com/greatdate

Time Off

THE ONE WHO GOT AWAY
Twelve years later, André Aciman returns to the lovelorn world of *Call Me by Your Name*

INSIDE

JOJO RABBIT *TURNS A DARK PERIOD INTO TENDER SATIRE*

COMEDIAN ALI WONG WRITES A MEMOIR TO HER GIRLS

WATCH HOW MRS. FLETCHER *FILLS AN EMPTY NEST*

PHOTOGRAPH BY CHRISTOPHER FERGUSON

BOOKS

The story continues, after all

By Rich Juzwiak

ANDRÉ ACIMAN WASN'T ENTIRELY HONEST with us. In late 2017, around the release of the film adaptation of his cherished 2007 novel *Call Me by Your Name,* he indicated that he'd closed the book on his characters Elio and Oliver, the star-crossed lovers at the center of the story. "I've said what I had to say," he told a reporter, when asked about a potential sequel. But Aciman had been working on a follow-up for over a year.

Now, as he prepares for the Oct. 29 release of *Find Me,* his new book set in the world of *Call Me by Your Name,* Aciman settles in his New York City apartment to come clean. "I wasn't sure," he says. "And I didn't want to use the word, which became poisonous, *sequel.*"

It's easy to see why Aciman might be wary of the pressure that comes with a sequel. Though his novel was acclaimed upon its release, garnering him a Lambda Literary Award for Gay Fiction, the movie, directed by Italian filmmaker Luca Guadagnino, turned his story into a phenomenon. Ten years after the book's initial release, it finally landed on the best-seller list, and Aciman's publisher says 800,000 copies have now been sold in the U.S. and Canada. Such a definitive account was Guadagnino's film that when Aciman thinks of Elio and Oliver, he sees actors Timothée Chalamet and Armie Hammer. He says he tried to put their faces out of his head when writing *Find Me,* not wanting to be influenced by Guadagnino's storytelling, and was able to do so because so much time has passed in Elio and Oliver's world.

But readers hoping purely for another Elio and Oliver story may be disappointed. Aciman points out that *Find Me,* his fifth novel overall, is not an "obvious sequel" to *Call Me by Your Name* because it focuses significantly on a secondary character from the original book. More than 100 pages pass in *Find Me* before Elio appears in the flesh, and it takes Oliver considerably longer. The author tried for years to jump back into their lives in a more direct way. "I started with Elio—now he's 21 or 22 years old and he's in his third year of college, blah blah blah," Aciman remembers. "I said, 'This is too stupid. It's not working.' I figured I'd better give up."

Then, in 2016, he met a woman on a train. She asked him to mind her dog while she used the bathroom, and he found her compelling enough to write a scene around. Within three pages of starting, Aciman realized he had shifted focus from the dog owner to Elio's father Samuel and commenced official re-entry into this verdant world.

Find Me begins with that scene, of the now single Samuel describing an encounter on a train with a woman about half his age, named Miranda. He's on his way to visit Elio, now an accomplished pianist, in Rome. Ten years have passed since the magical summer when 17-year-old Elio and 24-year-old Oliver fell in love, and although life has taken them apart, they are still on each other's minds. Where the first novel features a breathless internal monologue of rapture and anxiety, *Find Me* is more concerned with lovestruck conversations between burgeoning couples. The real woman got off Aciman's train after a few stops. Miranda stays on.

'Whenever you go into somebody's head—anyone's head—it's all insecurity.'

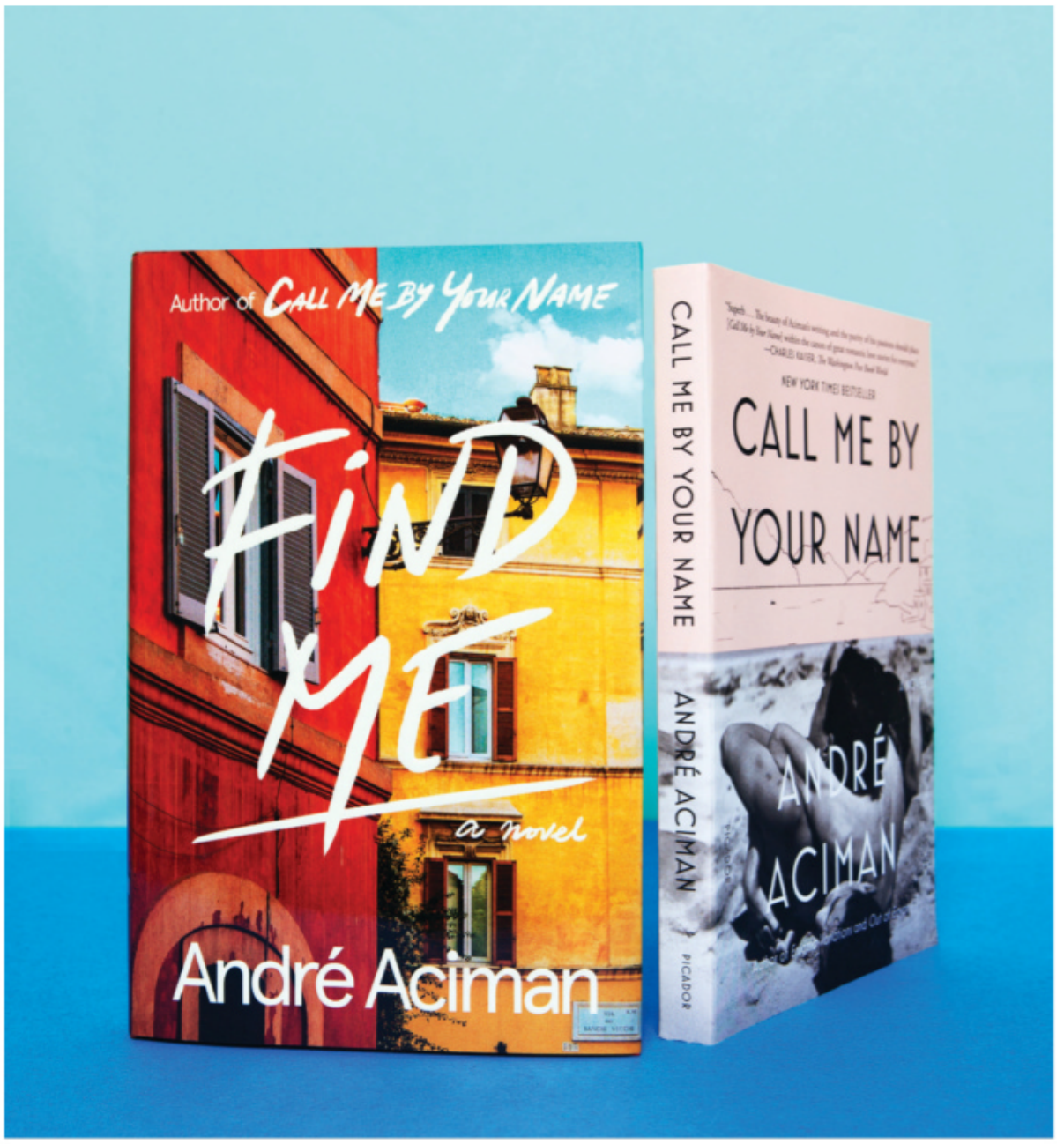
ANDRÉ ACIMAN

IN PERSON, Aciman speaks like the dialogue in *Find Me,* rhythmic and philosophizing. We sit in the living room of the apartment he shares with his wife of nearly 32 years, where they raised their three sons. As we face each other on identical beige couches, he barely pauses after questions before delivering long, eloquent answers in his unplaceable accent. (Aciman spent his childhood speaking French in Alexandria, Egypt.) Soon he grows passionate, waving his arms. When he's emphasizing, his eyebrows arch into crescents as if shielding his face from a torrent of thoughts.

Growing up, Aciman developed the worldly existence he would come to show through his characters, moving from Egypt to Italy to France to the U.S., all by the time he was 17. When he was 14, his Jewish family was kicked out of largely Muslim Alexandria after their business was nationalized and their assets were seized. They were left with nothing as refugees and spent three years in Rome before finding their way to New York to rebuild in 1968.

Aciman studied as an undergrad at New York's Lehman College, then dabbled professionally as a broker and in advertising before becoming a professor. "I'm trying to get rid of everything so I can do the one thing I've always cared to do," he remembers thinking, "which is to be a writer." He chronicled much of his youth in his first book, the 1994 literary memoir *Out of Egypt.* In addition to his memoir and novels, Aciman has written multiple essay collections and edited one about Proust.

Guadagnino, the *Call Me by Your Name* director, recalls Aciman speaking to him in "beautiful Italian" over breakfast in New York when they met for the first time to discuss the movie. The director says Aciman allowed him



Aciman tried for years to write a sequel to Call Me by Your Name *but struggled to find a way in; a chance encounter led to a breakthrough*

and his crew freedom with the source material. Guadagnino has discussed wanting to make a sequel to *Call Me by Your Name* and has spoken publicly about prominently featuring the AIDS crisis in the version he is writing, but he says he hopes to meet with Aciman in New York and discuss combining their visions. Aciman is "generous," Guadagnino says, and "does not perceive everything from the perspective of his own art."

But to hear Aciman tell it, in a word, he's "weird." He is certainly unpredictable. He writes wise books about the nature of love and time and the interactions of those forces, and yet he claims to think like a 14-year-old. (He's 68.) His books endlessly pour out ways to say "I love you," without saying "I love you." He denies being a romantic but concedes that is he perhaps a "romantic—with a sense of irony." His medium is literature, yet he believes classical music is the "topmost layer of aesthetic production of mankind." *Find Me*'s four chapters are named after musical terms ("Tempo," "Cadenza," "Capriccio" and "Da Capo"). Invoking the art form he finds superior is, he says, his way of saying, "O.K., guys, if I'm not perfect, at least I know what is."

Aciman's living room is lined with seascape paintings of varying degrees of abstraction. He doesn't like details, he says, which sounds like a contradiction from a writer of such precision. But it's the mundane, granular details he dislikes. Aciman writes in the tradition of *roman d'analyse* or, as he frames it, the focus on what motivates people to speak, feel or behave the way they do. "I'm only interested in what two people or three people will do when they're sitting down and chatting together," he says, from the facing couch. "That really is what fascinates me."

THOUGH HE IS "QUITE STRAIGHT," Aciman says life taught him what it is to be "totally fluid." That, along with imagination, is what he says allowed him to write such a convincing same-sex love story—a question about identity that is often asked when it comes to this book. Writing the explicit man-on-man sex in *Call Me by Your Name,* Aciman says, took no particular courage. "I just wrote it," he says, shrugging. Still, he acknowledges there's an irony that he, the straight guy, wrote gay sex that was toned down considerably in the film by Guadagnino, who is gay. That was one of the chief criticisms of the adaptation—that scenes like the one in which Oliver eats a peach that Elio has used for a sex act were restrained in the movie.

"I got a lot of mail of people saying, 'Why doesn't he eat the peach? We wanted to see that,'" Aciman says. "I understand." Even so, he was pleased with the film and admits he's not a big fan of watching sex scenes himself. He chalks up any cinematic chastity to "compromises" standard in the film industry.

As in *Call Me by Your Name,* the settings in *Find Me* are idyllic—the novel takes us through Rome, Paris, New York and back to the Italian countryside. His characters are secure financially and unburdened by the bigotry that in other stories threatens queer love. The turbulence, in Aciman's world, calls from inside the house.

"My belief is that whenever you go into somebody's head—anyone's head—it's all insecurity," he says. "It's all doubt, it's all reluctance, it's all inhibition, shame, that's all it is. There are sparks of desire that keep us interested in real life, but ultimately there's something suffocating all of us." That sense of instability and insecurity has an obvious root in his life story, and it finds its way into the lives of his characters, unlucky lovers included. "I live with that fear that in a minute," he says, "everything could go away." □

Davis, Waititi and Johansson in Jojo Rabbit: *good battles evil at the family dinner table*

MOVIES

A dark, stylized comedy leads us into the light

By Stephanie Zacharek

EVEN THOUGH FILMMAKERS AS REVERED AS CHARLIE Chaplin and Ernst Lubitsch have made movies that lampoon the Nazis and their one-note obsessions, Holocaust humor is still a delicate proposition. Laughter may be one of humankind's best survival mechanisms, but jokes about Hitler and those who did his bidding aren't an easy sell—their crimes are too inhumane to allow for laughs.

That's the turf Taika Waititi steps onto with his incandescently strange and openhearted black comedy *Jojo Rabbit*. Roman Griffin Davis plays Jojo, a tyke growing up in 1940s Germany who, with his rapturous smile and blond hair combed up into merengue-like tufts, would be adorable except for one thing: at 10, he's already a Hitler zealot. He loves his country's leader so much, he appears to have conjured a sort of Hitler hologram: Der Führer (played by Waititi, in a performance poised on the knife-edge of comical exaggeration and unnerving verisimilitude) appears to him privately, in moments of triumph and crisis, giving him tips on improving his "Heil!" and bolstering him after he fails, at the bidding of a couple of older Nazi youth, to kill a sweet, quivering rabbit.

Jojo isn't so tough after all, and his mother Rosie (Scarlett Johansson, who's the lustrous soul of the movie) knows it. His Nazi fixation cuts against everything she believes, though she doesn't dare express that. When the two encounter a group of traitors who've been hanged in the town square—we don't see their faces, but their legs dangle, a lifeless reproach, a few feet off the ground—Jojo asks what these people did to deserve such a fate. Her clipped answer: "What they could."

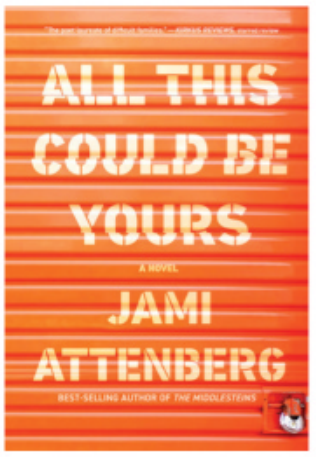
It turns out that Rosie is harboring a secret from her son: a teenage girl, Elsa (Thomasin McKenzie), is living in a hidden space in the family's house. Jojo stumbles into Elsa's warren-like quarters by accident, and his initial horror over his discovery—as a Jew, she's everything he has been conditioned to hate—eventually gives way to more complicated, and more tender, feelings.

NONE OF THAT, admittedly, makes *Jojo Rabbit* sound very funny. It's Waititi's ability to balance unassailably goofy moments with an acknowledgment of real-life horrors that makes the movie exceptional. (He adapted the screenplay from a novel, *Caging Skies,* by Christine Leunens.) Waititi establishes the tone—a vibe that will eventually take a hairpin twist—in the opening credits, setting the German version of the Beatles' "I Want to Hold Your Hand" against vintage footage of Führer-mad Germans cheering and saluting their idol.

The sequence is cheekily obvious. It's also exhilarating, a suitable opening into the world of extremes Waititi is about to show us, in vivid, highly stylized colors: even Hitler's eyes are an exaggerated, trustworthy blue. Many of the jokes, too, are delightfully obvious: a group of Gestapo officers is so large that once they've *Heil Hitler!*–ed everyone in their immediate vicinity, the words swirl into nonsense soup, like a round-robin homage to Mel Brooks.

Jojo Rabbit isn't subtle, yet it's still somehow delicate—more of a piece with Waititi's earlier films, like the prickly-sweet 2016 coming-of-age comedy *Hunt for the Wilderpeople,* than with his booming 2017 Marvel hit, *Thor: Ragnarok*. *Jojo Rabbit*'s ad campaign calls the movie "an anti-hate satire," which perhaps doesn't do it any favors. Being anti-hate is almost as vague as being pro-rainbow: Who doesn't like rainbows?

But then, nearly every other news story these days addresses some problem that has sprung from hatred of "the other," whoever that other might be. Evil can recycle itself, wearing a different disguise each time it appears. *Jojo Rabbit* is an entreaty to stay vigilant, and to live up to the ultimate epitaph: THEY DID WHAT THEY COULD. □



BOOKS

Deathbed of a salesman

Victor Tuchman, the ailing 73-year-old patriarch at the center of Jami Attenberg's twisty new novel, is a bad man. He has abused his wife and children, and made corrupt business deals. He's a raging misogynist. *All This Could Be Yours* opens as Victor has just suffered a heart attack—and the people he's hurt the most return to reckon with the grief he's caused them.

Attenberg, the author of six previous books including 2012's best-selling *The Middlesteins,* captures the heartbreak of fractured families. The Tuchmans are wonderfully specific in the way they process pain. In one chapter, Victor's daughter-in-law Twyla has a breakdown in a New Orleans drugstore and nearly buys all the lipsticks off the shelves. As Attenberg flips between perspectives—from strong-willed daughter Alex to mysteriously absent son Gary and more—she reveals the bleak loneliness they share.

Though the plot focuses on uncovering Victor's secrets—and their messy aftermath—*All This Could Be Yours* is most moving when its characters grapple with resentment and forgiveness. As the truth of Victor's past is eventually revealed, the rest of the Tuchmans are left unnerved by what it all might mean for their future. —*Annabel Gutterman*

JOJO RABBIT: 20TH CENTURY FOX; WONG: GETTY IMAGES

QUICK TALK

Ali Wong

Ali Wong broke out as a raunchy, lovable comedian in her Netflix specials Baby Cobra *(2016) and* Hard Knock Wife *(2018). Her debut book,* Dear Girls, *is a look at her personal and professional ups and downs, told in her hilarious signature voice.*

The book is constructed as a set of letters to your two daughters. Do you picture handing it to them when they're a certain age and saying, "O.K., you can read this now"? It's funny to pretend that I have any control over when they read it. I lost my virginity when I was like 15—you read about all the bad stuff I did. Kids grow up as fast as they want to. If they want to come to my stand-up shows or watch the specials, I will be so, so flattered. I have friends who are arguably some of the best comedians of our time, and their kids don't think they're funny.

What's the funniest thing your daughters have done? It's hard to describe how funny this is, but when my oldest daughter was maybe 1½, she did this thing where she would fart, and immediately she'd look at me and say, "No." And it was serious. She wouldn't laugh or anything. But her timing was so good. She would catch it right at the tail end of the fart where she would be like, "No."

You're so direct about your body and sexuality in the book. How are you planning to talk to your kids about these topics? I came from this really atypical Asian-American family. My parents were not focused on academics. If I got a bad grade, they weren't that upset. In terms of sex, my parents were always really open. So I'll probably do the same thing. But I don't know, my kids are under 4, and I'm just trying to get them to not choke on stuff right now.

***Dear Girls* ends with a letter by your husband Justin Hakuta. Why was it important to give him space to speak for himself?** I was really inspired when I read [Paul Kalanithi's] *When Breath Becomes Air.* His wife writes the afterword, and it's incredible. For my book I thought it would be nice because he never gets to say anything. He never gets to clap back at me.

Your name recently got pulled into a conversation about Shane Gillis' firing from *Saturday Night Live* for racist comments made before he was hired. What did you make of that? I had just heard that recently. I can't really speak about that situation because I never read the article or watched the clips. And I don't think I ever will. I'm just not interested.

What would you say to people who think it's O.K. to make jokes at the expense of others? It's really not about topic choice, it's about word choice. It takes a great joke crafter to put things in a context that makes people laugh. If people are cringing more than laughing, then it's not the topic that's wrong, it's probably the way you worded your joke. When fashion designers come up with their collections, you're not like, "What materials are off-limits?" It's all about how they cut the fabric and style it. I wish people would give the same credit to comedians. —LUCY FELDMAN

REVIEW

Here's to you, *Mrs. Fletcher*

By Judy Berman

"YOU HAVE TO BE NICE TO WOMEN," EVE FLETCHER, played by a sublime Kathryn Hahn, tells her son Brendan (Jackson White). They're in the car, on their way to drop him off at college. Before they'd left, she'd overheard him in his room with a girl, using misogynistic language obviously borrowed from porn. Eve had also fielded a last-minute phone call from her ex, Ted (Josh Hamilton), informing her that he wasn't free to help her move their only child into his freshman dorm after all. She's worried Brendan will become just like his father—with good reason.

Eve and Brendan are the dual protagonists of *Mrs. Fletcher,* a richly observed adaptation of a novel by creator Tom Perrotta *(The Leftovers)* that premieres on HBO on Oct. 27. A single mom who runs a senior center, Eve is constantly caring for others—many of them oblivious, ungrateful men. Brendan is the most oblivious and ungrateful of all, a casually cruel jock who has swaggered through high school bullying less popular kids, treating girls like chew toys and avoiding introspection. If he had any self-awareness, he'd see that he's really angry at his dad, who's busy with his new family.

That, of course, leaves Eve to manage Brendan's barely repressed emotions. Though their relationship looks one-sided at first, it slowly reveals itself to be symbiotic. She's made her son the focal point of her life, not just because she's such a generous person (though she is), but also because tending to his needs distracts her from her own. Brendan doesn't realize that he relies on his mom for moral guidance. And by demanding his love, she puts a check on his selfishness.

Alone in an empty nest, Eve (Hahn) logs on to the Internet and rediscovers her desires

Separated for the first time since his birth, mother and son both struggle. The bro-ish immaturity that made him king of his high school doesn't fly in college, where women expect a modicum of emotional intelligence from their dates. Faced with an abundance of free time, Eve takes a writing class—where she flirts with a thoughtful 19-year-old (Owen Teague) whom Brendan used to pick on in school—and develops an addiction to porn. (The latter is indeed a theme.) She's beginning to acknowledge her desires just as her son is flailing toward an awareness that the world doesn't revolve around his. Both characters are recalibrating their identities and aspirations.

THERE'S A LOT to love about this show, from the concision of its 30-minute episodes to an all-female roster of directors that includes Nicole Holofcener *(Friends With Money)* and *Obvious Child*'s Gillian Robespierre. Hahn may well be typecast as a sexually frustrated woman, but she's also the only actor I can think of who could do justice to such a simultaneously sweet and nasty role. Perrotta gives supporting characters surprising depth: Brendan's love interest Chloe (Jasmine Cephas Jones) is a social-justice crusader with a weakness for alpha males. Eve's teacher Margo (Jen Richards) is a trans writer cautiously pursuing a mutual attraction with a straight cisgender man. The show never soft-pedals Brendan's loutishness. It bears witness to the many indignities of female middle age.

Yet its greatest contribution may be its sensitive portrait of a mother and her son. You'd think we would see more of these stories, considering the perennial popularity of father-daughter narratives on TV, from the superdads of *Friday Night Lights* and *Veronica Mars* to the chilling patriarchs of *Twin Peaks* and this year's ABC oddity *Almost Family.* Then again, Hollywood so greatly prefers young women to middle-aged ones that the omission isn't really a surprise. It is, however, a shame. Half a century after women's liberation, with peace between the genders more elusive than ever, *Mrs. Fletcher* affirms that the bond between moms and their boys is a crucial piece of the puzzle. ◻

Mirren goes regal

REVIEW

Catherine, not so great

Well-behaved women may seldom make history, but Catherine the Great certainly did. After usurping her husband's throne in 1762, the Russian Empress modernized her adoptive homeland while greatly expanding its territory. As the most powerful woman in the world—and a sovereign with no intention of sharing that influence with a second husband—she also collected male lovers as if they were couture gowns. One affair, with the ambitious field marshal Grigory Potemkin, fed both her political and carnal passions.

Their relationship begged to be dramatized, and a decision to cast the ageless siren Dame Helen Mirren as the 18th century's sauciest autocrat seemed to bode well for HBO's *Catherine the Great*. Yet the four-part Sky co-production, airing on Mondays, never lives up to its name. A British cast with English accents can't capture the all-important cultural clashes within a Russian court where a German-born monarch speaks French with her courtiers. Though its lovely sets and costumes may satisfy diehard fans of period drama, the show never settles on a tone, toggling abruptly from stiff dialogue and boilerplate battles to frothy scenes of sex and intrigue. Not even the divine Mirren, an executive producer, is operating at full charm. —*J.B.*

REVIEW

BoJack floats toward the finish line

BOJACK HORSEMAN SOUNDED KIND OF silly at first: A cartoon about a washed-up '90s sitcom star who also happens to be a horse? Who asked for that? And sure enough, during its first season, mixed reviews reflected both a slow start and a widespread frustration with creator Raphael Bob-Waksberg's seemingly slight premise.

But five years later, with the first half of its two-part final season coming to Netflix on Oct. 25, *BoJack* may be the most important—and beloved—animated series since *The Simpsons*. A believably depressed substance abuser with a habit of hurting the people who care the most about him, BoJack (voiced by Will Arnett) became a poster boy for a mid-2010s movement for raw yet realistic and empathetic portraits of mental illness on television. Though he's certainly a descendent of Don Draper and Tony Soprano, he also embodies a critique of the way those prestige dramas romanticize their rich, moody antiheroes.

By now, the show's commentary on the 21st century entertainment industry has extended far beyond BoJack. Drawn in witty detail by production designer Lisa Hanawalt, its setting is a surreal, satirical Los Angeles where humans and anthropomorphic animals walk shoulder to shoulder. And it thrives on an ensemble of BoJack's friends and colleagues, each a multidimensional person trying to survive in a brutal city: his agent, a cat named Princess Carolyn (Amy Sedaris), leans in far enough to fall. Intelligent, self-righteous Diane Nguyen (Alison Brie) chases success as a journalist to hide from her emotions. Benign slacker Todd Chavez (Aaron Paul) seems incapable of establishing a grownup life. Even BoJack's peppy canine rival Mr. Peanutbutter (Paul F. Tompkins) struggles to maintain romantic relationships.

These characters come to the fore, one by one, in the masterly eight-episode first half of Season 6. (A second batch of eight arrives Jan. 20.) As BoJack hides at rehab, afraid to leave and risk hurting people, Diane and Carolyn's efforts to temper their ambition with love are especially poignant. Motivated or lazy, manic or depressive, what everyone in this world shares is restlessness. It's no wonder that a jarringly photo-realistic night-sky background becomes the season's defining motif. In *BoJack Horseman*'s Hollywood, every star is floating in a private abyss. —J.B.

After decades of heartbreak, Princess Carolyn, right, is still there for BoJack

MRS. FLETCHER, CATHERINE THE GREAT: HBO; BOJACK HORSEMAN: NETFLIX

Call of Duty: Modern Warfare *adds a female protagonist to the mix*

FEATURE

A hit game gets heavy

By Alex Fitzpatrick

IT'S NIGHTTIME IN LONDON, AND you're with a group of counterterrorism agents advancing on a house. Intelligence reports suggest there's a cell of assailants inside who carried out an attack against the city. Your team breaks down the door and moves from room to room, killing anybody who poses a threat. But it's not just armed men you find. There are children here too, scattering in the cross fire. Upstairs, you open the last door to find a woman who begs you not to shoot. When you pause for a moment, she lunges for a gun. It's her or you.

This is a scenario in *Call of Duty: Modern Warfare,* the latest installment in one of video gaming's most successful franchises. When the game's millions of fans fire up this version, they're going to find something very different from past games: a single-player campaign that's a gripping and emotionally difficult depiction of life on the front lines of the global war on terrorism. It's a major departure for the franchise and, for publisher Activision and developer Infinity Ward, a big risk too. Will players who look to video games for escapism want to grapple with the moral and ethical quandaries posed by real conflict? Or will they prefer to stick with cartoonish shooters like those in *Fortnite* and *Overwatch,* which ask only that players sit back and have a good time lobbing digital rockets and grenades at one another?

Modern Warfare's creators are betting that adult gamers are ready for a more mature take. "No one who is 18 these days believes that war is easily won," says Jacob Minkoff, who led the story design at Infinity Ward. "They want a war story that represents their experience living in a world that has been at war their entire lives."

ACTIVISION HAS PLENTY riding on whether Minkoff is right. *Call of Duty* has been among the world's best-selling video games since the original title, set in World War II, came out in 2003; it's now a multibillion-dollar franchise. The games have rarely asked players to think too hard about the ramifications of never-ending global warfare. They're more like action movies: characters inexplicably survive sniper attacks, airplane crashes and even entire buildings falling on top of them.

But in *Modern Warfare,* out Oct. 25 for PlayStation 4, Xbox One and PC, the story takes center stage, tackling heady themes like the question of terrorist vs. freedom fighter, the gray area in which modern Special Forces operate and the concept of national sovereignty.

In a step forward for the male-dominated world of first-person shooters, one of the story's protagonists, Farah Karim, is the female leader of a group of fighters seeking to protect their homeland. While Karim lives in the fictional country of Urzikstan, she evokes the all-female Kurdish Women's Protection Units active in northern Syria. In a flashback to her childhood, we watch through her eyes as her town suffers a chemical-weapon attack, forcing her family to flee. The first-person view—with the camera low to the ground to simulate a child's perspective—makes it all the more powerful.

"You have people who never chose to be soldiers but who are forced into the role of soldier to fight for their homes," says Minkoff. "Very early on, we decided that we wanted to tell the story both from the perspective of professional soldiers and civilian soldiers—what they fight for and the challenges they face."

While other *Call of Duty* games take players from the invasion of Normandy straight through Hitler's downfall, *Modern Warfare* players won't come away

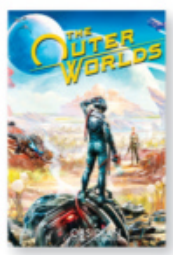
ACTIVISION/INFINITY WARD

with a sense that they have "cleaned up the whole global war on terror," says Minkoff. Rather, the point is to say something meaningful about the complexities of modern war. "No villain sees themselves as the bad guy," says Taylor Kurosaki, studio narrative director at Infinity Ward.

How *Call of Duty* players respond to this year's incarnation of the series, with its ambitious, decidedly more adult approach to its subject matter, could show a path forward for this lucrative business as it comes under the cultural microscope once again. The game has figured prominently in debates about the connection, or lack thereof, between video games and real-world shootings. A game this realistic, gruesome and psychologically challenging might reinforce criticism of violent games. But by tackling these themes head-on, *Modern Warfare* might be doing more to illuminate the true horror of terrorism and gun violence than to glorify it. ◻

This fall's biggest games

CAN YOU FEEL IT? THE TEMPERATURE IS DROPPING, THE WIND IS picking up, and the pumpkin-spice lattes are flowing. Fall is here, and with it inevitably come the year's biggest video games. Here are the titles we're most excited about—and the games we think we'll be talking about well into 2020. —MATTHEW GAULT



THE OUTER WORLDS
(PS4/Xbox One/ PC/ Switch)
In a far-flung future, humanity has colonized the stars—driven not by a need to explore but by a quest for profit. Players wake from cryosleep on the edges of colonized space, then fight to survive and investigate the megacorporations that hold sway.
Oct. 25

DEATH STRANDING
(PS4)
What happens when you give video-game auteur Hideo Kojima, best known for the *Metal Gear* series, freedom to do anything? *Death Stranding,* a surreal game about a man traveling across America with a baby strapped to his chest that he uses to move between life and death. *Nov. 8*

POKÉMON SWORD AND SHIELD
(Switch)
Pokémon Sword and Shield mark a major milestone for the beloved franchise, representing the first time the mainline games have gone from Nintendo's handhelds to its console. They will have new creatures to catch, a new world to explore and much more.
Nov. 15

Instagram cooks hit the books

By Rachel E. Greenspan

RACHEL MANSFIELD IS GETTING READY to make mouthwatering mac and cheese. She's known for the paleo, vegan and gluten-free recipes she shares on Instagram and on her blog, but this time she's preparing a traditional version of the hearty classic. During our phone call, she's picking up cheddar cheese at Whole Foods, which pays her to promote the grocery chain, and she pauses every few minutes to exuberantly say hello to fellow shoppers.

Mansfield, 29, has no formal culinary training. But to the 325,000 Instagram users following her at @rachlmansfield, she's both a celebrity chef and a trusted online friend. She built a following by cooking up healthy, simple versions of baked goods, like chocolate-chip funfetti cookies (made with oat and almond flour, as well as maple syrup for sweetness), paleo beef tacos (using a grain-free shell) and crispy cauliflower bites (baked and served with dairy-free ranch). To connect with fans, she shares "authentic" moments, like the challenges she faced while nursing her son Ezra, who was born in January after a struggle with fertility. For her next dish, Mansfield will join the growing number of "foodfluencers" who are taking their brands from the digital world into print, with a cookbook, *Just the Good Stuff,* out in February.

"I felt like I worked so hard to grow my own brand in a digital space, and that really carried over," says Mansfield. Her book will sit beside releases from other foodfluencers, like Danielle Walker's *Against All Grain,* Gaby Dalkin's *What's Gaby Cooking* and Chungah Rhee's *Damn Delicious.* Along with books from stalwarts like Martha Stewart and Bobby Flay, the Instagram crowd seems to be having an impact: cookbook sales were up 21% from 2017 to 2018, according to NPD Group, a research firm. Overall book sales rose only around 2% in the same period. "With more people cooking meals at home, there is renewed interest in cookbooks of all kinds, especially those that help cooks save time and eat well," NPD said in a 2018 report.

THE BLOG-TO-COOKBOOK PHENOMENON kicked off with Ree Drummond's Pioneer Woman blog, leading to a book and a Food Network series. Instagram has since led to a proliferation of food celebrities, whose huge prebuilt audiences are attractive to publishers. "That is a dramatic shift, to have all of those different places for publishers and for potential cookbook readers to discover new talent," says Doris Cooper, editor in chief and SVP at Clarkson Potter, the Penguin Random House imprint publishing Mansfield's book. For foodfluencers, writing a cookbook, like plugging a grocery chain, is one more way to monetize audiences. YouTube's beauty gurus are creating makeup lines, fashion bloggers are selling clothing, and fitness celebs are offering exercise plans and health supplements.

While some may scoff at the idea of buying a cookbook from a self-taught home cook, Mansfield says her casual approach has only strengthened her brand. "I think that that's what has really attracted people to my blog and Instagram because they know it's not these heavily curated, crazy recipes," she says. That sentiment echoes other successful food celebrities, like Ina Garten, who also says she doesn't consider herself a professional chef despite a Food Network show and nearly a dozen cookbooks. Henry Notaker, a literary historian and author of *A History of Cookbooks: From Kitchen to Page Over Seven Centuries,* says people like Mansfield sit at the intersection of celebrity, trust and familiarity where cookbook success long has resided.

The same technology that has turned people like Mansfield into minor celebrities able to land book deals also makes it possible for anyone to access almost any recipe for free, whenever and wherever they are. Why, then, are people paying $25 or more for cookbooks from their favorite online personalities? For Mansfield, the question is yet another opportunity. "I think it is a lot about people just wanting to support the brand that they have watched grow." □

AGAINST ALL GRAIN
Danielle Walker offers gluten-free and grain-free recipes

WHAT'S GABY COOKING
Gaby Dalkin puts the focus on fresh ingredients

DAMN DELICIOUS
Chungah Rhee keeps things quick for home cooks with little time

Cheese. Tacos.
No dinner drama.

Kraft

For the win win

Robert J. Shiller The Nobel Prize–winning economist on the odds of recession, the trade war with China and his new book *Narrative Economics*

What is narrative economics? I define narrative economics as the study of popular stories that are economically relevant, that have a moral, that are a lesson that people will take heed of in their economic decisions.

You write that these narratives can and do shape the economy. Can you give me an example from the past of how a narrative has caused a recession? The narrative that comes to my mind for the 2007 through 2009 recession is the housing narrative. There were a lot of people flipping houses. That was a new term. And the idea that home prices have always gone up was encouraged by the stories of people making a lot of money selling houses in that environment. There wasn't much attention to the history of price declines. There was no counternarrative.

How have economists failed to understand narratives in the past? A lot of them do understand them, but they haven't thought they were worthy of entry into their pronouncements. The problem is, as an economist you can't rely on what people tell you on the street. But sometimes it does have real relevance. The problem is we don't have the right kind of survey data. We have confidence indexes, but they are based on surveys which ask people for their outlook in quantitative terms, without asking about the story that is motivating them.

The inverted yield curve has been in the news recently. Do you think the notion that it always precedes a recession is a narrative? Yes. There's a chart showing inverted yield curves followed by recessions. So maybe people remember that visual stimulus. It's very direct. People have memories of seeing it on the news in decades past. Now it has exploded, and people are talking about it everywhere. I'm afraid that it will bring about a recession because if you think a recession is coming, your probable actions will be to reinforce that.

"THERE WILL BE A RECESSION. THE QUESTION IS WHEN. I'M TEMPTED TO SAY WE'RE OVERDUE FOR ONE"

Is there something about nationalism that you think goes hand in hand with certain economic decisions? Patriotic narratives are more contagious. I think angry narratives are often contagious. Tribal loyalties are prehistoric. People would tell stories in the past that elevated the tribe and give us a reason to fight for it as a unit. So narratives are part of human history. Even though we haven't always had the Internet and social media, we have had viral narratives.

Do you think there's going to be a recession in the U.S.? Well, there will be a recession. The question is when. I'm tempted to say that we're overdue for one, because this expansion will be the longest in history. That's assuming the economy isn't already in recession. I'm thinking about the narrative and the stories I'm hearing. I think the talk of the recession is building up. The stories are coming in which are probably related to the trade crisis. And it's going back to a 1930s narrative about a tariff war, a trade war. It's unsettling people. It's causing some people to curtail their spending. Distrust of President Trump is building.

How do you think Trump is trying to control the narrative on the trade war with China? And do you think the way that he's framing that narrative has an impact on the economy? He is constantly generating news. It's what he did on his TV show. He would send people into conflictual situations, and then he would fire them at the end of the show. It's a little bit like the wrestling that he was involved with, where he actually appeared in a wrestling TV show, punching another man. It's what he knows. If we start a recession, it will discredit him. And public opinion could turn against him and make him seem not so invulnerable. —BILLY PERRIGO

CHRISTOPHER LANE—CONTOUR BY GETTY IMAGES

ACCELERATING RESEARCH WORLDWIDE

TO END ALZHEIMER'S

The Alzheimer's Association® is the world's largest nonprofit funder of Alzheimer's research, and the nonprofit with the highest impact in the field worldwide, behind only the Chinese and United States governments as measured by InCites Clarivate™. Bringing together government, academia, companies and philanthropists to support researchers and accelerate science, the Association works relentlessly to pursue discoveries that will change the trajectory of Alzheimer's and all dementia.

Learn more about the Alzheimer's Association research program at **alz.org/research**.

alzheimer's association