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LS 500 F SPORT shown with options. 1. Ratings achieved using the required premium unleaded gasoline with an octane rating of 91 or higher. If premium fuel is not used, performance will decrease. 2. Performance figures are for comparison only and were obtained with prototype vehicles by professional drivers using special safety equipment and procedures. Do not attempt. ©2019 Lexus

JANUARY 2020 FORTUNE.COM

FORTUNE

20 IDEAS THAT WILL SHAPE THE 2020s

By **Melinda Gates · Jamie Dimon · Malala Yousafzai Robert Shiller · Aileen Lee · Klaus Schwab · and more!**


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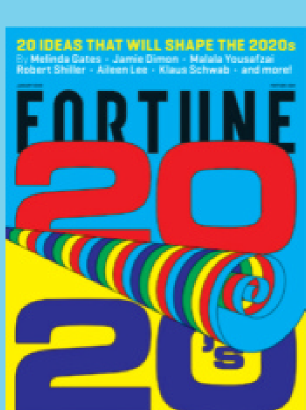
JANUARY 2020

FEATURES

VOLUME 181 /// NUMBER 1



▲ ON THE COVER: ILLUSTRATION BY STEVEN WILSON

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VOLUME 181 /// NUMBER 1

FORTUNE AROUND THE WHEEL

WHAT OUR EDITORS ARE UP TO THIS MONTH

HOT STREAK
The cochairs of our annual tech summit, Brainstorm Tech, hit the Las Vegas Strip on Jan. 6 for an invite-only dinner featuring Waymo CEO John Krafcik and top mobility execs from GM, Daimler, and others. *fortuneconferences.com*

ON *PISTE*
Fortune's* top editors join top executives at the World Economic Forum in Switzerland from Jan. 21 to 24 to discuss solutions to challenges including climate change, sustainable business models, and tech governance. *fortune.com* and *weforum.org

CORRECTIONS

Owing to a transcription error, "Ripping Up the Rules at Goldman Sachs" (Dec. 2019) included a misquotation of the firm's chief strategy officer, Stephanie Cohen. The correct quote is: "When we say 'operating efficiency,' everyone hears 'cost'—operating efficiency, you're a cost. What we're really trying to do is help people do their job more efficiently, and sometimes that's a cost thing."

"Rewriting a Toy Story" (Dec. 2019) erroneously stated that Mattel plans to sell 12 of its 13 factories; in fact, Mattel has not said how many factories it intends to sell.

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PANDORA'S BOXES

CHANCES ARE THAT VIRTUALLY ALL OF YOU received a box, or several, at your doorstep this holiday season. And there's a very good chance that it was put there by a cheerful, brown-clad driver for UPS, which dispatches nearly 21 million such packages to an untold number of doorsteps each day. In which case, it almost certainly passed through a sorting facility like the one in western Atlanta that UPS opened in October 2018—one of six new complexes the company has built across the U.S.

Here, at the Southeast Metro Automated Routing Terminal (a name no doubt designed with acronym in mind), boxes zoom through a spaghetti tangle of conveyor belts at 600 feet per minute, not slowing for a second as they're photographed on all six sides—traversing from a drop-off truck at one of 104 unloading bays to a new set of exit bays (and waiting delivery trucks) in an average of just seven minutes.

All of this kinetic wizardry—as *Fortune* senior writer Aaron Pressman explains in his marvelous feature on UPS (please see "Stand and Deliver" on page 76)—is made possible by a wealth of unseen technology. Ultra-high-speed cameras and image-processing computers, for instance, send encoded destination data to one of the most complex route-optimization algorithms on the planet, as smart mechanical "shoes" guide packages through a sorting building the size of 19 football fields. Hogwarts has nothing like it.

UPS's tech arsenal already includes everything from drones and robotics to self-driving vehicles, and the company is deep into a three-year $20 billion tech upgrade to keep the competition—including Amazon, which is building up its own delivery service—at bay. By every measure, the investment is making an already efficient company all the more so. But the gains don't come without disruption—there's that dreaded word again—to UPS's global workforce of nearly half a million people. It's pushing some company veterans to face retraining or early retirement, even as the company has brought in some lower-paid weekend workers to handle the demands of online shoppers who want *everything* the next day.

Fortune has long reported on the technology arms race. And *Fortune*'s Robert Hackett offers another enlightening take on tech's relentless advance as he investigates Facebook's continuing effort to create a financial ecosystem around Libra—a digital currency known as a stablecoin—before another company or country gets there first (please see page 58).

But what seems more and more apparent these days is that the competition isn't so much among companies as it is between technology and people. Indeed, as we explore in our cover package, "20 Ideas That Will Shape the 2020s" (page 41), gracefully shepherded by editors Lee Clifford and Kristen Bellstrom, this is a theme that is sure to play out in myriad ways over the next decade. How will human beings coexist with rapidly advancing technology that is taking away traditional jobs—and creating new digital divides in its wake? How will we rein in machine-learning algorithms that may have built-in biases? Or protect our privacy in an age in which digital identities are as fungible and free-flowing as the Internet itself? How can we turn social media interaction into simply social interaction again?

For our first issue of the new decade, we've tapped a host of the world's sharpest minds to answer these questions.

Which brings me at last to *Fortune*'s own self-disruption, which will be unveiled later this month as we launch a new premium website, a robust video portal in which to explore our conference content (and much, much more), and a comprehensive, customizable app—which will make it easier for subscribers to engage with us anywhere. The following month we're also relaunching our print edition with a brand new design—one elegant enough to celebrate *Fortune*'s 90th anniversary. And better still, you can get all of the above without ever opening a box.

CLIFTON LEAF
Editor-in-Chief, *Fortune*
@CliftonLeaf

THE WORLD IN 9 PAGES

BRIEFING

The Great Big Billionaire Backlash

Fifteen years ago, the ultrarich were widely admired by the American public. Now we find their entire existence is being questioned. What changed? By Geoff Colvin

WEALTH

AMERICANS DON'T HATE WEALTH. They hate injustice. Those facts are worth remembering as we enter this election year and try to understand America's schizoid attitude toward billionaires, three of whom are running for President. It's an attitude worth understanding because billionaires are certain to symbolize crucial issues for the next President, whoever he or she may be.

It's a bizarre political moment. Two of the top three Democratic candidates in national

ORIGINAL PHOTOS: GETTY IMAGES (3)

ILLUSTRATION BY TRES COMMAS

polling, Bernie Sanders and Elizabeth Warren, routinely vilify billionaires as more or less the root of all evil. Sanders has said, “I don’t think that billionaires should exist.” The top-polling Democrat, Joe Biden, sends a more subtle message: “I don’t begrudge anybody making a million or hundreds of millions of dollars,” he said in February, leaving unspoken that 10 figures are just too much. Yet the Democratic field also includes two billionaires, Tom Steyer and recent entrant Michael Bloomberg, who in only a few weeks has used massive TV advertising to approach the top tier, a few points behind the No. 4 candidate, Pete Buttigieg.

As for the Republicans, they’re not entirely unconflicted on this subject, even though their candidate became the first billionaire President three years ago.

So do we love billionaires or disdain them? Simple partisanship is the easy part of the answer. Polling confirms what we already know: Republicans tend to be billionaire-friendly, and Democrats tend not to be. What complicates the picture is a large nonpartisan element. Oprah Winfrey, Steven Spielberg, Michael Jordan—they’re all billionaires, and America loves them. Bill Gates and Warren Buffett rank near the top in YouGov’s 2019 survey asking Americans whom they admire most, interspersed among movie stars, Pope Francis, and the Dalai Lama.

Sometimes we love billionaires. But as the success of Sanders and Warren shows, a sizable group of Americans resent them bitterly. At a deep level, our billionaire bifurcation reflects two starkly different views of the world—how it works, why some people get ahead and others don’t, whether the future is dark or bright. The divide separating those who hold these opposing views has deepened dramatically over the past few years.

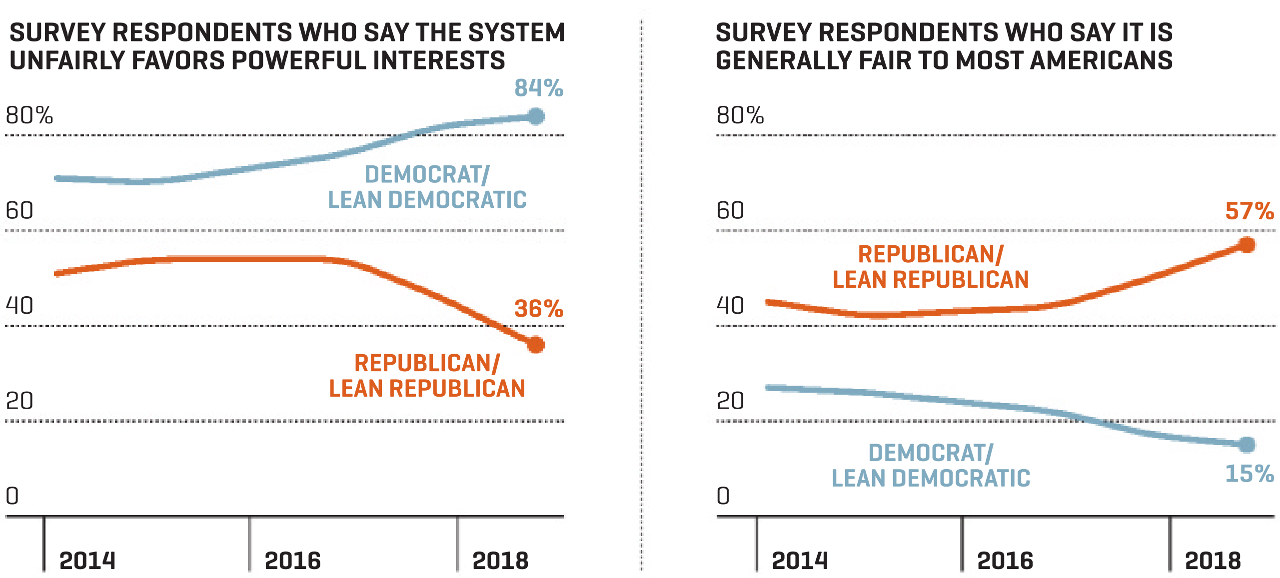
Consider the fundamental question of whether the U.S. economic system “is generally fair to most Americans” or “unfairly favors powerful interests,” as the Pew Research Center has posed it for the past five years. Overall sentiment has barely budged: About 33% of U.S. adults say it’s fair, and 63% say it’s unfair. But in just the past three years, Republicans and Democrats have polarized on the issue, with Republicans now far more likely to say it’s fair, and Democrats far more likely to say it isn’t.

Little wonder that billionaires are under fire. It’s no longer just Democratic Socialists like Bernie Sanders who believe they’re profoundly bad for the nation; Cato polling finds that 54% of Democrats believe “billionaires are a threat to democracy” (while 79% of Republicans don’t agree).

Underlying this historic shift is the megatrend of increasing income disparity. The inescapable fact is that since 1967, inflation-adjusted income has increased 99% for the top quintile of households and only 31% for the bottom quintile. Republicans and Democrats frame their explanations of what happened in fundamentally different ways based on their rapidly diverging worldviews, leading to ever more sharply contrasting policy prescriptions.

Which brings us back to America’s love-hate relationship with billionaires. In our hyperpartisan environment, two extreme election outcomes are entirely plausible. The Democrats’ more progressive wing could sweep, promising an unprecedented anti-billionaire agenda of historic tax increases on the wealthy. Yet voters could also deliver a completely opposite and equally unprecedented outcome: Next January, for the second time in U.S. history, a billionaire—of either party—could be taking the oath of office. ■

SPLIT DECISION: THE PARTISAN DIVIDE ON U.S. ECONOMIC SYSTEM FAIRNESS



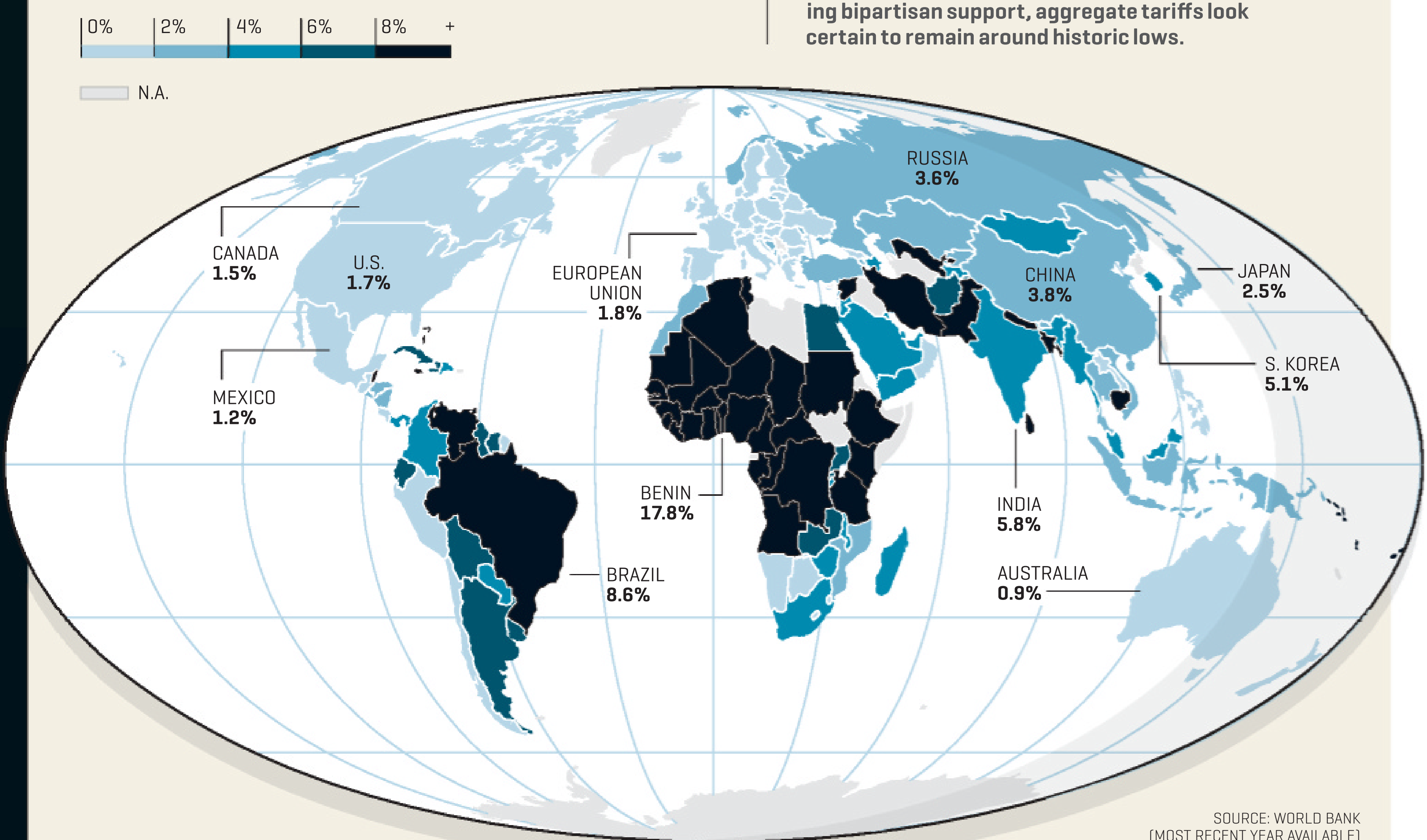
SOURCE: PEW RESEARCH CENTER

ANALYTICS Seeing Trends in the Data

WHETHER THE CALM in trade hostilities between the U.S. and Beijing will hold or not, the current tariffs imposed by the Trump administration on Chinese goods are already being felt by businesses and soon, by consumers. But while China is the United States' single biggest trading partner, neighbors Canada and Mexico are a close second and third, and they combine for more than $1.1 trillion in annual trade. With NAFTA replacement USMCA enjoying bipartisan support, aggregate tariffs look certain to remain around historic lows.

U.S. TARIFFS NEAR GLOBAL, HISTORIC LOWS

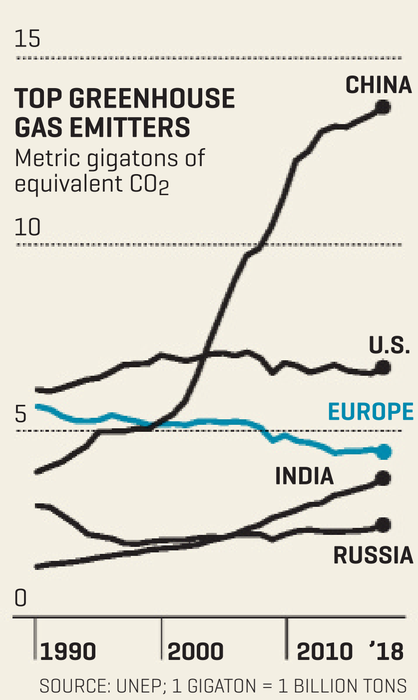
TARIFF RATE (APPLIED, WEIGHTED MEAN, ALL PRODUCTS)



SOURCE: WORLD BANK (MOST RECENT YEAR AVAILABLE)

CO_2 EMISSIONS: A STARK WARNING

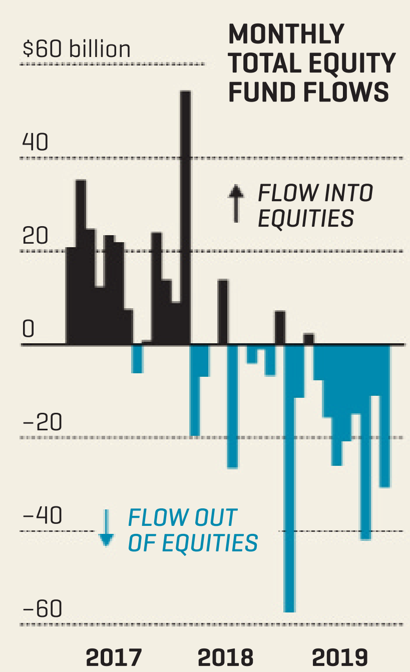
THE PLANET is in peril, and the world's largest economies need to take drastic action to save it. That's the message of a recent UN climate report, which showed that greenhouse gases continue to rise at dangerous levels. For the past decade, greenhouse emissions rose 1.5% per year. But to avoid a climate disaster, the authors of the UN report say, emissions must fall 7.6% every year for the next decade.



SOURCE: UNEP; 1 GIGATON = 1 BILLION TONS

RETAIL INVESTORS GROW CAUTIOUS

WALL STREET may be reveling in a historic bull market, but Main Street investors are being careful about holding too much stock when the next recession hits. Money from retail investors is flowing out of equities and into bond mutual funds and ETFs as the aging population, with the last financial crisis in mind, seek a safer alternative.



SOURCE: ICI

GRAPHICS BY **NICOLAS RAPP**

Dropout culture for the in-crowd.

CRUSTY NO MORE: DEADHEAD THREADS ARE HIGH FASHION

STYLE **THE GRATEFUL DEAD** and conspicuous consumption are terms that don't pair well, but the homemade tie-dyed culture found at Deadhead tailgates has officially gone high-fashion. While Prada sells $2,480 tie-dyed dresses on Net-a-Porter, companies that got their start selling bootleg T-shirts outside those Dead shows have quickly found themselves participating in *GQ* spreads. Online Ceramics, often referred to as the Supreme of Shakedown Street, sells out of its $90 shirts within minutes of posting them on its charmingly rustic website. —**NICOLE GOODKIND**

CEOs Feel Climate Pressure at Home

Business leaders are being pushed to act on climate change by their children.

By Katherine Dunn

ACTIVISM **WHEN THE CONCEPT** of "flying shame"—embarrassment over flying owing to its carbon footprint—began to catch on, the CEO of Air France wasn't new to the idea. Anne Rigail had already faced pressure at home from her "three activists": her two children and her husband.

"It's very good, because I was not at all surprised by this whole thing about 'flight shaming,'" she says. "I think it's our biggest challenge."

Call it the Greta Thunberg phenomenon: When it comes to taking action on climate change, kids—in particular—may well be CEOs' greatest critics.

"I'm hearing it from many [executives]," says Christiana Figueres, founding partner of the NGO Global Optimism. "Because some of these kids are out in the streets, demonstrating—and some are demonstrating over the dinner table, asking their parents what they're doing—what are they truly doing—for their kids' future."

As for Rigail, she says Air France aims to lower its carbon emissions by 50% per passenger/km by 2030, from a baseline in 2005. Asked if her activists were satisfied with her efforts, she admitted: "Not yet."

PRIVACY

SENATE WATCHES THE RING

A SERIES of reports has revealed that employees of Amazon's Ring security camera product, both in the U.S. and abroad, had access to users' unencrypted videos. So do police, with surprisingly few restrictions. Ring also appears to have been pursuing facial-recognition technology, and had drawn up plans to create "watch lists" of "suspicious" people. That dystopian agenda has made Ring a target for activists as well as the U.S. Senate. A group of five Democratic senators wrote Jeff Bezos late last year asking for an explanation of Ring's security and privacy practices. Ring says it complies with all applicable privacy laws. Watch for Ring and similar companies like Nest to come under increased scrutiny this year.
—DAVID Z. MORRIS

FASHION, FROM LEFT: SAY CHEESE!—GC IMAGES/GETTY IMAGES; CHRISTIAN VIERIG—GETTY IMAGES; RANDY BROOKE—WIREIMAGE; MIKE COPPOLA—GETTY IMAGES FOR LIU YONG X RISHIKENSH; SIGN: MICHAL FLUDRA—NURPHOTO VIA GETTY IMAGES

MOBILE RETAIL BOOM

Fortune teamed up with SurveyMonkey to find out how Americans are shopping.

89%
BUY ONLINE
Nearly nine in 10 Americans buy online, and nearly 30% buy something online every week.

69%
USE MOBILE FOR SHOPPING
82% of millennials and 55% of baby boomers use their mobile phone to make purchases.

55%
PREFER BRICKS AND MORTAR
While nearly everyone is shopping online, a majority of respondents said they still prefer the experience of physical retail.

Die Another Day

Whether bankrupt or sold off—these once-doomed retailers are rising up from the ashes.

By Phil Wahba

RETAIL

A GROWING NUMBER of bankrupt or failed retailers seem to be discovering an afterlife this year—with some beloved brands returning to the land of the living in notably snugger incarnations.

Le Tote, which recently bought the struggling Lord & Taylor from HBC, opened a pop-up shop for the department store chain in New York City for the holidays, its first Manhattan presence since the store closed in early 2019. Kids' apparel brand Gymboree, which filed for bankruptcy in early 2019 for the second time in two years, will live on in the form of shops within 200 Children's Place stores. And Barneys New York, once it is done liquidating its stores, will have a presence at a number of Saks Fifth Avenue stores, including the fifth floor of the chain's Manhattan flagship.

These cases, along with the recent small-scale comebacks of FAO Schwarz and Toys "R" Us, all show how much life there still is in many storied retail brands, corporate mismanagement and choking debt loads aside. So while the so-called retail apocalypse has claimed a number of chains, many are being welcomed back with open arms by consumers.

In the case of Lord & Taylor, HBC had been very late in equipping it for e-commerce: It only got around to having a mobile-device-friendly site last year, among other missteps. "We are combining tradition with the technology that Le Tote is bringing to the table," Le Tote chief executive Rakesh Tondon tells *Fortune*. "It's an iconic brand," he says of the 193-year-old retailer. "There's a lot of value in that." And savvier management teams are figuring out how to extract such value.

Retail resurrection: Lord & Taylor finds new life in Le Tote.

© LORD & TAYLOR: EUGENE GOLOGURSKY—GETTY IMAGES; POP-UP: GETTY IMAGES FOR LORD + TAYLOR

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HEALTH

A FITNESS REGIME PLANNED BY YOUR GENES

DESPITE OUR better instincts concerning data security, genetics companies like 23andMe are massively popular—with the $800 million global market for direct-to-consumer genetic testing projected to triple in five years. Whereas most services analyze multiple genes for inheritable health conditions, Singapore-based startup ELXR is focused on just one: ACTN3. Known as the "gene for speed," it influences the composition of muscle tissue, creating more fast-twitch fibers associated with sprinters and powerlifters. (Those without ACTN3 are predisposed to be better endurance athletes.) Combining analysis of users' current fitness level and exercise goals with their ACTN3 count—ELXR creates a personalized fitness regimen. "It was like a eureka moment," says ELXR founder Steffan Fung, a former member of the Singapore Special Forces, on using the gene to design workouts. While the science behind ACTN3 is sound, the gene can indicate only which types of exercise you are best suited for, not how good you will be at them. So don't think you'll be challenging Usain Bolt anytime soon. **—NAOMI XU ELEGANT**

A Tesla Cybertruck… or a scene from a 1995 video game?

Tesla's $100 Deposit Keeps Shorts at Bay

For the price of a nice dinner for two, you can "order" a Cybertruck. By David Z. Morris

AUTO

THE NOVEMBER unveiling of Tesla's Cybertruck was met with raised eyebrows, and not all were about its bizarro postapocalyptic design. Tesla revealed impressively low pricing—the Cybertruck will start at $39,900—but a stunt intended to demonstrate the truck's toughness ended with two "bulletproof" windows shattered.

All in all, hopes were dashed that Tesla could move aggressively into the wildly lucrative (and currently gas-guzzling) American truck market with such a radical design. Credit Suisse analysts said legacy truckmakers could "breathe a sigh of relief." Tesla's stock fell more than 6% after the unveiling.

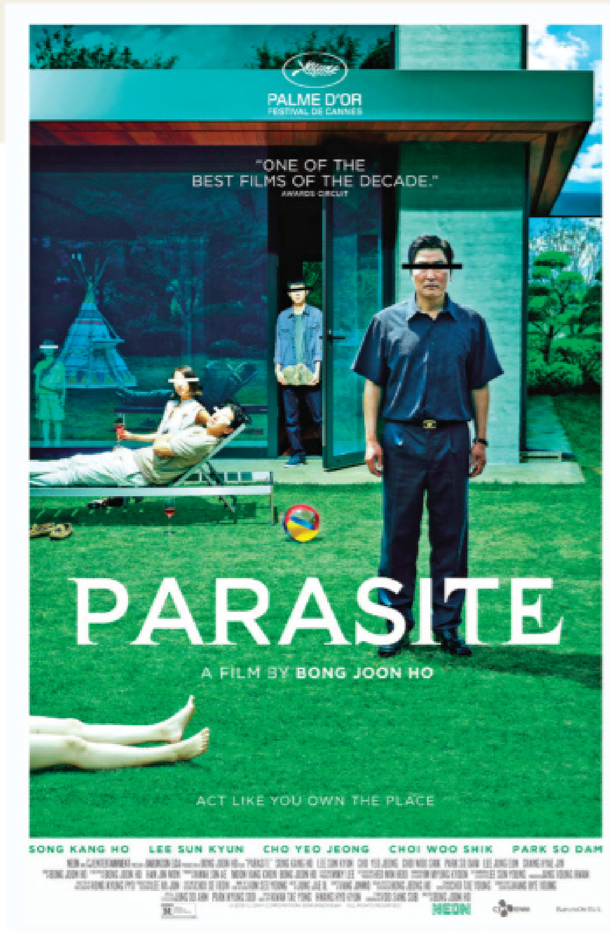
But in the following days, CEO Elon Musk announced "orders" for the Cybertruck had reached 250,000. Impressive, *non?*

Well, that depends on how you define an "order." Musk was actually citing fully refundable $100 deposits, or 0.25% of the cost of even the cheapest Cybertruck. According to Edmunds, the average down payment for an auto loan is now 11.7%—so $4,670 for an entry-level Cybertruck. The low commitment raises questions about how many of those will turn into actual sales when production starts in late 2021. But the short-term PR boost was real. Tesla's stock had recovered most of its post-Cybertruck nosedive within a few weeks.

NOSTALGIA

COSMO COMEBACK

IN AN OFT-QUOTED *Sex and the City* scene, Carrie Bradshaw pulls up to a McDonald's drive-thru and orders "a cheeseburger, large fries, and a cosmopolitan." The hot-pink, vodka-based concoction defined the sickly sweet cocktail culture of the early 2000s. And while anything other than a tequila soda might be unthinkable in today's keto-loving world, Pernod Ricard's Absolut predicts it will find its way onto trendy bar menus in 2020. Banking on millennial nostalgia, Absolut has launched a marketing campaign using the hashtag #CosmoComeback and suggests the cocktail shows "you have a global mentality, and a concern for the finer things in life." Like Manolo Blahniks and brunch, perhaps.
—**NICOLE GOODKIND**



Biting the hand that feeds? *Parasite* producer Miky Lee (top) and her cousin Samsung Electronics head Jay Y. Lee.

Parasite Producer Pokes Fellow Elites

The breakout South Korean black comedy is funded by a Samsung scion. By Adam Lashinsky

MOVIES

***PARASITE*, THE HIT FILM** from South Korean director Bong Joon-ho, was the most talked-about movie of 2019 in its home country, a serious candidate for a Best Picture nod at the Oscars (and a presumed shoo-in for Best Foreign Language Film), and is on track to gross $20 million in the U.S., a windfall for a non-English title. The film checks multiple boxes. It is a hilarious farce, a boy-meets-girl tale with a twist, and a heartbreaking send-up of income inequality in South Korea. In short, *Parasite* has struck a chord worldwide at a time of maximum rich-versus-poor tensions.

It is all the more noteworthy, then, that Miky Lee, the film's executive producer, is vice chairman of CJ Entertainment and a granddaughter of the founder of Samsung, from which CJ was spun out. In other words, the film's top financial backer is a member of the most prominent family in South Korea—her first cousin is Jay Y. Lee, the de facto head of Samsung Electronics—the epitome of the social elite that *Parasite* demonizes.

For CJ, backing *Parasite* and Bong, whom it has financed before, is business as usual. What's more, Miky Lee has a track record of supporting artists, particularly Korean actors who have crossed powerful interests at home. "Miky Lee has taken a risk in investing in dicey and innovative films for the past decade or so," says Jinsoo An, a professor in the University of California at Berkeley's East Asian studies department who studies Korean cinema. He cites Park Chan-wook's *The Handmaiden* and Kim Jee-woon's *The Good, the Bad, the Weird*, two films CJ distributed. Lee's background notwithstanding, says An, her company is "liberal and progressive," and she is "the most influential and powerful female film producer in South Korea."

© COSMO: ISTOCKPHOTO—GETTY IMAGES; MIKY LEE: MICHAEL KOVAC—GETTY IMAGES; JAY Y. LEE: CHUNG SUNG-JUN—AFP VIA GETTY IMAGES

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The Year of the CEO Exodus

The seat in the corner office has never felt so hot. In 2019, with the jobless rate sitting at a 50-year low, a record number of CEOs left their high-paying jobs.

By Kevin Kelleher


Adam Neumann


Larry Page


Steph Korey


Oscar Munoz

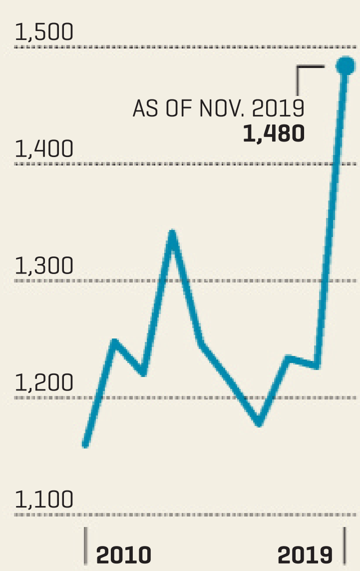
CEO DEPARTURES through November rose 12% year-on-year to 1,480, according to executive outplacement firm Challenger Gray & Christmas. That was only four exits shy of the record set in 2008, during the turmoil of the global financial crisis. Since November, five more prominent chiefs have left their jobs: Alphabet's Larry Page, United's Oscar Munoz, Expedia's Mark Okerstrom, Harold Hamm of oil producer Continental Resources, and Steph Korey of Away, a trendy luggage company.

But unlike 2008, this isn't a period of economic turbulence. Periods of booming stocks allow successful CEOs to hand over the reins without spooking investors. Alphabet's Page—along with cofounder and president Sergey Brin, who also stepped down—exemplifies this kind of smooth transition. All told, 36% of departing CEOs transitioned to another senior role at the company. Hamm, for example, stayed on as chairman.

But that doesn't fully explain the surge in CEO turnover. "It's surprising," says Andrew Challenger of Challenger Gray. "It doesn't jibe with what we've seen historically, but in some ways, it's a tight labor market for CEOs too." One clue is that more replacements are coming from outside candidates, not in-house. "This means companies are saying, 'We don't have the institutional knowledge to do this. We need to go out into the market and find new talent.'"

That trend is evident in the ever-evolving tech industry, where CEO exits have increased 45% this year. And shifting consumer tastes have roiled the retail, food, apparel, and entertainment industries: Together, they saw CEO departures rise 63%. When Nike CEO Mark

CEO DEPARTURES, YEARLY



SOURCE: CHALLENGER GRAY & CHRISTMAS

> **"COMPANIES ARE SAYING, 'WE DON'T HAVE THE INSTITUTIONAL KNOWLEDGE TO DO THIS. WE NEED TO GO OUT INTO THE MARKET AND FIND NEW TALENT.'"**

Parker stepped down in October, the company tapped John Donahoe, formerly of eBay, to oversee a new push into e-commerce.

Unhappy shareholders made their voices heard this year too. Okerstrom left after clashing with Expedia's board and its chairman Barry Diller; eBay's Devin Wenig, meanwhile, departed under pressure from activist hedge funds. And 35 CEOs left under a cloud, whether because of résumé padding (Samsonite), regulatory backlash (Juul), or inappropriate behavior (McDonald's). Most notably, WeWork's board pressured Adam Neumann to step down in an effort to salvage a troubled IPO.

But the fact that more CEOs are leaving because of bad behavior doesn't necessarily mean leadership is declining. "There's always been misconduct among CEOs," says Challenger. "But today it's being looked at under a microscope." ■

NEUMANN: PETER PRATO—THE NEW YORK TIMES/REDUX; PAGE: DAVID PAUL MORRIS/BLOOMBERG VIA GETTY IMAGES; KOREY: JARED SISKIN—PATRICK MCMULLAN VIA GETTY IMAGES; MUNOZ: SAUL LOEB—AFP VIA GETTY IMAGES

The Best Workplaces for Diversity

These companies walk the talk in creating workforces that look like America.

By Hadley Hitson

THE U.S. IS BECOMING MORE DIVERSE by the day, and so is its workforce. Along with these shifts come rising expectations that companies' ranks reflect society at large—and that everyone feels welcome and can thrive at work. For employers, there are not-so-secret benefits to promoting diverse and inclusive workplaces: They're more likely to drive innovation, increase market reach, and improve productivity—and they're more enticing to job candidates.

The companies on this year's 100 Best Workplaces for Diversity list welcome people who identify with different genders, races, sexualities, and backgrounds, as well as people from various age groups and those who live with disabilities. In ranking the list, research and analytics firm Great Place to Work weighed the effectiveness of companies and their leaders, based on employee surveys, and also took the diversity of the company's workforce and leadership into account.

Stryker, a $13 billion medical technology company whose workforce is made up of 35% women and 26% minorities, tops the list. CEO Kevin Lobo has doubled the number of women on Stryker's board since his appointment in 2012, and he has emphasized cultivating a workplace that mirrors the diversity of Stryker's customers and patients.

With 3% of its workforce identifying as LGBTQ, Cisco (No. 2) has been at the forefront of corporate activism for diversity and inclusion, notably by outspokenly opposing "bathroom bills" that restrict the rights of transgender people.

In testimonials, employees explained why they value working for these companies. Among traits they singled out: open celebration of LGBTQ Pride Month, leadership opportunities for the underrepresented, and executives who "look like America." F

See all of the top 100 workplaces for diversity at Fortune.com.

01 STRYKER
WOMEN AS % OF WORKFORCE	35%
MINORITIES	26%
PEOPLE WITH DISABILITIES	2%

02 CISCO
WOMEN	28%
MINORITIES	48%
PEOPLE WITH DISABILITIES	5%

03 PROGRESSIVE INSURANCE
WOMEN	N.A.
MINORITIES	N.A.
PEOPLE WITH DISABILITIES	11%

04 ACCENTURE
WOMEN	38%
MINORITIES	51%
PEOPLE WITH DISABILITIES	9%

05 SYNCHRONY
WOMEN	62%
MINORITIES	45%
PEOPLE WITH DISABILITIES	16%

06 MOHEGAN SUN
WOMEN	48%
MINORITIES	49%
PEOPLE WITH DISABILITIES	13%

07 WORKDAY
WOMEN	42%
MINORITIES	45%
PEOPLE WITH DISABILITIES	4%

08 ADOBE
WOMEN	36%
MINORITIES	39%
PEOPLE WITH DISABILITIES	5%

09 ULTIMATE SOFTWARE
WOMEN	49%
MINORITIES	46%
PEOPLE WITH DISABILITIES	5%

10 MARRIOTT
WOMEN	55%
MINORITIES	66%
PEOPLE WITH DISABILITIES	5%

ILLUSTRATIONS BY SAM PEET

CHANGE AGENTS

WOMAN SCIENTIST INSPIRES SAUDI HEALTH DRIVE

Q&A with Yasmin Altwaijri, Head of Epidemiology Research, King Faisal Specialist Hospital and Research Centre

Medical scientist Yasmin Altwaijri is one of a new breed of high-achieving Saudi women.

On the front line of Saudi Arabia's research into the causes and treatment of mental health, obesity, diabetes, and other contemporary ills, Altwaijri is an inspirational role model for thousands of young Saudi women building their careers in science and technology.

As the pace of reform accelerates in Saudi Arabia, talented and creative women are rising to the top across all areas of science and technology.

The so-called STEM subjects of science, technology, engineering, and mathematics are popular study choices for young Saudi women. In total, 28% of scientific researchers in the Kingdom are women, in line with the global average of 30%. Many women who graduate with STEM degrees from Saudi Arabia undertake advanced study in the U.S. or other nations and return to assume senior roles at institutions in their home country, where their work often earns them an international reputation.

Foremost among the new cohort of female scientists is Yasmin Altwaijri, who has carried out groundbreaking research in two areas that have become national priorities as Saudi society modernizes: obesity and mental health. Altwaijri's study of the rise in obesity in the Kingdom inspired the government's Quality of Life program and its support for fitness, sports, gyms, and healthy lifestyles.

More recently, Altwaijri has turned her attention to the issue of mental health. As one of the driving forces behind the Saudi National Mental Health Survey, Altwaijri was instrumental in measuring, for the first time, the scale of mental health problems in Saudi Arabia. Some 4,000 people across the country were interviewed for the study.

Yasmin Altwaijri is focused on helping empower Saudi women socially and economically

CULTURE OF COMPASSION

The findings from the survey have inspired a new effort to raise awareness of mental health issues across the Kingdom, and to marshal resources for initiatives to prevent, detect, and treat mental health problems.

A keen believer in the potential of digital healthcare technology, Altwaijri is now helping to roll out new apps and health services that will help Saudi Arabia fight some of its most pressing health issues.

“Saudi Arabia is facing the same health challenges as any other developed country,” she says. “Digital healthcare products can give us the solutions we need to fight these global epidemics.”

> “DIGITAL HEALTHCARE APPS ARE EASY TO SCALE NATIONALLY. IF THEY ARE IN ARABIC, WE CAN USE THEM ACROSS THE WHOLE REGION.”
>
> –
>
> **Yasmin Altwaijri**,
> Head of Epidemiology Research,
> King Faisal Specialist Hospital
> and Research Centre

How is the role of women in Saudi science changing?
Science is increasingly seen as a great career opportunity for women in Saudi Arabia. Because we have women-only classrooms, female students who are interested in science are not put off by the prospect of a predominantly male atmosphere. After they finish their studies, many women become very involved in the work of scientific institutions.

The government has prioritized initiatives that are supportive of women. As a member of the Al-Nahda Philanthropic Society for Women, I am focused on helping to empower Saudi women socially and economically, and on achieving further gains for women in the workforce in science and other fields. At the G20 summit in Riyadh next year, Al-Nahda will be organizing the Women 20 meeting, and we hope to achieve further gains for women in the workforce.

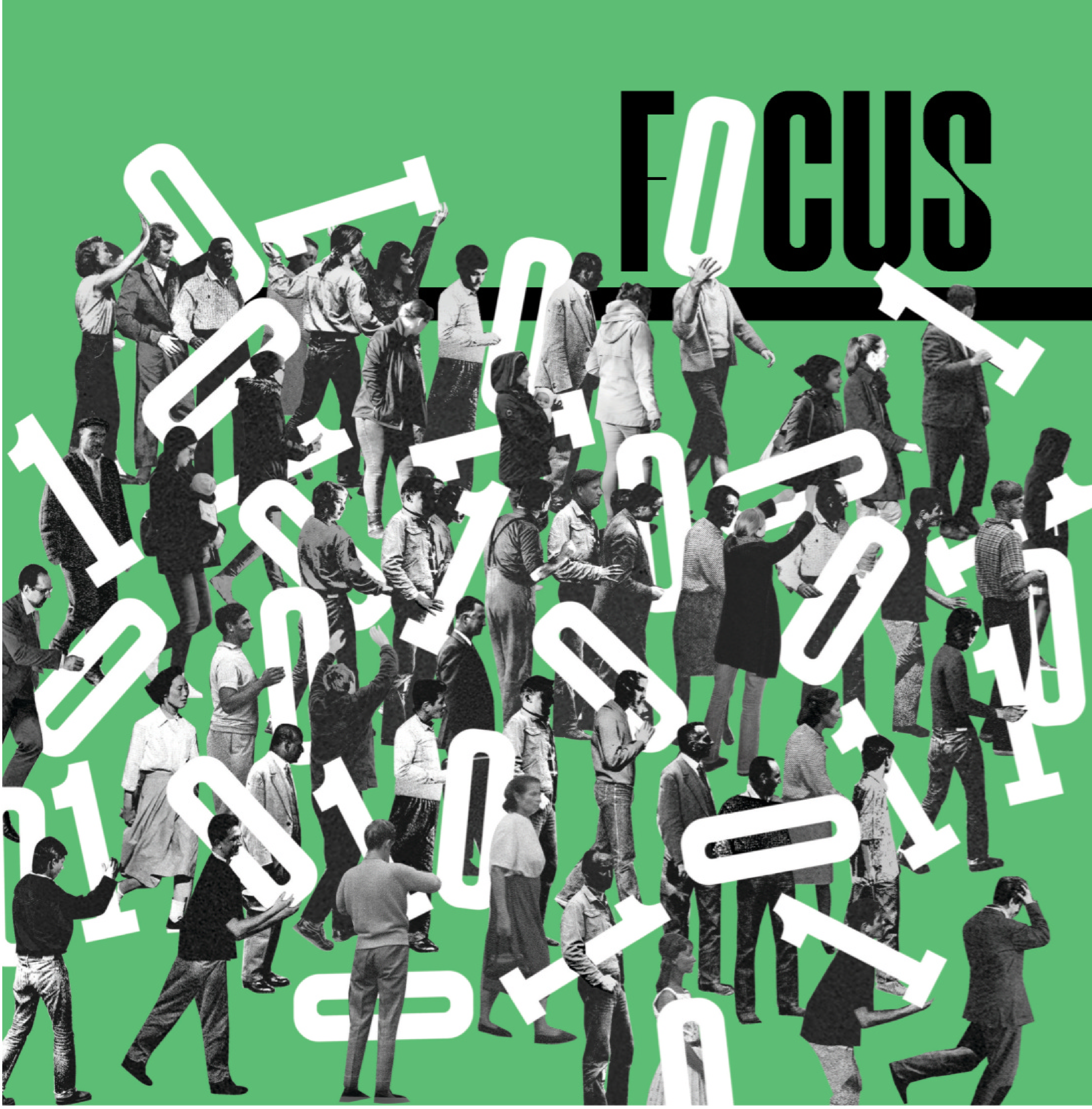
How are you building on the work of the Saudi National Mental Health Survey?
The results of the survey were similar to those of other countries and showed that about 35% of the population has had a mental illness at some point.

The question is, what do we do now? We need to develop training programs and increase resources in this area. That will take time. There simply are not enough mental health professionals to treat everyone, so we are also looking at digital technology as a solution.

How receptive is the Saudi healthcare system to digital innovation?
There is a culture here of wanting to leapfrog and do the next big thing today and not tomorrow. This new attitude has a lot to do with our bold and ambitious leadership and with Vision 2030. It trickles down through the culture and we can feel it at every level in every sector.

Do you think Saudi Arabia is ready to tackle 21st-century health problems such as depression and obesity?
Saudi Arabia faces the same health problems as other developed countries. My daughter just graduated in the U.S., and when she came back to Saudi Arabia there was no culture shock. The lifestyle is very similar in many ways. And because young Saudis are such heavy smartphone users, I think there is a great opportunity to treat people in their homes using apps. Saudi digital health developers can create products that are culturally relevant. And I hope many of these developers will be women!

FOCUS



CALIFORNIA SETS OFF PRIVACY SCRAMBLE

A new state law that goes into effect this year has major national implications for businesses and consumers. By Jeff John Roberts

▲ PHOTO ILLUSTRATION BY **DOUG CHAYKA**

TECH

THIS YEAR, many Americans will get a powerful tool to protect their online privacy. A sweeping new law will require millions of businesses to tell consumers what data they have collected about them and, if asked, to delete it.

The law, known as the California Consumer Privacy Act (CCPA), could play havoc with the online economy, since so many companies—from tech giants to ordinary retailers—rely on targeted ads. If people demand that companies delete their data, those ads would be less effective.

Walmart, for example, could miss out on sales because its online ads wouldn't be as personalized as before. Google, meanwhile, risks losing a big chunk of its revenue because generic ads command far lower prices than ones targeted using personal data.

The effect of California's law, which is being copied in nearly two dozen other states, could therefore be enormous. But that's only if people assert their new rights after the law goes into effect on Jan. 1—which is a big "if" considering that relatively few have taken advantage of a similar privacy law in Europe, called GDPR, that was implemented in 2018.

"Is this a big deal for thousands or hundreds of thousands or millions of people? We don't know yet," says Chris May, who focuses on corporate risk for consulting firm Deloitte.

For businesses affected by the privacy rules, however, the burden of complying is very real. Requirements include giving consumers two ways, such as an online form and a toll-free number, to ask for their data and to demand that it be deleted. A nonpartisan report commissioned by California's attorney general says the state's businesses will have to spend an extra $55 billion for upfront costs, such as legal advice and engineering, or an extra $55,000 to $2 million for individual firms.

While CCPA is a California law, most major companies do business in the state and, as a result, are impacted. Few of them can afford to pull out of the nation's biggest market.

To create goodwill, a handful of big companies, like Microsoft, and small ones, including Boston-based Internet service provider Starry, have said they would voluntarily comply with the new law in all 50 states. So far, Starry CEO Chet Kanojia says, only a handful of customers have asked for their data to be deleted, while several dozen more have written to thank the company for giving them the option to do so.

"LARGE BUSINESSES HAVE THE CAPACITY TO FIGURE THIS OUT, BUT IT'S AN EXTREME BURDEN FOR SMALL ONES," SAYS TIM DAY, A SENIOR VICE PRESIDENT AT THE U.S. CHAMBER OF COMMERCE.

Others, like Tim Day, a senior vice president at the U.S. Chamber of Commerce, are less sanguine about CCPA. He warns that the law will ensnare thousands of smaller enterprises, such as florists and wineries.

California's law exempts most firms with less than $25 million in sales. But companies that have data for at least 50,000 people—a threshold that's easily reached for businesses that collect customer email addresses, for instance—are subject to new rules.

"Large businesses have the capacity to figure this out, but it's an extreme burden for small ones, which are the backbone of this nation's economy," says Day.

As a result, Deloitte's May predicts that many small and midsize companies may not comply with the law, calculating that they won't be punished or that any penalty will be cheaper than jumping through CCPA's hoops. California's Justice Department is tasked with enforcing the law, starting July 1, following a six-month grace period, and May suggests it's unlikely that florists and wineries will be top targets. The agency declined to provide details about its enforcement strategy to *Fortune.*

"We were given the responsibility to enforce, and so that's what we're going to do, working as much as we can with consumers and businesses to make sure they're complying with the law," California Attorney General Xavier Becerra says in an email.

This may not be the final word, however, because the Chamber of Commerce is lobbying Congress to pass a federal law to preempt CCPA. An earlier attempt by the tech industry fell short, but Day says the Chamber's push is different in that the organization wants to preserve the law's broad principles, notably the right to demand and delete most personal data, while doing more to spare smaller businesses.

In Congress, there has been unusual bipartisan agreement to pass such a law, although Democrats and Republicans disagree about who should enforce it and whether it should preempt state privacy laws. While many think new legislation is unlikely until after the 2020 presidential election, Cameron Kerry, a privacy expert at the Brookings Institution, believes U.S. attitudes about privacy have changed so dramatically that a law may pass before then.

Says Kerry: "There's been a shift as more members of Congress spend more time online and worry about the implications of data privacy for their children and grandchildren." F

AFRICA GETS ITS TECH BUZZ ON

Once bypassed by the tech boom, cities like Kigali, Rwanda, are now home to a growing number of startups and increasing investment. By Richard Morgan

TECH **WHEN A FACTORY** in Rwanda's capital of Kigali debuted Africa's first made-in-Africa mobile phones in October, their provenance wasn't the only surprise: The devices also came loaded with higher-end features like fingerprint sensors for unlocking the screen that many rival phones used across the continent lack. It wasn't just a push for African tech but also for African quality.

The factory, owned by Rwandan company Mara Group, was a major milestone for Kigali, which has spent a generation emerging from the ashes of the nation's genocide in 1994 by refashioning itself as a tech hub. Already, the city is home to several tech incubators, a Carnegie Mellon University engineering campus, and local startups that produce such items as drones and cashless payment systems.

"It boils down to our turbulent past, being left with nothing, and using ashes as a con-

Mara Group recently started producing the first smartphones made entirely in Africa.

COURTESY OF MARA PHONES

struction tool for unity," says Paula Ingabire, Rwanda's tech minister.

Hamstrung by poverty and the legacies of the slave trade and colonialism, Africa had, until recently, been left largely behind by the global tech boom. But increasingly, it's having success nurturing tech startups and attracting major foreign tech companies.

In November, Visa invested $200 million in Nigerian payments firm Interswitch at around the same time that OPay, a Norwegian-owned but Lagos-based mobile payment service, raised $120 million from high-profile investors including Sequoia Capital China and SoftBank Ventures Asia. Meanwhile, in May, Microsoft opened offices in Kenya and Nigeria for engineers working on artificial intelligence, machine learning, and mixed reality. A month earlier, Google opened an A.I. lab in Ghana.

In another sign of Africa's growing tech buzz, Jack Dorsey, CEO of Twitter and payment-terminal maker Square, tweeted in November that he would spend up to six months in 2020 living on the continent. "Africa will define the future," he said.

Still, Africa's growing tech scene remains small and, in many ways, limited by some very stark realities on the ground. Nearly 600 million Africans lack electricity, including as many as two-thirds of sub-Saharans, and 85% of the continent's residents live on less than $5.50 a day.

Such challenges are compounded by the inevitable operational problems that all startups face, regardless of their location. For example, Nigerian online retailer Jumia Technologies, which in April became Africa's first tech company to hold an initial public offering on the New York Stock Exchange, recently shuttered its e-commerce operations in Tanzania and Cameroon, along with its food delivery service in Rwanda. As of mid-December, its shares had plummeted nearly 87% from their peak.

On the bright side, access to venture capital is growing. Investors poured $1.2 billion into African startups in 2018, more than triple the amount of two years earlier.

Of all the African countries pushing into tech, Rwanda stands out. A hilly nation of 12 million that's similar in size to Maryland, its effort is centered on Kigali, named "world's cleanest city" by the World Economic Forum.

The drive has already attracted Co-Creation Hub, a design lab from Lagos; Norrsken, a coworking space and investment fund from Stockholm; and Carnegie Mellon University, which opened its campus for 300 graduate

AFRICA'S SILICON VALLEYS

Several of the continent's cities have established themselves as important tech hubs. Here are a few examples:

CAPE TOWN

South Africa's second-largest city has a diverse tech industry, including Aerobotics, which makes drones for farmers, and SweepSouth, an Uber for domestic workers. It's also where Naspers, a media- and tech-investing giant that owns a major stake in Chinese tech titan Tencent, is based.

NAIROBI

Startups in Kenya's capital include AB3D, which turns e-waste into 3D printers that make things like prosthetic limbs; money transfer startup M-Pesa; and crowdsourcing platform Ushahidi, which has been used for election monitoring in India and Mexico. Google, IBM, and Microsoft also have offices here.

LAGOS

Africa's biggest city is home to Nigeria's online retailer Jumia, Africa's first tech company to hold an initial public offering on the New York Stock Exchange. Nigerian payments service Interswitch and OPay, a Norwegian-owned mobile payment service, are also headquartered here.

© CAPE TOWN: TONY MARSHALL—PA IMAGES VIA GETTY; NAIROBI: STUART FRANKLIN—GETTY IMAGES; LAGOS: NYANCHO NWANRI—REUTERS

students in 2011 and upgraded to a new campus in November.

Rwandan President Paul Kagame has long said that his goal is to make Rwanda an African Singapore. But it has become more of an African Estonia, the powerful, practical back-end workhorse of Europe's burgeoning tech scene.

Part of Rwanda's sales pitch to tech companies is its lack of red tape. The country ranks 38th in terms of ease of doing business, according to the World Bank, the best ranking in continental Africa and ahead of the Netherlands (42), India (63), and Brazil (124); the U.S. is sixth.

While political freedoms in the country are constrained by Western standards, social progress has piggybacked Rwanda's social development (its parliament is 61% women, the highest percentage in the world). In 2017, the country embraced Swahili as an official language—to better integrate with its neighbors.

Whatever Rwanda is doing, it appears to be paying off. In November, the International Monetary Fund revised its growth forecast for the country in 2019 to a zippy 8.5%, up from an already strong 7.8%.

Mara Group, founded in 1996, is trying to capitalize on Rwanda's rapid economic development and, for that matter, the similar gains taking place across much of Africa. The company's two Android smartphones—$159 for the basic version and $229 for the higher-end one—compete mostly against cheaper models from Samsung and Chinese phonemakers Huawei and Transsion.

"Yes, it's cheaper to import. But if we think that, we'll never produce anything," says Mara Group CEO Ashish Thakkar. "You have to create because a copy-and-paste approach always means that by the time you've pasted, you're years behind."

In addition to its factory in Kigali, which employs more than 200 workers, Mara has opened a plant in South Africa and is considering a third one in Nigeria.

Thakkar declined to say how many phones his company has sold, only that its devices have been bought in 46 countries, including in Europe and in the U.S.

Rwandan President Paul Kagame (in blue) and Mara Group CEO Ashish Thakkar (left) at Mara's smartphone factory in Kigali. The plant has added to the city's tech credentials.

TECH

Fresh from attending a web summit in Lisbon, Lionel Mpfizi, CEO of Awesomity Lab, a software development firm, describes Kigali's entrepreneurialism as agile. "It takes six hours to start a business here," says Mpfizi, who also goes by the more informal name Captain Awesome. "Since the genocide, we have been able to leapfrog progress. It was a massive reboot. Now our everyday life is a startup mentality."

Some of Mpfizi's recent work involves developing a ride-hailing app called Move, including chauffeured and driverless options, for a fleet of electric cars. The app is part of a partnership among Volkswagen, Siemens, and the Rwandan government to pilot the use of electric cars in Rwanda.

Ingabire, the tech minister, is fond of calling Kigali a "proof-of-concept hub." When I note that a simpler term for that is "dreamland" and suggest she ask Rwanda's President to promote her to minister of dreams, she laughs before regaining bureaucratic professionalism, albeit with a personal twist: "I have three children—7, 5, and 2. They will know the genocide only as history. They deserve Rwanda as their dreamland. We all do." ■

EYESORE
Bike graveyards, the result of market-share grabs, are commonplace in China.

CHEN ZIXIANG—VISUAL CHINA GROUP VIA GETTY IMAGES

BIKE BUST: AN A.I. PREVIEW?

Investors in China's doomed bike-sharing craze don't seem to have learned their lesson as an artificial intelligence boom gathers speed. **By Grady McGregor**

TECH

IN 2014, FIVE STUDENTS from the cycling club at Peking University had an idea to build new, technologically savvy bicycles. The bikes would allow customers to scan a code with their smartphone, pay a small fee for a short ride, and then park basically wherever they pleased, where the next user would repeat the process. In just a few years, this bike-sharing idea became a countrywide phenomenon, and by 2016, millions of new bicycles could be found in cities across China supplied by companies with billion-dollar-plus valuations.

By the end of 2018, however, several leading bike-sharing companies had gone bankrupt, and now the bicycles that were once viewed as one of the country's great disruptive inventions have largely become inconvenient and colorful stains on city streets or have been sent to massive bicycle graveyards.

"Bike sharing was one of China's biggest innovations, so everyone was championing it," says Chen Lin, a marketing professor at China Europe International Business School in Shanghai. "Nobody saw the rise and fall being so quick and so dramatic."

The rapid ascent and even quicker spectacular collapse of China's bike-sharing sector may presage future problems in one of the world's technology powerhouses. The bike-sharing phenomenon hasn't prompted reflection across China's technology industry, analysts say, and the issues that spurred its downfall may soon inflict its miseries on new industries. "Nobody was questioning the investing patterns" behind the bike-sharing boom, says Henrik Bork, founder of Beijing-based consulting firm Asia Waypoint. "Now it is shifting to new hot issues." For example, investors are enthusiastic at the moment about artificial intelligence and big data companies. These may have little in common with bike sharing and may prove to be better businesses—but those differences aren't likely to prevent another boom-bust cycle. "Many people are easily blinded by the fact that China's economy is still growing," Bork says. "But in reality, it is difficult to make money anywhere, even in China."

THE RISE OF CHINA'S BIKE SHARING

CHINA WAS ONCE known as the Kingdom of Bicycles, with its government famously defining prosperity for Chinese citizens in the 1970s as the ability to own a bike, claiming that it would put a Flying Pigeon, a state-owned bicycle brand, "in every household." And even though cars have overtaken bicycles on China's streets, the country's deep connection to two-wheelers helps explain how bike sharing took off so quickly and on such a massive scale (being environmentally friendly and convenient helped too).

"It was a fantastic innovation, in that it really looked at the consumer journey and pinpointed the way that people needed more convenient and accessible travel," says Chen.

Ofo, the company whose founders were members of that Peking University cycling club, was at the center of the industry's rise after it launched in 2014. At its peak in 2017, Ofo was worth close to $2 billion following several rounds of funding and had expanded to hundreds of cities in nearly two dozen countries.

THE FALL BEGINS

OFO WAS FAR FROM the only company in the market, however, and competition from companies like Mobike and Bluegogo launched a loss-making race to grab market share.

For Chen, the unsustainable rise of the sector was made possible by two factors: easy-to-mimic product features and overeager investors.

"There was no intellectual property, and

PEDAL POWER Though cars now outnumber bikes on China's streets, the country once was the Kingdom of Bicycles, making it fertile ground for a disruptive bike-sharing business model.

the companies copied each other all over the place, so people were only competing on prices and availability," Chen says. Therefore, investor-fueled attempts to expand and snap up as much of the market as possible became the presumed path toward success.

"Investors drove [bike-sharing startups] to grow faster and quicker than their competitors, to move to more cities and places, to lay out more bikes without even calculating breakeven points," Chen says.

In late 2018, after the startups had burned through billions of dollars, it became clear that even the top companies didn't have a path to profitability. In July, a court found that Ofo couldn't pay its debts, and the company still refuses to refund $15 deposits to up to 15 million customers. (A recent Ofo refund scheme promises customers their deposits if they purchase over $200 worth of other products.)

Mobike was purchased by food-delivery giant Meituan Dianping, which prized the startup more for its data than its operations, which it promptly scaled back. And at least five other competitors went bankrupt, a string of failures that likely means rusting bikes will become only more of a nuisance.

"This year and the year after, you will only see more and more garbage bikes being laid on the street at a great social cost," Chen says. "The companies don't have money to clean it up, so it almost becomes a societal burden. Who's going to take care of all this steel and metal?"

Still, amid the doom and gloom, there may be some hope that bike sharing can work. Recently, a bike-sharing latecomer called Hellobike found success in building a customer base in smaller cities and with fewer bikes, with plans to expand into electric scooters.

THE SAME FATE FOR A.I. FIRMS?

ALL OF THE TURBULENCE in the bike-sharing sector seems to have cooled off funding and expectations for China's once skyrocketing sharing economy. And China is not the only country in which sharing-economy firms are struggling to make the model profitable, as shown by the travails of firms like WeWork and Uber.

Brock Silvers, managing director of the Shanghai private equity firm Kaiyuan Capital, believes that most of the responsibility should fall on investors, who will likely now take a more restrained approach. "The tech sector's lessons aren't the true issue. No one can blame companies for accepting wild investments. The reality is that the pathways to exit have become more difficult," Silvers says. "This will temper [venture capital and private equity] investors, which in turn should enforce a more sober outlook upon China's tech firms and entrepreneurs."

Still, there are signs that the bike boom and bust of yesterday might be the A.I. cycle of tomorrow. Bork says that while it has gotten more difficult to raise funds in the sharing economy, easy funding patterns are simply switching to new, "hot" technologies like artificial intelligence.

In 2018, A.I. investments in China rose 54%, to $7.4 billion, according to ABI Research. And in the 2019 edition of the Hurun Global Unicorn List, an annual international report that tracks startups worth more than $1 billion, China boasts 15 unicorns in the A.I. sector alone. Onetime unicorns Mobike and Ofo, on the other hand, are now worth a fraction of what they once were, and Hellobike is the sole bike-sharing unicorn on Hurun's list.

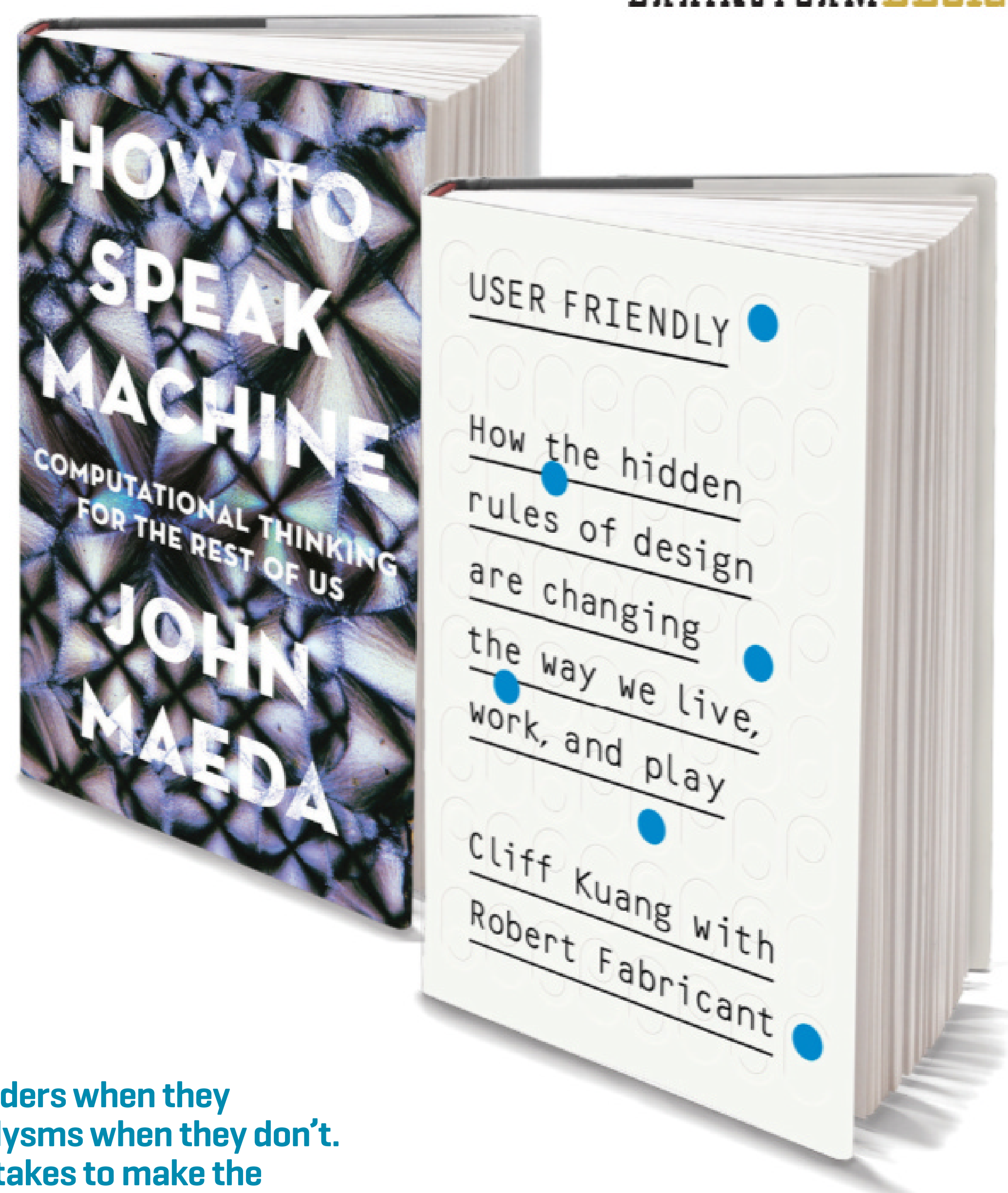
"For businesses in China that manage to package their business model with these new hot issues, you are seeing the same thing," says Bork. "And I don't see so far that this stops. The big gamble here in China is still on." ■

TWO-WHEELED ROCKETSHIPS THAT FELL TO EARTH

China's bike-sharing startups quickly raised billions from prestigious Chinese and Western investors. They used that money mostly to drive one another out of business.

COMPANY	NUMBER OF BIKES	MONEY RAISED	PROMINENT INVESTORS	WHAT HAPPENED
OFO	10 million–plus	$2.2 billion over nine rounds	Ant Financial, Didi Chuxing	Deep in debt; cannot give refunds to customers; laid off thousands of staff
MOBIKE	7 million–plus	$900 million	Tencent, Foxconn, Hillhouse Capital, Warburg Pincus	Purchased by Meituan Dianping for $2.7 billion, but then scaled back international operations
BLUEGOGO	700,000	$90 million	Black Hole Capital	Deeply in debt by November 2017; taken over by Didi Chuxing in January 2018
HELLOBIKE	5 million–7 million	$1.8 billion	GGV Capital, Grains Valley VC, Joy Capital, Ant Financial	Cautiously expanded from China's lower-tier cities, becoming a leader in e-bikes; plans to become a ride-hailing platform
XIAOMING BIKE	430,000	$15 million in second round	NewMargin Ventures, Cronus Bike	Filed for bankruptcy; cannot pay back over $100 million in deposits
KUQI (COOLQI)	1.4 million	$130 million	Private	Filed for bankruptcy in 2017

BRIDGING THE GAP BETWEEN HUMAN AND MACHINE



People and machines can accomplish wonders when they understand each other—and create cataclysms when they don't. Two important new books explore what it takes to make the relationship work. **By Clay Chandler**

BOOK REVIEWS

THE PARTIAL MELTDOWN of a reactor at the Three Mile Island nuclear power plant in Pennsylvania in 1979 is typically explained as the product of mechanical malfunction and human error. The precipitating cause of the catastrophe, the worst nuclear disaster in U.S. history, was the malfunction of a pipe meant to pump water into one of the plant's two reactors to keep it from overheating. Plant operators inadvertently made things worse by shutting off a backup system.

But Cliff Kuang, in a fascinating new book, argues that Three Mile Island is better understood as a design failure. The reactor, he notes, would have saved itself had it been left alone. Instead, a simple pump failure became a nuclear nightmare because "catastrophically bad control room design" made it impossible for the men operating the plant to understand what had gone wrong. "The plant and the men were talking past each other," Kuang writes. "The plant hadn't been designed to anticipate the imaginations of men; the men couldn't imagine the workings of a machine."

Humans and machines talking past each other is the central preoccupation of 2019's two most important design books. One is Kuang's, written with designer Robert Fabricant and titled *User Friendly: How the Hidden Rules of Design Are Changing the Way We Live, Work, and Play*. The other is *How to Speak Machine: Computational Thinking for the Rest of Us*, by design and tech guru John Maeda.

Both books agree that people and machines can achieve great things when they understand each other—and invite cataclysm when they don't. But whereas Kuang stresses the importance of keeping technology "human-centric," Maeda suggests that humans, especially

DESIGNS FOR LIVING **Our picks for the two most important design books of 2019 are *How to Speak Machine*, by John Maeda (Penguin), and *User Friendly*, by Cliff Kuang with Robert Fabricant (Macmillan).**

designers, aren't trying hard enough to understand how technology works and, therefore, aren't taking full advantage of all that it can do.

User Friendly, true to its title, is the more accessible of the books. Kuang, a former *Fast Company* editor, weaves a vivid narrative of the rise of human-centric design that readers won't require design expertise to appreciate.

The idea that designers must understand and empathize with users of their products and services is by now so pervasive it seems obvious. But producers haven't always believed in putting people first. Kuang traces the idea of "user-friendliness" to the dawn of the Machine Age around the turn of the 20th century. At the time, design's dominant ethos was anything but human-centric: Management experts like Frederick Winslow Taylor sought to modify human behavior to maximize the efficiency of machines in factories, while industrial titans like Henry Ford displayed a gleeful disregard for customers.

Kuang hails the efforts of the Bauhaus movement to reunite art and functional design, and the success of designers like Raymond Loewy and Norman Bel Geddes in dazzling customers with sleek contours and the allure of modernity. But he has special affection for Henry Dreyfuss who, from humble beginnings as a Broadway set designer, became the first American industrial designer to insist that design had to be grounded in an understanding of the person meant to use the product.

Kuang shows how that new focus helped designers stoke consumption after the Great Depression, improve the performance of fighter pilots and tank commanders during the two World Wars, and emerge as powerful players in the digital revolution. He follows the career of Donald A. Norman, who led a congressional investigation into what went wrong at Three Mile Island, invented the term "user experience," and was eventually hired by Steve Jobs to work at Apple.

User Friendly is especially good in describing the triumph of human-centric design in Silicon Valley. Kuang chronicles the rise of IDEO, the consultancy that helped develop the first computer mouse, coined the term "design thinking," and created the early curriculum for the Stanford d.school. Sections on design at Apple and Facebook benefit from extensive interviews. Kuang is an accomplished designer, but his book's greatest strengths are his thorough reporting and skillful storytelling.

The moral of most of Kuang's stories is that products and services must be adapted, dumbed down even, to accommodate the quirks and foibles of the people who use them. The goal, Kuang suggests, is to render even the most complicated technologies so intuitive that users can understand them without instruction or training. "Technology should get simpler over time," he declares. "Then it should become simpler still so that it disappears from notice."

JOHN MAEDA SHOWS little patience for that view. The problem, as he sees it, isn't that technology is too complicated; it's that humans aren't keeping up. Designers who insist that man must be the measure of all things aren't helping.

Maeda brings a unique perspective to the debate. He's a classically trained graphic designer, a former president of the Rhode Island School of Design, and author of the influential *Design in Tech Report.* But he's also a computer science expert who has taught at MIT's Idea Lab and held senior positions at eBay and venture capital pioneer Kleiner Perkins. In August, he assumed a new role as chief experience officer at Publicis Sapient, the tech consulting arm of the global marketing and communications giant.

In *How to Speak Machine,* Maeda heaps scorn on classical designers who cling to the traditional view that the designer's role is to create perfect, finished objects suitable for curation in a museum. In the digital age, he argues, the most powerful designs will be imperfect and incremental—each one what engineers call a minimum viable product, meant to be "flung out into the world and later modified by observing how it survives in the wild."

In such a world, Maeda suggests, designers who can't "speak machine" will be relegated to a supporting role, while techies, whose "tired fingers can push back against the many dams of chaos and complexity," will prove the unsung heroes.

WHAT KIND OF DESIGNER ARE YOU?

Tech and design guru John Maeda taxonomizes designers into three categories. Business leaders may find that their problem-solving styles overlap with one or more of the descriptions.

"CLASSICAL" DESIGNERS create physical objects or products for a specific group of people, usually with an end-goal of a single tangible product in mind. This is the approach taught in traditional design schools.

"COMMERCIAL" DESIGNERS seek insights into how customers interact with products and services, and innovate based on that knowledge. The idea of "design thinking" is associated with this category.

"COMPUTATIONAL" DESIGNERS use programming skills and data to attempt to quickly satisfy users. These practitioners often deploy imperfect or incremental designs, and modify them after seeing how they perform.

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Without more donors, patients will not have the type A, B, O or AB blood they need.
You can help fill the **#MissingTypes** this summer. Make a blood donation appointment today.

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Actors (from left) Thomas Middleditch, Zach Woods, Amanda Crew, and Martin Starr in a scene from the *Silicon Valley* finale.

SILICON VALLEY: THE EXIT INTERVIEW

Mike Judge and Alec Berg, producers of HBO's hit tech satire, explain what made ending their Emmy-nominated series so complicated (and how they landed a Bill Gates cameo).

By Stacey Wilson Hunt

TECH **THERE'S A REASON** *Silicon Valley* worked from the moment it premiered on HBO in 2014: It was only about the pursuit of tech greatness and never ever about icky stuff like office romances or boring backstories.

The critically acclaimed comedy, which aired its finale Dec. 8, centers on programmer Richard Hendricks (Thomas Middleditch), who develops software featuring an unparalleled data compression algorithm and founds the startup company Pied Piper with an eccentric group of coders. For Richard, Gilfoyle (Martin Starr), Dinesh (Kumail Nanjiani), Jared (Zach Woods), and Monica (Amanda Crew), nothing mattered more than creating something indelible and good, away from the predatory glare of Big Tech. And they did. Until they didn't. And they did again. Until they didn't. (And so on.)

A week before the finale aired, *Fortune* sat down with series cocreator Mike Judge, who loosely based *Silicon Valley* on his own experience as an engineer in the 1980s, and executive producer Alec Berg, who wrote and directed the finale and appears in it as a documentary filmmaker. Inside their offices on the Sony lot in Culver City, Calif., Judge and Berg revealed what had been their biggest concerns and aspirations for the finale, how they landed *Silicon Valley* super-fan (and Microsoft founder) Bill Gates for a cameo, and how the series might be the ultimate underdog morality tale.

This conversation has been edited for clarity and space. For the full Q&A, go to Fortune.com.

You've both worked on series finales before: *Seinfeld* for you, Alec, and Mike, *King of the Hill* and *Beavis and Butt-Head*. What was distinctly challenging about crafting the ending to *Silicon Valley*?

Alec Berg: We'd lived with one big idea the last couple of seasons: that the show was, in pretentious terms, about the idea that Richard invented fire. So what does he do with it? Protect it? Does he owe a debt of service to it? Can he sell it? Is he responsible if something bad is done with it?

Essentially what is the—to borrow your word from this season—"tethical" fallout from his technology?
Berg: We decided it wasn't right for him to monetize. It would do more good if he set it free, so instead he'd open-source it. We played with that for a few years.
Mike Judge: Then we heard about [A.I. so powerful that it can break encryption]. Then it was, "Oh, man, that's the ending."

So all of Richard's work over the last six years is essentially moot. What's the takeaway for the audience?
Berg: It's about asking the question: Is the point of technology to push, serve, or enslave humanity? The idea that inventing things may not always be good for us is the takeaway.

What's the lesson for Richard? That being a success is inherently incompatible with being a good person?
Berg: He isn't cut out to be a brutal taskmaster or CEO. He's an artist. That's always been the clash in the show. If he were as ruthless as other CEOs, he'd be fine, but he always had a sense of moral justice and propriety.
Judge: But he did get to save the world.

Did you ever worry about the density of the tech content? That it was so accurate and insidery, it might alienate viewers?
Berg: Yeah. But it's like watching a medical show. We don't understand that stuff either. But if you attach emotion to all that jibber-jabber, it works.
Judge: We've also been lucky to have great tech consultants, led by [digital-media and blockchain entrepreneur] Jonathan Dotan. In the second-to-last episode this season, there's a scene where Richard is unhinged about what he did with Gilfoyle's A.I. I had to cut a ton of it, but Jonathan emailed and said, "You have to put 'Fuck gradient descent!' back in." I was like, "Okay!"

So generally your consultants would read the scripts, and they'd come back with notes and edits?
Judge: Yes, and we'd show them rough cuts and more finalized cuts.
Berg: But at the beginning, it was more open. "So ... what would these guys actually do all day?" [*Laughs*]
Judge: I visited some startups when I wrote the pilot. And I used to program myself, but it was so different back then. Alec and I were like, "Great. Neither one of us knows what these characters are actually doing." [*Laughs*]
Berg: Each season we'd do research in Seattle and the [San Francisco] Bay Area and ask, "What's the latest thing?" The cryptocurrency thing last season, that was an instance where every person we talked to had said: "Crypto, crypto, crypto." Then as we were doing it, Bitcoin took off. I remember listening to the radio one morning. "Here's the traffic, the weather, and Bitcoin is up to whatever." I'm like, "Whoa."
Judge: When that episode came out, my friend Willie D from the [rap group] Geto Boys was like, "Yeah, I just made $16,000 off cryptocurrency." [*Laughs*]
Berg: We've put in a lot of real-world stuff without having to change a thing. Like Gabe and the wearable chair this season—we saw that in an office once and said, "That's so obnoxious, it has to be in the show." And in the pilot, Peter Gregory's narrow car.
Judge: I think [production designer] Richard Toyon suggested it. It was some crazy electric car that really existed, but lots of people thought we'd made it up.
Berg: And it got one of the biggest laughs. That's the great thing about writing a show about this business. So much is fucking ridiculous.

ALI PAIGE GOLDSTEIN—HBO

"THEY WERE THEIR OWN UNIQUE VERSIONS OF UNDERDOGS. WHO KNEW WE COULD FIND THAT MANY DIFFERENT FLAVORS OF NERD?"

—Mike Judge (above right, in blue) on the *Silicon Valley* cast

Bill Gates had long been a fan of the show, and you finally got him for a cameo in the finale. How did you pull that off?

Berg: We'd met and spent an hour with him in 2017. We asked, "If you had advice for Richard, what would it be?" He said, "If you get petitioned by a foreign government to explain your business to them, you should go in person." [*Laughs*] We'd talked about putting him in the Senate hearings episode at the beginning of season six.

Judge: But this was better. If you get him, you might as well save him for the end.

Berg: He was so great and incredibly prepared. We set up for two hours at his offices [in Kirkland, Wash.]. They said, "He'll arrive in one hour and 42 minutes." He walked in exactly when they said. "You'll have 15 minutes with him." He gave us about 20. "Okay, we have to take him now." It's funny, we never really had a big discussion about that scene; only just that it feel very real. That's been our approach overall. It's also made the show 10 times harder to write. There's that saying: "Comedy thrives in a confined space."

Judge: The challenge of being confined to writing about introverted people who sit and program all day forces you to come up with creative solutions. [*Laughs*]

Berg: And tone, too. This show is about the comedy of pause, silence, and awkwardness.

Is there a joke from *Silicon Valley* that you feel best represents the way you wrote the show?

Berg: A lot of people love the "jerk-off equation" from the season one finale. There was a hole in that story, and we needed a very funny way for Richard to get inspired.

Judge: Some funny analog to a mathematical thing.

Berg: One writer had talked about how he and his friends had a running joke about how you could jerk off four guys at once if they stood tip to tip. It was my *Beautiful Mind* moment. "Yes, that's it!" [*Laughs*] Actually, the rats in the finale—that idea came late and in a similar way. We talked to [consultant] Todd Silverstein about how the guys could fail in the finale. Maybe they shut down the network, and phones start emitting a weird noise? Then Todd told us he'd lived in an apartment where the person downstairs had a sonic pest repellent. It drove rats and bugs crazy, and they ran into his apartment. Then [writer] Sarah Walker goes, "Wait! Rats and Pied Piper!" And we were like, "Oh, my God."

"WE'VE PUT IN A LOT OF REAL-WORLD STUFF WITHOUT HAVING TO CHANGE A THING."

—Alec Berg (above right, with Kumail Nanjiani)

And here people thought you'd been sitting on that joke for six years.

Judge: Yes, we decided to name the company Pied Piper because we knew six years later we'd be doing a scene with rats. [*Laughs*]

The finale answers a lot of questions and yet leaves us with one great, lingering mystery: Did Jian Yang kill Erlich Bachman? So, did he?

Berg: There were more definitive versions of it that felt too ghoulish. I think it's funnier to be coy and let the audience fill in the blanks. By the way, Thomas improvised what's maybe my favorite line in the finale: When he finds out that Jian Yang is dead, he turns to the camera crew and says: "Um, okay, he's dead. What do we do?" [*Laughs*]

Judge: Totally what an engineer-type would say. "I don't understand emotions."

Berg: I feel like we've always deferred to the actors for those moments. Even when we were running late, if they asked, "Hey, can I just try one thing?" We'd say yes because it was likely going to end up on-screen.

Judge: They saved a lot of scenes that maybe weren't great to begin with. It also helped that the actors always understood their characters. They were their own unique versions of underdogs. Who knew we could find that many flavors of nerd? ■

Charlotte Jorst wears her Kastel Denmark line at the Arroyo Del Mar stables in San Diego.

SUCCESS THROUGH BEING PUSHY

She was harassed and told that she couldn't be a saleswoman. More than $200 million later, this entrepreneur shows what happens when you don't take no for an answer. **As told to Dinah Eng**

When people tell Charlotte Jorst she can't do something, she gallops right past them. When told she couldn't sell beer in America, she did just that, and founded her own watch company to boot. When skin cancer threatened her equestrian career, she started a new line of UV-resistant ride-wear. Here's how she got started and kept competing.

HOW I GOT STARTED

VENTURE

I ALWAYS WANTED TO GO into business. Growing up in Denmark, I dreamed of being wealthy, which probably came from being teased and bullied in school as a young girl.

After high school, I went to France to work as a hostess at a ski resort. I was tall, blonde, and big-chested, and people made inappropri-

▲ PHOTOGRAPH BY JOHN FRANCIS PETERS

ate passes at me. I saw what the world was like without a college education and decided to return to Denmark to focus on school. I finished my degree in finance and business in three and a half years.

While going to college, I worked part-time at Carlsberg, where I met my husband, Henrik, in the brewery. He moved to the U.S. to help introduce Carlsberg there, and when I finished school in 1988, I followed him to New York.

Carlsberg sent a number of Danes to the U.S. to work with Anheuser-Busch, but when I applied for a sales job, Carlsberg told me women couldn't sell beer. I thought, "I'll show them!" So I left Denmark, and Anheuser-Busch hired me to be Miss Carlsberg. They needed someone to attract attention at festivals around the country. I'd put on a green sash, and people would take pictures with me.

Back then, it was fashionable to give watches to your employees for Christmas. So while I was traveling as Miss Carlsberg, I started representing a Danish company that sold premium watches that could be customized with a company's logo. Absolut Vodka was my first customer.

When I wasn't traveling, I'd walk the streets of New York, pick buildings with names of big corporations, and go looking for marketing managers to sell our watches to. Sometimes I got thrown out, but sometimes they saw me, and it would lead to an order.

I wanted to do a watch for the Guggenheim Museum and kept calling the marketing manager. He agreed to see me, but when I walked in, he was so irate. He got within a centimeter of my nose, saying, "You're so pushy!"

Two days later, I called him back, and he ended up giving me an order. When he moved to the Whitney, he continued to buy from me. I built the business by continually calling people and being pushy.

My time as Miss Carlsberg ended when I became pregnant with our first daughter. Henrik continued working for Carlsberg for a while, then also quit, and we were left with very little money. We bought a car for $300 that didn't always run, and we had no health insurance. We couldn't even buy a crib for the baby. She slept in a drawer in our bedroom, and we ate bread and ketchup. But we were determined to make things work.

The watch business did well enough that I decided to take some samples to a trade show. There, the owner of a small retailer named Silver Square said the watches were so beautiful that if we took the company logos off, he could sell them. So Henrik and I decided to do just that. We named the company after Skagen—a fishing village in northern Denmark that gets more sunshine than anywhere else in the country. We took out a $10,000 loan on our Long Island house and ordered 200 watches with our own logo and design.

We took the money from that sale to make 400 watches, sold them, and used that money to make 800 watches, and so on. We reinvested everything.

Sharper Image became our first big retail customer in 1992. That year, annual revenue was $800,000.

Since Nevada had lower state taxes, we moved to Lake Tahoe in 1993, and we had a second daughter. It was still just the two of us doing everything. We'd sit down to dinner, and a truck would arrive with boxes of watches. We'd stop eating to unload them.

At first the department stores didn't want us, so we concentrated on small, local design stores and became a cult brand. But then Nordstrom, Neiman Marcus, Saks, and Macy's became customers, and we attracted the attention of Fossil. It approached us every year for 10 years, wanting to buy us. In 2010, we were ready to spend more time with our family, and I wanted to compete in dressage at the Olympics, so we agreed. We were the last company that Fossil didn't own in the watch bay at Macy's. It took a year and a half to close the deal. We both cried when we told the employees.

After selling, I started training on my horses and got skin cancer. Doctors told me to stay indoors. But I started researching materials that would protect skin from the sun so that I could ride again. I began designing riding wear with UV-protective fabric that had a Danish, preppy point of view and started Kastel Denmark in 2012. Annual revenue was $1.5 million in the first year.

In 2016, I placed 10th in the World Cup Finals, and I aim to try out for the U.S. Olympic team. I've had one recurrence of skin cancer, but now I'm in the clear. At horse events, I do trunk shows and sell our line to tack stores. I'm not as aggressively ambitious as I was with Skagen, but I won't ever give up selling. It's too much fun.

BEST ADVICE

CHARLOTTE JORST
COFOUNDER OF SKAGEN AND FOUNDER OF KASTEL DENMARK

Be careful whom you do business with. One of the biggest mistakes we made in the beginning was selling a lot of watches to a retailer who then declared bankruptcy. We didn't think to check his credit and lost about $6,000, which was a year of salary for us back then. After that, we started checking people's credit and literally didn't eat for a while.

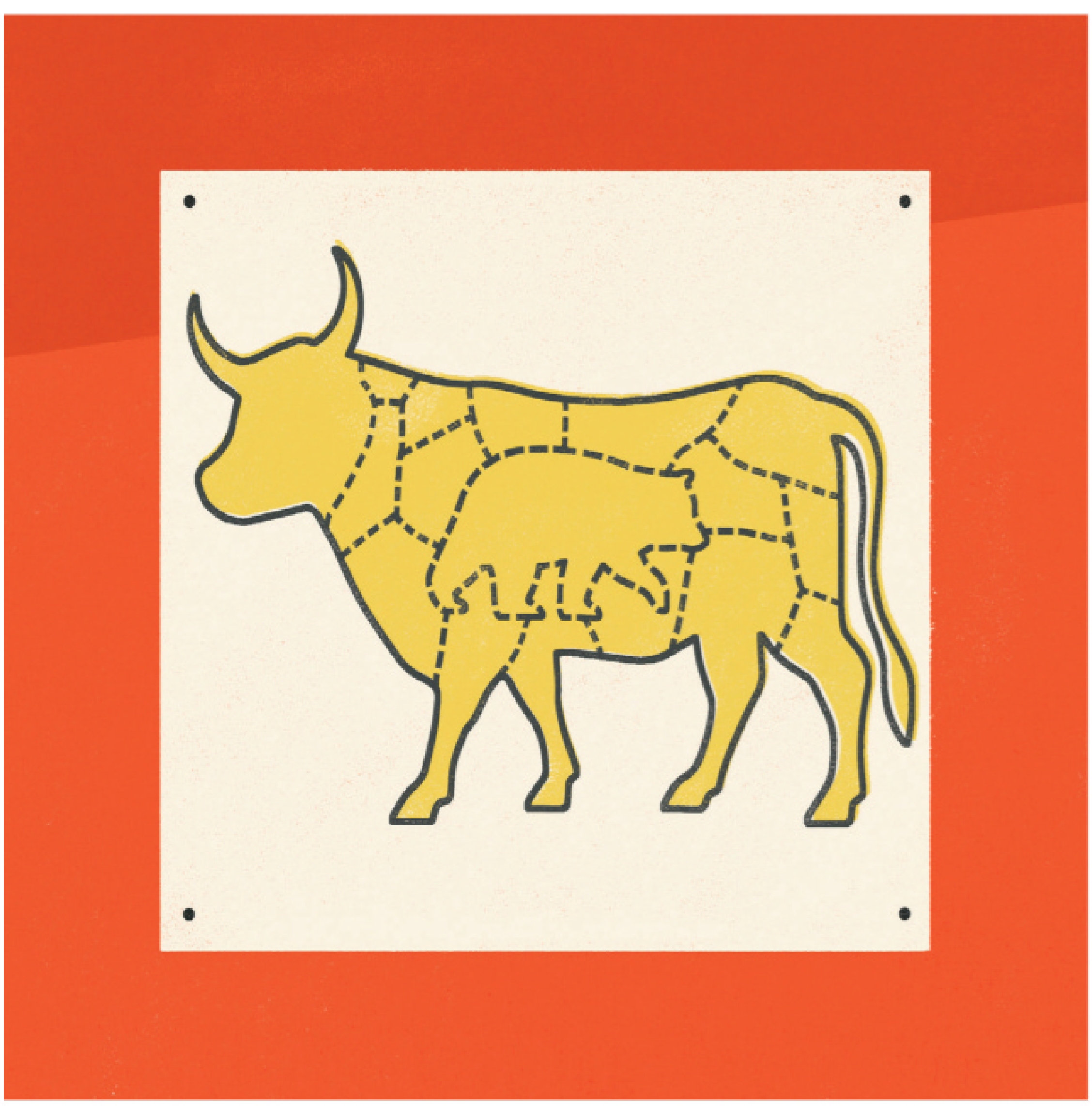
BUYING 'BEARS' IN A BULL MARKET

Many stocks that are affordably priced today are cheap for a reason—because economic trends have left them behind. Here's why you may want to buy them anyway. By Ben Carlson

INVEST **NEW HIGHS IN THE STOCK MARKETS** are great for those who already own stocks. But there is a downside when stocks seemingly do nothing but rise. Any investor who's been holding cash, waiting for lower prices and a better entry point, has had to keep waiting. And those deploying new savings into the markets have had to do so at higher and higher prices.

Those rising prices are also a catch-22 for long-term investors, because pricey markets today make impressive future gains less likely. The S&P 500 currently trades at about 30 times its average inflation-adjusted earnings over the past 10 years (the so-called CAPE ratio). Historically, levels anywhere near that high have almost always preceded periods of disappointing returns.

That's why many investors are more comfortable buying shares when there's blood in the streets. And the good news for those investors is that there will always be a bear market somewhere, even when the broad market is killing it. Three asset classes that have been left behind during this bull run stand out in particular right now in the eyes of bargain hunters:



▸ **Energy stocks** Oil prices topped $150 a barrel in June 2008. Since then, new production unleashed by the fracking revolution, combined with low inflation, has helped drive oil prices down by two-thirds—while hammering energy-company profits. Energy has been by far the worst-performing sector of the S&P 500 since mid-2008, and it's not even close: The Energy Select Sector SPDR ETF (XLE) has fallen more than 13%, versus a gain of more than 200% for the S&P 500. One consolation prize is high dividends: XLE, for example, currently yields 3.8%, more than twice what the broader market yields.

▸ **Precious metals and mining stocks** These commodity-producer stocks often exhibit wild volatility because they're unusually sensitive to economic growth and fluctuating supply and demand for the commodities themselves. Vanguard Global Capital Cycles (VGPMX), a mutual fund that's a good proxy for the metals markets and related commodities, has done worse than just trail the market during this cycle: Over the past 10 years, the fund is down nearly 50%. (Again, relatively modest global growth is a culprit.) Investors often seek metals and mining stocks because they have a low correlation to the broader market,

▲ ILLUSTRATION BY CHRIS GASH

offering the benefits of a diversified portfolio. But sometimes owning uncorrelated assets means eating big losses while the rest of the market screams higher.

▸ **Value stocks** After the dotcom bubble deflated, value stocks—stocks that are cheap relative to the value of their underlying businesses—went on a run of huge outperformance over growth stocks. But growth has beaten the pants off value since the financial crisis (see graphic), led by high-growth companies such as Amazon, Netflix, Google, and Facebook that have monopolized investor mindshare. The growing economic impact of tech innovation, particularly in software; the rising value of intangible assets like patents, copyrights, and trademarks; and the willingness of investors to pay extra for growth in a world awash in capital have all contributed to growth's edge.

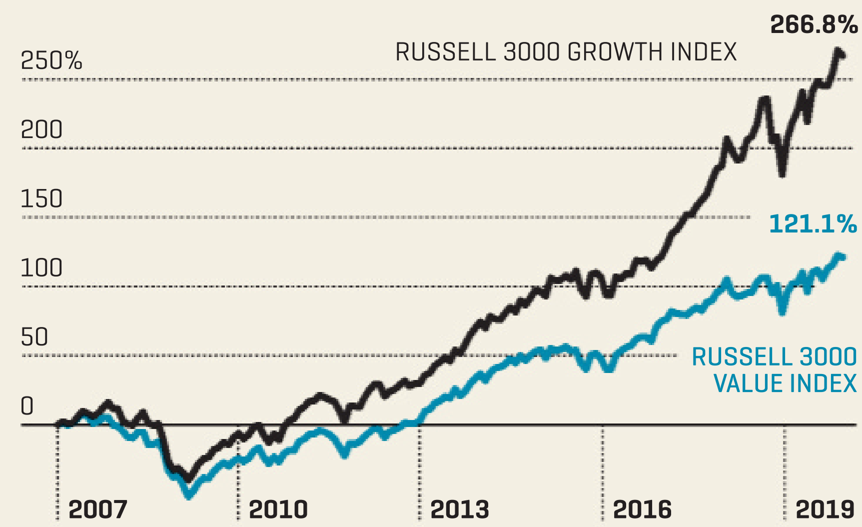
Still, investors think a turning point could be near. Using a number of metrics, Cliff Asness, head of investment giant AQR Capital Management, showed in a recent piece that growth stocks are more expensive now than at any time other than the dotcom bubble. In contrast, Asness writes, "Excluding the tech bubble, the value of value is the cheapest it's ever been."

OF COURSE, JUST BECAUSE something is cheap doesn't mean it can't get cheaper. As our examples show, each of these categories has a black eye for a reason. That's what makes the current situation for investors so confusing: It can seem like your only choices are to invest in assets with good fundamentals but high prices or to invest in assets with deteriorating fundamentals but low prices. Yes, history tells us that economic cycles will eventually boost energy and metals stocks and value stocks again, but it won't tell us when.

The best move may be to worry less about "when." Many investors (including my firm) favor a long-term strategy that involves broad diversification. In practice, that often means investing some capital in the areas of the market that have been hit the hardest, to take advantage of the cheap entry point. When deciding whether to wade into beaten-down asset classes, here are some lessons to keep in mind:

UNDERVALUED

After a long stretch of being outperformed by growth stocks, value stocks are cheaper in relative terms than they've been in decades. But there's no guarantee that they'll rebound to close the gap.



SOURCE: BLOOMBERG

▸ **Nothing works all the time** Value investing has been repeatedly vetted by academics, professional investors, and the iconic Warren Buffett as an approach that works over the long term. But even sound investment strategies are bound to go through painful periods of underperformance. After all, the only reason any assets earn a premium over the rate of inflation is because owning them involves risks—and "sound" doesn't mean "risk-free."

▸ **Diversification means always having to say you're sorry** The main reason to diversify is to avoid concentrating your money in a terrible-performing asset for an extended period. But spreading your bets also means that at least part of your portfolio will be sucking wind while the rest of it sprints ahead. You're accepting the occasional strikeout to increase your odds of winning the game.

▸ **Don't forget to rebalance** Diversification works only if you periodically rebalance your asset allocations. In essence, this means selling a little bit of what has done well to buy a little bit of what hasn't. All of the asset classes above experienced strong returns before their fall from grace. Did you sell off a bit during the good times to bring them back to their target weights? If not, their losses have been even more painful for you—which could make it even harder to buy now, when strategy might dictate that you should.

Ben Carlson is director of institutional asset management at Ritholtz Wealth Management. His firm has positions in value stock funds, but not in any specific fund mentioned here.

Day-to-Day Diversity

Sprint has made a point of integrating diversity and inclusion into its everyday business.

WHEN MARCELO CLAURE, A BOLIVIAN-AMERICAN entrepreneur, took over as president and CEO of Sprint in 2014, he made diversity and inclusion (D&I) a priority. Just five years later, the effects of the current chairman's stewardship reverberate throughout the company and the communities it serves.

"We used to have the typical initiatives around diversity and inclusion," says Deeanne King, Sprint's chief human resources officer. "Now it's part of how we operate and work."

Through a series of robust D&I initiatives implemented over the past several years, the Overland Park, Kans.–based company has worked hard to create a culture of inclusion that's integrated into its day-to-day operations. And these efforts have landed the telecom giant on *Fortune*'s list of the 100 Best Workplaces for Diversity for the first time.

Right: Employees enjoy a midday break at Sprint HQ. Below: Enthusiastic employees at one of Sprint's many sales rallies held throughout the year.

ENGAGING EMPLOYEES

Sprint's seven employee resource groups (ERGs) have more than 5,000 combined members across the globe. These ERGs, which include groups for African-Americans, Hispanic-Americans, members of the LGBTQ+ community, military veterans, and others, offer support and community for participants, as well as advice to company leadership about product development, hiring practices, and more.

For instance, the Real Deal ERG, a group for people with disabilities, regularly provides feedback to Sprint managers and executives

about improving company devices, tools, and workspaces to help better serve employees and customers with disabilities. And ERG Enlace helps the company's Hispanic marketing team with Spanish-speaking marketing initiatives.

Another way Sprint enhances its commitment to D&I is by working with diverse suppliers. In 2019, the company will have spent about $1.5 billion with women- and veteran-owned businesses, among others from marginalized communities.

HELPING COMMUNITIES

Sprint is also helping underserved communities through its 1Million Project Foundation. Launched in August 2017, the foundation provides 10 gigabytes of free high-speed wireless data per month to more than 300,000 high school students who don't have access to reliable Internet service. The foundation's goal is to get at least 1 million students on board.

When it comes to leveling the playing field for employees, customers, and communities, Sprint is ahead of the game, thanks to its leadership and its employees. "Of course, there's always more to do," says King. "But it's important that we create a culture at a grassroots level where people can be their very best." ■

Employee Resource Groups

Diamond Network | REAL DEAL | Enlace | Pride | WISE | OASIS | VETS

FORTUNE
100 BEST
WORKPLACES FOR DIVERSITY
2019

At Sprint, we don't just recognize diversity, we celebrate it and make it a vital part of the way we work.

Sprint is proud to be named to *Fortune*'s 2019 list of the 100 Best Workplaces for Diversity.

We are #SprintFam.

20 IDEAS

THAT WILL SHAPE THE 2020s

Will paper money disappear? Will gene-tailored medicine transform how we treat disease? And will you finally trade in that juicy steak for "cell grown" meat? As a new decade begins, it's hard to think of an industry that doesn't feel like it's on the brink of a massive transformation. We asked 20 of the sharpest minds we know to weigh in on the epic, disruptive, thrilling, terrifying, and fascinating ideas that will shape the next decade. The future is now.

▲ ILLUSTRATION BY **GARY PERCIVAL**

ECONOMY & MARKETS

Corporate and government teams collaborated to put a man on the moon.

MARIANA MAZZUCATO

BUSINESS AND GOVERNMENT WILL—GASP!—WORK TOGETHER AGAIN

INTERVIEW BY **BERNHARD WARNER**

The moon landing could not have happened without government partnering with major corporations. Mazzucato has struck a bipartisan nerve with her calls for business and government to tackle ambitious projects—together.

WARNING SIGNS that the capital markets aren't functioning properly are everywhere. Take corporate profits. Long term, they're up. But investment is down. Now look at the levels of income inequality and youth unemployment: Young, able-bodied people lack the skills to compete in the job market, while companies are desperate to find skilled workers.

According to Mariana Mazzucato, an economist and founding director of the UCL Institute for Innovation and Public Purpose in London, paradoxes like these point to the fact that the public and private sectors have lost their way. There was once a fairly smooth running partnership between the two in which publicly funded R&D helped propel us into the space race, and, later, the computer and Internet ages.

Unless we rebuild those bonds, Mazzucato warns, innovation will dry up, growth and profits will suffer, and inequality will worsen.

How should government and business be working together? The public sector isn't just there to fix the market failures. It's also an investor of first resort, to invest in some of the most uncertain highly capital-intensive areas before businesses are willing to ... The big point is that we need to focus on a more purposeful system that goes beyond shareholder value. And that requires a redesign of

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the governance systems of both the public and private sectors, and how they relate to one another.

How optimistic are you that we can get there?
In 2019, we celebrated the 50th anniversary of going to the moon, which was basically a massive technological feat. Reflecting on that gives me hope. Humanity did something pretty extraordinary. Now think about the Apollo 11 mission. Apollo was not a left-wing or right-wing mission. It definitely was bipartisan, and it involved the public and private sectors. There were many companies, like Honeywell, Motorola, General Electric, that were fundamental in getting us to the moon—with, of course, the massive directional power provided by NASA and the government. That's the kind of arrangement we need today.

Your ideas have been cited by Republican Sen. Marco Rubio and freshman Democratic Rep. Alexandria Ocasio-Cortez. How do you get both the right and left to listen?
I've learned that as long as you're talking about the long run and risk-taking, entrepreneurship, creativity, wealth creation—in a way that really brings in both business and the public sector—it ends up being a bipartisan narrative.

Economist MARIANA MAZZUCATO is the founding director of the University College London Institute for Innovation and Public Purpose.

A New Age of Economics Is Dawning

BY ROBERT SHILLER

THE POWER of narratives in driving economic events will be studied more. Economics will become less mechanical—more attention to storytelling and changing popular ideas. And it will give impetus toward trying to manipulate and manage narratives. This is something politicians do instinctively. Franklin D. Roosevelt in 1933 said the only thing you have to fear is fear itself. That's just one example. But before him, in the 1920s, Calvin Coolidge was always boosting the market. He thought that was the right thing for a President to do: instill confidence. But maybe not, because it ended badly with 1929 and the Great Depression.

Certain narratives are recurrent. Aristotle introduced the idea that machines might replace jobs over 2,000 years ago. Now we're hearing that again. Automation is a buzzword from the 1950s. In fact, one downturn in 1957–58 was called an "automation recession" by some. In terms of today's narrative, I think there is danger of a serious contraction, like we had 10 years ago. The stock market has reached new records, so some people are worried. But a lot of economic indicators remain strong. It's a split. Nobody knows exactly what's coming. It's like 1929. Nothing in the air strongly suggested that change was coming—and suddenly it came.

Nobel Prize winner ROBERT J. SHILLER is Sterling professor of economics at Yale.

A 'Gold Standard' of Digital Currencies Will Emerge

BY KLAUS SCHWAB

OVER THE NEXT DECADE there's the potential for an entirely new form of money, "stablecoin." If achieved, it could help include the world's unbanked population and ensure a more stable financial system for all. Experimentation with blockchain in financial services has already led to the development of digital currencies like Bitcoin and Ethereum. But these remain ineffective and have proved prone to major fluctuations and misuse. Moreover, they are still hard to use in daily life, with few retailers accepting them as a form of payment. Libra, proposed by Facebook and backed by a consortium of other firms, conceptually might overcome some of those hurdles: It would be easy to use via a digital wallet on Facebook and would be stabilized by pegging it to a reserve basket of currencies (for more, see the feature story in this issue). But a "gold standard" of digital currencies has not emerged—yet. The real opportunity lies in major guarantors of the financial system, such as central banks and governments, committing to a supranational form of money. Such new currency could facilitate international payments and include those people and small businesses that are currently unbanked in the financial system.

Indeed, the real promise lies not in New York, London, Singapore, or Tokyo, where most people and businesses already have ample ways to conduct business and transfer money. It lies in helping those who are unbanked in countries like India, Indonesia, Ethiopia, or the DRC. A stablecoin could make financial inclusion real. It would represent the new frontier of money. There has not been anything as exciting since Bretton Woods.

KLAUS SCHWAB is the founder and executive chairman of the World Economic Forum.

ILLUSTRATION BY **BENEDETTO CRISTOFANI**

ECONOMY & MARKETS

Capitalism Will Save the Planet (Seriously)

ANDREW MCAFEE

BY **ROBERT HACKETT**

IN THE INDUSTRIAL AGE economies grew at earth's expense. Resource extraction directly correlated to wealth accumulation: More mining of metals, felling forests, and burning bitumen meant greater prosperity. Capitalism literally became a dirty word.

That's changing, says Andrew McAfee, principal research scientist at the MIT Sloan School of Management. McAfee believes capitalism is partly the solution to its own ills. In the U.S. "we're not using up the earth as much anymore. We're using it less, even as our growth continues," says McAfee. Pollution is, in the developed world, decreasing year over year. Electricity use has been effectively flat in America for about a decade even as growth continues. Companies are "locked in nasty competition" thanks to capitalism, McAfee says, and many are fighting to use fewer resources and less energy, which cost money.

At the same time, innovations in digital technologies are creating cleaner, more efficient alternatives to material goods. Consider the smartphone. How many fewer cameras and camcorders and answering machines and fax machines are being produced now? "I'm convinced that smartphones have actually let us tread more lightly on the planet," he says.

That's not to say humanity can be complacent. Without regulation, capitalism is "voracious," McAfee says. "It will eat up sea otters and tigers and rhinos and blue whales if we let it."

He thinks governments must protect struggling species and make polluting technologies more costly than green ones. They should also implement a carbon tax—or better yet, dividend—that would have businesses pay citizens based on the quantity of carbon dioxide the firms emit. "Properly configured and constrained, capitalism will not eat up the planet, it will actually let us take better care of it."

ANDREW MCAFEE is the cofounder and codirector of the MIT Initiative on the Digital Economy at the MIT Sloan School of Management.

ILLUSTRATION BY **BENEDETTO CRISTOFANI**

HEALTH

JENNIFER DOUDNA

GENOMICS WILL REWRITE MEDICINE—AND PREVENTION

INTERVIEW BY **SY MUKHERJEE**

JENNIFER DOUDNA may well be the queen of Crispr. The UC–Berkeley professor and world-renowned biochemist is one of the pioneers behind the gene-editing technology, which could be used to fight conditions from cancer to blood disorders to many inherited diseases. But this genomic revolution also raises fundamental questions about ethics and the cost to consumers.

Crispr, a gene-editing technique that borrows from a biological trick that bacteria use to fight off viruses, is already transforming the way we treat and cure existing diseases. But its increasing use in preventative health care will revolutionize the field, says Doudna.

What will gene editing and genomic sequencing look like 10 years from now?

I think that 10 years from now, we're likely to see much more high-quality prediction about health outcomes for people that are based on their genes. Not only that, but increasingly we'll see Crispr turn the entire field around, with genome editing being used for preventive health care, not just for treating disease or curing existing disease.

A year after reports that a Chinese doctor created gene-edited embryos, you wrote an essay for *Nature* calling urgently for ethical guidelines in genomics. What should that look like?

I certainly hope that over the coming decade we see an increasing global effort to put in place appropriate regulations for using genome editing, especially in applications that could have a very profound

ILLUSTRATED PORTRAITS BY JOEL KIMMEL; LAB: COURTESY OF INNOVATIVE GENOMICS INSTITUTE impact on everyone. And that'll include not just human reproductive health, but frankly also agriculture, because I think that's an area where there is a very large opportunity with genome editing, but one that also needs to be approached with caution.

When do you think the U.S. will approve the first Crispr-based medication?
I think it'll be before 10 years out, at least the way things are going right now. I think it's been incredibly exciting for those of us in the field to see recent announcements around developments using Crispr in treating cancer and in treating blood disorders like sickle-cell anemia.

Often, that technology needs to be individually tailored—an expensive prospect. Will there be an accounting for that?
One area that does need a lot more attention, and something I'm personally very committed to, is thinking about cost and access. I think increasing attention will be paid to: How do we afford genome editing? How do we make it accessible to as many people as possible globally? Personally, I think a lot of it will have to come from additional technological development—not so much on the Crispr side of things, but more with respect to how we manufacture the molecules that are used for gene editing and how we deliver these new medications.

In this decade will we see the science move out of the lab?
I suspect that within about five years it will be possible to make essentially any kind of change or edit to any genome in any celled organism with precision. I think we're really that close to being able to do that. Now, that's in the laboratory. It'll be maybe longer than that before it's possible to make those kinds of genome edits in organisms in actual patients. The next step will be developing ways to effectively deliver these gene-editing tools. To me, that's the next horizon.

JENNIFER DOUDNA is a professor of chemistry and molecular and cell biology at the University of California at Berkeley and executive director of the Innovative Genomics Institute.

> **Within about five years it will be possible to make any kind of change or edit to any genome in any celled organism with precision.**

In Doudna's labs, huge advances are afoot.

JOHN MACKEY

Cell-Based Meat Will Change the Way You Eat

AS TOLD TO **BETH KOWITT**

OVER THE NEXT decade, diets will become increasingly individualized—vegan, ketogenic, gluten-free—and also more tribalized. A mass market still exists, but it's shrinking. You can see that with traditional consumer packaged goods companies losing sales.

We're in the most innovative cycle in history. There's a massive amount of capital, and it's easier now for any good idea to get financing and spread quickly. One innovation that's coming as a result is cell-based meat. In the long term, it's going to be bigger than plant-based meats, which don't taste like meat without being extremely processed. But cell-based meat—that is, meat grown from animal cells—could change the planet. That trend will break in the next decade. Imagine if it's not only more ethical, or environmentally less harmful, but even cheaper. A different way of procuring animal foods than what we've done for all of humanity—that would change everything.

JOHN MACKEY is the cofounder and CEO of Whole Foods.

WORKPLACES

Ahren Harrison, 18, stands near the grapple skidder he's learning to operate in the Maine Community College System's mechanized logging operations program.

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JAMIE DIMON

THE FUTURE OF WORK IS SKILLS—SO STOP WORRYING ABOUT DEGREES

In the next decade, companies will stop relying on the outdated notion that you need a four-year college degree to be qualified for a decent job. At JPMorgan Chase, more than three-quarters of the jobs posted last year did not require a bachelor's degree.

A FOUR-YEAR COLLEGE degree is not the only path to a well-paying job. This outdated thinking is partially to blame for holding back America's growth and blocking many people's access to opportunity. We must consider more inclusive means of hiring the best and most talented people to meet the needs of our rapidly changing economy.

The reality is the future of work is about skills, not just degrees. To be clear, we continue to value college and advanced degrees, and there's no question of their relevance. But the talent that fuels a global company like ours is increasingly diverse and includes people who do not have a four-year college education.

As technology changes the way we work, we must be better at providing pathways to good jobs that everyone—no matter their zip code or background—can access.

To start, this is only possible if businesses and educators work together, partnering to develop curriculums and apprenticeships that offer students on-the-job experience and training. In the Washington, D.C., area, this approach has taken root. Employers are working alongside high schools, community colleges, and universities to prepare students to fill well-paying technology jobs including 30,000 open cybersecurity jobs in

Northern Virginia alone.

Community colleges, which are an affordable and attainable option, exist in nearly every community, educate 13 million diverse students a year, and are often overlooked as a source of talent.

Last year, more than three-quarters of the U.S. jobs posted at JPMorgan Chase did not require a bachelor's degree. Schools such as Columbus State Community College in Ohio are increasingly valuable resources for our company and many other employers, from technology to advanced manufacturing and health care. In the next decade, we must eliminate the stigma of community college.

Finally, with about 7 million job openings and 6 million unemployed workers in the U.S., people with criminal backgrounds deserve the same opportunity to obtain in-demand skills and good jobs as anyone else.

Returning citizens deserve a chance to secure a job at any company, including ours. We must eliminate barriers to their employment too, by increasing access to Pell Grants and financial aid, and dropping questions about criminal backgrounds from job applications. Hiring them and developing their skills is good for business and the right thing to do.

JAMIE DIMON is the chairman and CEO of JPMorgan Chase.

What Will Really Lead to Workplace Equality? Men Leaning Out

RUTH WHIPPMAN

AS TOLD TO **ANNE SRADERS**

THOUGH WE'VE made some strides in workplace equality, what we've really done is say: Women, your traditionally female norms aren't as valuable or useful as men's, so shape up. Lean in. Whatever men are doing and valuing is what we should all aspire to.

We've set up the cultural equation so that assertiveness is greater than deference, demanding is greater than listening. What we need to do is ask men to step back, listen more, and be humble. Maybe instead of telling women to stop apologizing, we need to encourage men to apologize more when they make mistakes!

The burden of self-improvement has been on women for the last decade. If we can encourage men to think of female norms as just as valuable as their default standard, we'll take a big step toward equality. I hope companies will start taking responsibility for gender inequality, and as a society, we'll start to focus on how men can start to make changes, instead of male norms dictating the standard behavior for all of us.

RUTH WHIPPMAN is a British cultural critic and author living in the U.S.

The 4-Day Workweek Will Make Companies More Productive

ANDREW BARNES

BY **EMMA HINCHLIFFE**

WHAT IF THERE WERE one change companies could make to lessen their environmental impact, close the gender opportunity gap, improve employees' mental health, and increase productivity—and what if all it took was taking a day off?

Andrew Barnes, the founder of a New Zealand estate-planning company, in 2018 introduced a four-day workweek for his 240 employees. After a carefully managed trial period, Barnes found employee engagement had improved by 40%. He's now made it his mission to get companies around the world to reimagine what they ask of their staffers.

The pitch is the hard part. "If I went to your company and said, 'By restructuring, I can deliver you a 40% improvement in productivity,' most CEOs would say yes immediately," Barnes says. "If I walk in and say, 'I want you to let your employees work less time,' ... most people say, 'Are you kidding?' "

The secret is rethinking how employees work during the four days of the week they're still spending in the office. Barnes has found that workers will happily give up small talk and time spent on social media when the prize is an extra day away from their desks. And the benefits—to companies, economies, and societies—are enormous.

The system takes cars off the road during rush hour. Flexible work schedules help women stay on track to move into leadership positions, rather than dropping out of the workforce after having children. At Barnes's company, employees maintained their job performance and reported a 7% decrease in stress levels and a 24% jump in satisfaction with work/life balance. Barnes cites German autoworkers' 28-hour weeks—and a recent Microsoft Japan experiment that saw a four-day week boost sales by 40%—as examples of how the schedule can work across blue- and white-collar professions. "We have picked an arbitrary five days a week, and we've stuck to it. But the world's changed," Barnes says.

ANDREW BARNES is a New Zealand-based entrepreneur and philanthropist.

▲ ILLUSTRATION BY **BENEDETTO CRISTOFANI**

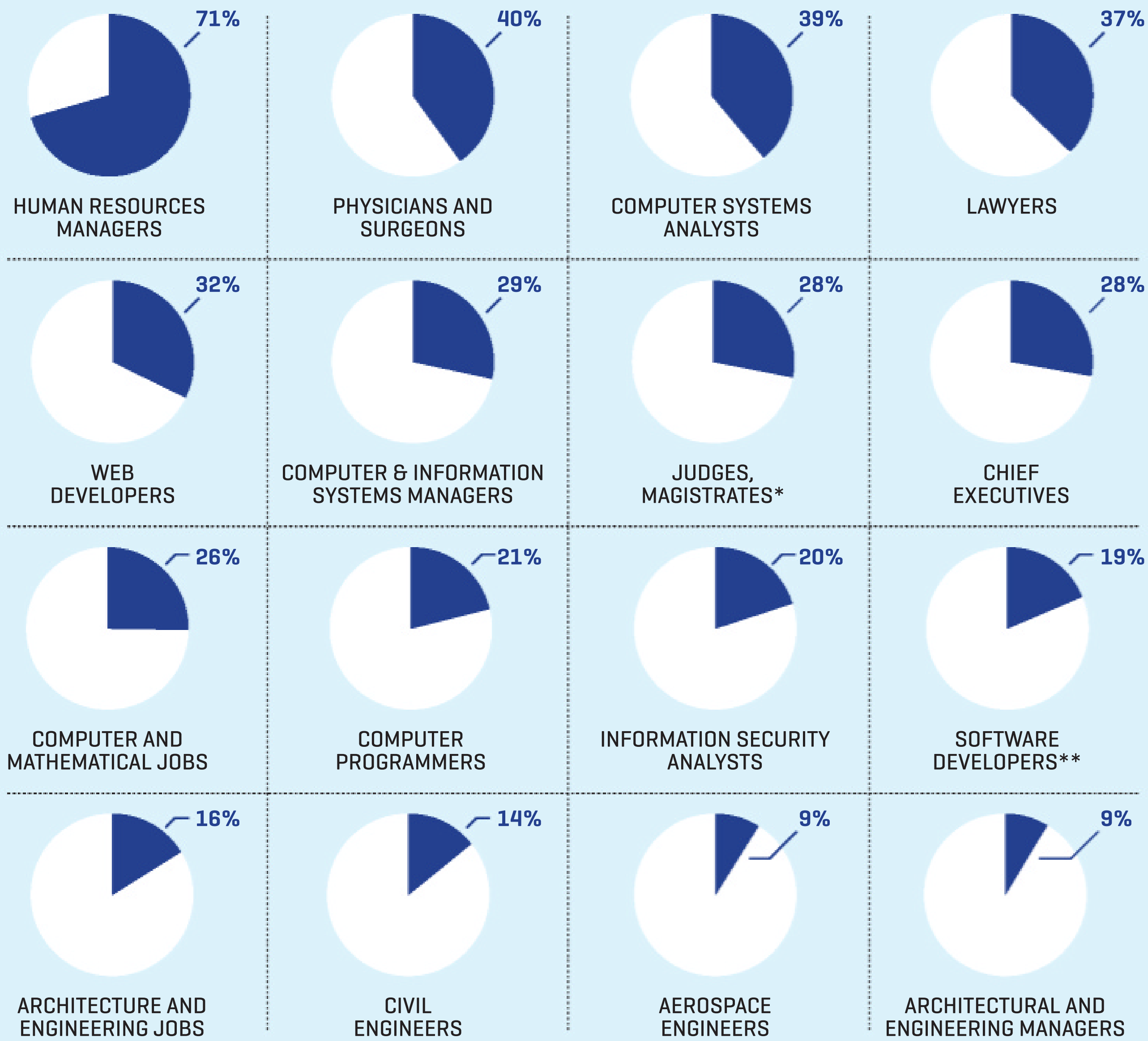
SOCIETY

MELINDA GATES

WOMEN WILL ALTER THE WORKFORCE—DRAMATICALLY

Enabling women to exercise power and influence in their workplaces, homes, and communities will change everything.

SHARE OF WOMEN IN THE U.S. WORKFORCE, PER OCCUPATION



SOURCE: BLS (PEOPLE WITH EMPLOYMENT. 2017 AVERAGES) *INCLUDES OTHER JUDICIAL WORKERS ** APPLICATIONS AND SYSTEMS SOFTWARE

THROUGHOUT OUR history, the face of power and influence in the United States has been overwhelmingly white and male. Over the next decade, that will change.

Women—and, more important, women of all backgrounds—will increasingly be the ones making decisions, controlling resources, and shaping perspectives in all spheres of society. We'll see this shift play out in homes, in workplaces, and across public life. It will lead to new narratives, products, and policies that reflect a much broader range of perspectives. And it will enable more women to fully participate in solving the challenges that will require our collective brainpower, like structural racism and rising inequality.

This shift will not happen by accident. It will require the concerted efforts of a broad coalition of Americans working together.

In addition to the activists and advocates who are already engaged on these issues, we'll need to enlist new partners to turn up the pressure on the institutions that are enshrining the status quo.

We'll need to fast-track women in high-impact sectors like tech and ensure that all women (not just white women or women from elite backgrounds) are able to enter and advance in these fields.

We'll also need to bring down the barriers that most women encounter at some point in their careers, like norms around caregiving that mean they're expected to do more work around the home and the pervasive sexual harassment and discrimination they face in the workplace.

When I think about what it means for a woman to exercise power and influence, I picture a CEO setting new strategies for her company, a fast-food worker successfully taking action against the boss who harasses her—or any woman, whether she works outside the home or not, sitting down with her partner to divide the household chores in a way that makes sense for their family.

Those interactions, multiplied every day across millions of women, will change everything.

MELINDA GATES is cochair of the Bill & Melinda Gates Foundation and founder of Pivotal Ventures.

Showing Up Will Matter Again

BY GEOFF COLVIN

IN THE 2020s people in developed economies will rediscover the value of physical presence—engaging with others face-to-face, eye-to-eye. The opposite trend, social isolation, has been building for decades, described chillingly in Robert Putnam's 2000 bestseller, *Bowling Alone.* Since then, as the world has become more digital, the trend has accelerated. In a 2018 survey, U.S. teens said they prefer texting to talking in person. Other research finds that compared with previous generations at the same age, members of Gen Z are less likely to get together with friends in person, go to parties, go out with friends, or go on dates. Across age cohorts, our phones are crowding out in-person interaction.

The bill for such behavior is coming due. "Loneliness kills," says Robert Waldinger of Harvard Medical School. "It's as powerful as smoking or alcoholism." Researchers find that social isolation increases the risk of heart disease by 29% and stroke by 32%. The U.K. has appointed a minister for loneliness.

Now a countertrend is taking shape. WeWork may have been a financial house of cards, but coworking spaces are a megatrend in commercial real estate, attracting millions of people who could work at home for free but instead pay to sit among fellow humans. Companies are encouraging or requiring employees to come back to the office because researchers find that creativity and innovation are group activities built on trust, and "there is no substitute for face-to-face interaction to build up this trust."

The most thoughtful analyst of the trend away from and back toward in-person interaction is MIT's Sherry Turkle, author of *Alone Together* and *Reclaiming Conversation.* Here's what she told *Fortune*: "I see a historic trend to introduce more friction, to slow us down, to look up and talk to each other and to appreciate what only we as humans can give each other. The trend for the next decade: the embrace of what we don't share with machines. Empathy. Vulnerability. The human-specific joy of the friction-filled life."

GEOFF COLVIN is an author and longtime editor at *Fortune.*

▲ ILLUSTRATION BY **BENEDETTO CRISTOFANI**

MALALA YOUSAFZAI

Investing in Girls' Education Pays Huge Dividends

WHEN GIVEN opportunities to learn and lead, girls show us again and again that they will.

But today almost 1 billion girls lack the skills they need to succeed in the modern workforce. As technology continues to change how our world operates, girls in low-income countries are falling further behind. Experts recommend that developing countries, where the highest numbers of out-of-school girls live, spend 6% of GDP on education—but very few are meeting this target today.

When girls go to school, the future is brighter for all of us. Last year, Malala Fund and the World Bank published research showing that if all girls completed 12 years of school, they would add up to $30 trillion to the global economy, closing workforce gaps and generating new jobs. More educated girls means more women driving innovation, holding seats in government, and running companies. I want to help girls catch up, so they can take us forward.

MALALA YOUSAFZAI is a student, cofounder of Malala Fund, and the youngest person ever awarded the Nobel Peace Prize.

TECH AND A.I.

Venture Capital Will Transcend the Valley

AILEEN LEE

AS TOLD TO **MICHAL LEV-RAM**

FOR THE FIRST time, in 2019, this became part of the conversation between venture capitalists and startup founders: Where are you thinking of being based? Will you have one headquarters or two? Are you planning to be a distributed workforce from the beginning? The fact is, those types of decisions change how you build your culture and processes from the get-go. Because of what's happening with open source code and Amazon Web Services [the cloud-computing infrastructure that powers many startups], more and more multibillion-dollar tech companies will be built outside Silicon Valley. There are some great areas like Seattle, Denver, Austin, Washington, D.C., and San Diego where you can live comfortably and send your kids to good schools. And there are already quite a few multibillion-dollar tech companies outside Silicon Valley.

I think you will see more regionally focused VC firms have success. And more Silicon Valley VCs will spend more time on airplanes. I think Zoom [the videoconferencing company] has something to do with this trend too. You can live—and work—anywhere.

AILEEN LEE is a venture capitalist and founder of Cowboy Ventures. She coined the term "unicorn."

TRISTAN HARRIS

BIG TECH WON'T REIGN—IT WILL BE REINED IN

BY **ROBERT HACKETT**

"**THE MATRIX EXISTS,** it just doesn't look like it did in the movie," says Tristan Harris.

What the former Google design ethicist is conveying is the notion that we all live, as dystopian as it may sound, in a mock reality fabricated by machines. These machines constitute "the surveillance-attention economy," as Harris calls it, a product of the growing cadre of companies and technologies that "profit off of renting access to manipulate

▲ ILLUSTRATION BY **BENEDETTO CRISTOFANI** us with increasing levels of precision."

Facebook, Google, TikTok-owner ByteDance—Big Tech corporations with hands in data-siphoning and advertising-based business models—are building profiles of people so they can predict and influence human behavior. In essence, they're creating virtual "voodoo dolls" they can poke, prod, and use to bewitch, Harris says. "They're competing for a better way for a third party to manipulate your habits, your moods, subtle shifts in your identity, beliefs, or behavior."

The harms are many. Harris lumps them together under the header of "human downgrading," a phenomenon that includes a shortening of attention spans, diminishment of free will, and increasing incidences of polarization, isolation, and depression among the population. The apparatus ultimately "destroys our capacity to make sense of the world in an accurate and well-founded way that is critical for democracy."

How to stave off self-destruction? Harris proposes implementing regulation that would force Big Tech to disassociate its profits from "the increasing capacity to control and shape human behavior."

The proposal has precedent. Until the late '70s and '80s, energy utilities in the U.S. were almost purely incentivized to encourage overconsumption: The more people left the lights on, the more money electricity suppliers made. Policies were then put in place to decouple that profit motive from consequent wastefulness. Past a certain point, consumers would be charged steeper prices for their consumption, and some of that premium would go toward funding renewable energy sources. The approach had a dual effect: bolstering thriftiness and long-term energy solutions.

Harris believes a similar policy will be needed to repair "the breakdown of society" that Big Tech is causing. These companies should be required to plow some of their profits into "regenerative" areas, Harris says. Some money could prop up investigative journalism, whose core business model Big Tech helped hollow out. Some could bankroll mental health and community-building initiatives. Still more could fund alternative tech products designed with the public interest in mind, like public utility social networks supported by Wikipedia-style nonprofit business models.

In this Matrix, so-called users are the ones being used. "Free is the most expensive business model we've ever created," Harris says. Now we have to choose: "free" or freedom.

TRISTAN HARRIS is the director and a cofounder of the Center for Humane Technology. Earlier, he worked as a design ethicist at Google.

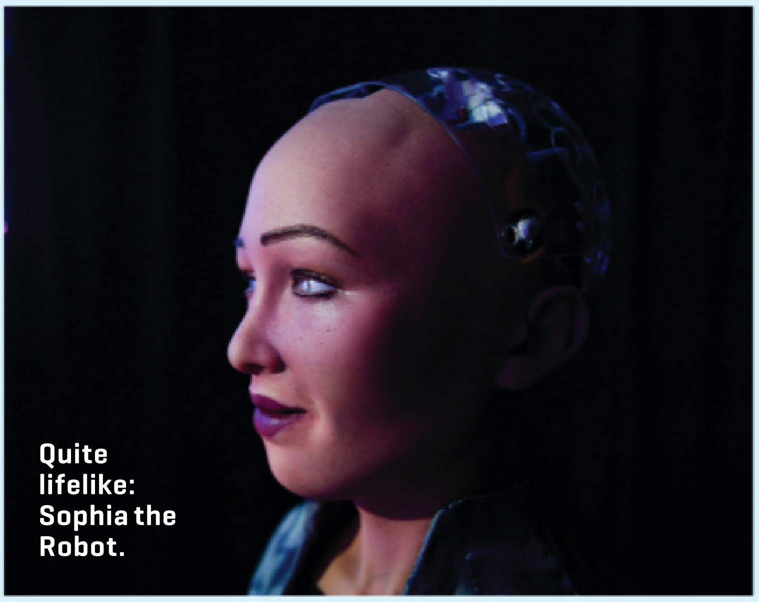
The Line Between Human and Bot Will Disappear—and We'll Be Fine With It

BY GEOFF COLVIN

WHEN YOU'RE TEXT-CHATTING with Katie as you resolve a problem at a retail website, do you wonder whether Katie is a person or a bot? More important, do you care? Did it bother you that the 30-years-younger Robert De Niro in *The Irishman* was partly real and partly computer generated? Have you smiled at deepfake videos in which public figures seem, convincingly, to say outrageous things they never said?

The blurring of humanness is well underway and will accelerate in the 2020s. Living with indistinguishable humanoids—text, audio, and video versions, and just maybe physical—will become routine. The hard part is fully grasping how much better the technology will become. Just a few years ago those deepfake videos were difficult and expensive to make, and they still looked obviously doctored. Now high-quality, make-your-own-deepfake apps are available for free and getting better every day. Google demonstrated a convincing audio humanoid, Duplex, 18 months ago; this year fraudsters called a U.K. executive with a fake audio version of his boss so realistic that the executive followed its orders to send 200,000 pounds to the fraudsters' account.

Video game makers scan thousands of athletes' faces every year; today's games aren't quite indistinguishable from actual TV coverage, but it's reasonable to think that within a decade they will be. As for the ultimate indistinguishable humanoid? Hanson Robotics in Hong Kong is developing Sophia, which it intends to make physically realistic and fully human—a "conscious, living machine." Living? Really? Seems unlikely. What we can say with confidence is that the 2020s will be the decade in which we stop wondering if a human image, voice, or message is actually human. In many cases, we just won't know. And we'll be okay with that.



Quite lifelike: Sophia the Robot.

© DAVID FITZGERALD—WEB SUMMIT/GETTY IMAGE

TECH AND A.I.

A majority of farmers in places like Rudd, Iowa, struggle with connectivity.

BETH FORD

THE 2020s WILL CONNECT RURAL AMERICA—OR LOSE IT

Less than 2% of the population provides the nation with safe and affordable food. And, argues Ford, these people are in danger of being cut off.

DIVISION IS ALL around us today. Rural versus urban. Heartland versus coasts. Boomer versus Gen Z. Republican versus Democrat. To ensure prosperity a decade from now, we need connection. Literal connection, enabled by technology and investment, and human connection, enabled by all of us.

Today, 24 million Americans, 80% of them in rural areas, do not have access to high-speed Internet—the greatest enabler of human connection in our lifetime. It is to our times what electricity and transportation were to our grandparents.

In 10 years, all America must be connected. We must address accessibility in rural areas and affordability in urban areas. Less than 2% of the population provides the nation with safe and affordable food. The health of their communities is vital to the food security of the nation.

But today, one in four children in rural America

SCOTT OLSON—GETTY IMAGES

lives in poverty. Over the past year, rural job growth was less than half the nationwide rate. More than 60% of new jobs were in metro areas, compared with 8% in rural areas. Nearly 45% of the 2017 deaths from heart disease in rural areas were deemed "potentially preventable," compared with 18.5% in one of the urban classifications. Without the population to support large grocery stores, fresh food is less available in rural areas.

Farmers, both small and large, are the backbone of these communities. When they aren't profitable, they can't invest in education, health care, and the local economy. Today 60% of farmers say they don't have enough connectivity to run their businesses; 78% do not have a choice of ISPs; and 60% say what they do have is slow. Modern agriculture relies on cutting-edge agtech and precision farming tools to boost production, address climate concerns, and improve sustainability.

You would think, given these statistics, coupled with the year they've had, farmers would look to the future with trepidation. But they are looking forward with a sense of action in mind—and so should we. In the coming decade, we will either connect rural America or risk losing it.

BETH FORD is the president and CEO of Land O'Lakes and is No. 31 on *Fortune*'s Most Powerful Women in Business list.

A.I. 'Hygiene' Will Determine the Success of A.I.

JOY BUOLAMWINI

BY **JONATHAN VANIAN**

DESPITE A CURRENT boom in artificial intelligence, today's complicated mathematical systems still suffer an inherent flaw—their propensity, like their human creators, to fall prey to their own biases.

Recognizing that fact, explains Joy Buolamwini, the founder of the Algorithmic Justice League, is a crucial part of practicing good A.I. hygiene, a technology concept akin to continuously taking care of one's health. A.I. systems that adapt and take action based on the data they ingest require constant tending and human oversight, especially if the systems end up failing to work as well on minority or marginalized groups not equally represented in the data sets.

Consider the facial-recognition technologies offered by companies like IBM and Microsoft that worked better on lighter-skinned men than on darker-skinned women. Buolamwini and colleague Timnit Gebru's milestone research paper published in 2018 highlighted the bias problems, which resulted in both companies improving their systems to reduce the discrepancies. But despite the fixes, the systems still don't work as well on women with darker skin, underscoring how companies must continuously monitor and adjust their A.I. systems as more people interact with them.

She thinks more companies need to consider whether it's appropriate to use an A.I. system in the first place. If they do, they must keep track of their impact on different societal groups, because systems often function differently than expected.

Companies also need to be aware of their technology's limitations and open to having an "active process and oversight and engagement with the people using these systems," or opening up the "black box," as she puts it.

Practicing good A.I. hygiene can help companies mitigate potential harms and bias, but it's not something they can do once and consider themselves in the clear. It's an ongoing process. Quips Buolamwini, "You wouldn't shower once in 2020 and say you're good."

JOY BUOLAMWINI is the founder of the Algorithmic Justice League.

ILLUSTRATION BY **BENEDETTO CRISTOFANI**

OUR ENVIRONMENT

CHRISTIANA FIGUERES

WE'LL WITNESS THE END OF THE INTERNAL COMBUSTION ENGINE ERA

Employees work on the assembly line for the production of the ID.3 electric car at the Volkswagen plant in Saxony, Germany.

IN THE 2020s, we will see the beginning of the end of the internal combustion engine. That is quite remarkable because the entirety of our economic growth over the last 150 years has come on the back of this technology and the fossil fuels that feed it. Over the past few years we have been investing heavily in electric and hydrogen-powered vehicles, and this is just going to accelerate exponentially over the next decade. Regulators at the city, state, and national levels are beginning to understand that the internal combustion engine is both a global and locally polluting technology. Our cities are heavily polluted mostly because of the burning of fossil fuels, causing almost 7 million deaths per year globally. In addition, many—if not all—car manufacturers realize that the demand for low- or no-emission vehicles is increasing exponentially.

Users are realizing that these vehicles can have all of the performance advantages of the internal combustion engine without the maintenance or the pollution. The vehicles can go from 0-to-60 miles per hour in 2.5 seconds. Vehicle-charging networks are extending their coverage, and battery costs dropped 13% just in 2019. Some have predicted cost parity between electric cars and gasoline-powered vehicles as soon as 2020. Ford recently announced that it is producing a Ford Mustang SUV that is completely electric. Meanwhile, two-wheelers are shifting to electric: Drivers can go to a petrol station in India, find a wall of batteries that are all charged, exchange their empty battery in a few minutes, and take off. By 2030, we will probably not be able to purchase a new vehicle with an internal combustion engine. We will still have a transition period of maybe 10 to 15 years during which both technologies will be on the road. But by 2030 I would like to see the internal combustion engine in a museum, a museum that duly honors the role that it has played in global economic development but makes it clear that such technology is now history.

CHRISTIANA FIGUERES was the executive secretary of the United Nations Framework Convention on Climate Change from 2010 to 2016.

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TONY FADELL

Today's Waste Will Replace Tomorrow's Plastic

AS TOLD TO **CLAY CHANDLER**

WE DESIGNED our way into the plastics problem. Now we have to design our way out.

Some plastic is good. But the fastest-growing use is in disposable packaging. Recycling isn't the answer. Petroleum-based plastic stays in the environment for 500 years. It gets into our oceans, our food, our bodies.

We need a bio-inspired packaging material that disintegrates no matter where it ends up. PHA (polyhydroxyalkanoates, a class of natural polyesters derived from bacterial fermentation) is one solution. It will degrade just like a leaf. We're learning to produce it with biowaste, like rancid olive oil.

Governments should start banning plastics, and companies have to stop the greenwashing. It will take capital, but we could tackle this in three to five years.

TONY FADELL, principal at advisory firm Future Shape, is known as the "Father of the iPod." He is also coinventor of the iPhone and cofounder of Nest.

Tech Alone Can't Save the Planet—Transparency Is Needed, Too

BY FRED KRUPP

AS THE REALITY OF CLIMATE CHANGE hits home, it's easy to feel despair. But the pace of environmental innovation is accelerating too. We still need ambitious government policies, but new technology and increased transparency can speed progress and spur both business and government to deliver better results.

Business leaders know these changes are underway, and many have embraced them. In the Environmental Defense Fund's second annual survey of 600 executives, more than 84% say they are confident that technological advances will have a positive effect on the way businesses impact the environment, especially analytics, automation, A.I., and sensors.

And because social media means that everybody gets a vote on whether your company is a responsible corporate citizen, more than 85% of those executives expect customers, employees, and investors to hold them more accountable for their impact on the environment.

After Hurricane Harvey, for example, EDF worked with a startup called Entanglement Technologies to measure air pollution near flooded petrochemical plants in Houston. With its portable technology, we quickly identified a plume of cancer-causing benzene in a community of 4,000 people. This real-time data allowed officials to identify potential health risks and prioritize resources.

EDF recently created a new subsidiary to launch MethaneSAT, an orbital mission designed to help citizens, companies, and governments locate, measure, and reduce potent greenhouse gas emissions. Data from MethaneSAT will also be available to the public free of charge so that everyone will be able to hold businesses accountable, applauding progress or spotlighting laggards. Imagine a world in which thinking machines, handheld analyzers, and orbiting sensors empower an environmental revolution. We'll see that in this decade.

FRED KRUPP is the president of the Environmental Defense Fund, a U.S.-based nonprofit environmental advocacy group.

ILLUSTRATION BY **BENEDETTO CRISTOFANI**

Building Diversity and Inclusion in Health Care

A diverse workforce supports **Atlantic Health System's** commitment to delivering high-quality care at the right time, at the right place, and at the right cost.

ABOVE: ARMOND KINSEY, CHIEF DIVERSITY OFFICER, ATLANTIC HEALTH SYSTEM. **BELOW:** AT AHS, INCLUSIVE TEAMS LEAD TO A HIGHLY ENGAGED WORKFORCE.

ONE YEAR AGO ATLANTIC HEALTH SYSTEM (AHS)—a leading New Jersey–based health care system that operates five medical centers, a children's hospital, and more than 400 sites of care—began its search for a chief diversity officer. The search led the company to experienced diversity executive Armond Kinsey.

Since his appointment in March, Kinsey has developed a strategic plan focusing on Patient Care, Team Member Experience, Community, and Supplier Diversity. "It was important that I take time to immerse myself in the culture," Kinsey says. "Belonging is a big part of it. We not only recruit diverse talent, but also want people to feel valued and know they are part of something important."

AHS also considers the social determinants of health when creating company and community initiatives. "If patients are challenged with access to transportation or food, for example, we look to partner with the community to help close, if not eliminate, those gaps," Kinsey explains. "We also look at it from a chronic disease standpoint. For example, if we see an increase in asthma patients coming from a certain zip code, we ask, 'What can we do to address the community's needs?'"

In addition to examining solutions for equitable care, Kinsey has guided growth of existing diversity initiatives, such as a job-training partnership with Project SEARCH designed for people with disabilities. "We've ramped up our apprenticeships and intern programs to ensure we are supporting a diverse workforce of the future," he explains.

The impact of investment in diversity and inclusion initiatives across AHS is clear. Approximately 70% of its workforce and more than 50% of its physicians are female. All five of its medical centers and the children's hospital are designated as leaders in LGBTQ care on the Healthcare Equality Index. And the company strives to make its centers welcoming to veterans, offering programs that help service members readjust to civilian life and recruiting veterans to work within the system.

"It's vital that we have an inclusive workforce that reflects the communities we serve," Kinsey notes.

What's more, every success, every challenge, and every accolade, including being named one of *Fortune*'s 100 Best Workplaces for Diversity, is a direct reflection of the rich and vibrant AHS team, patients, and community. ■

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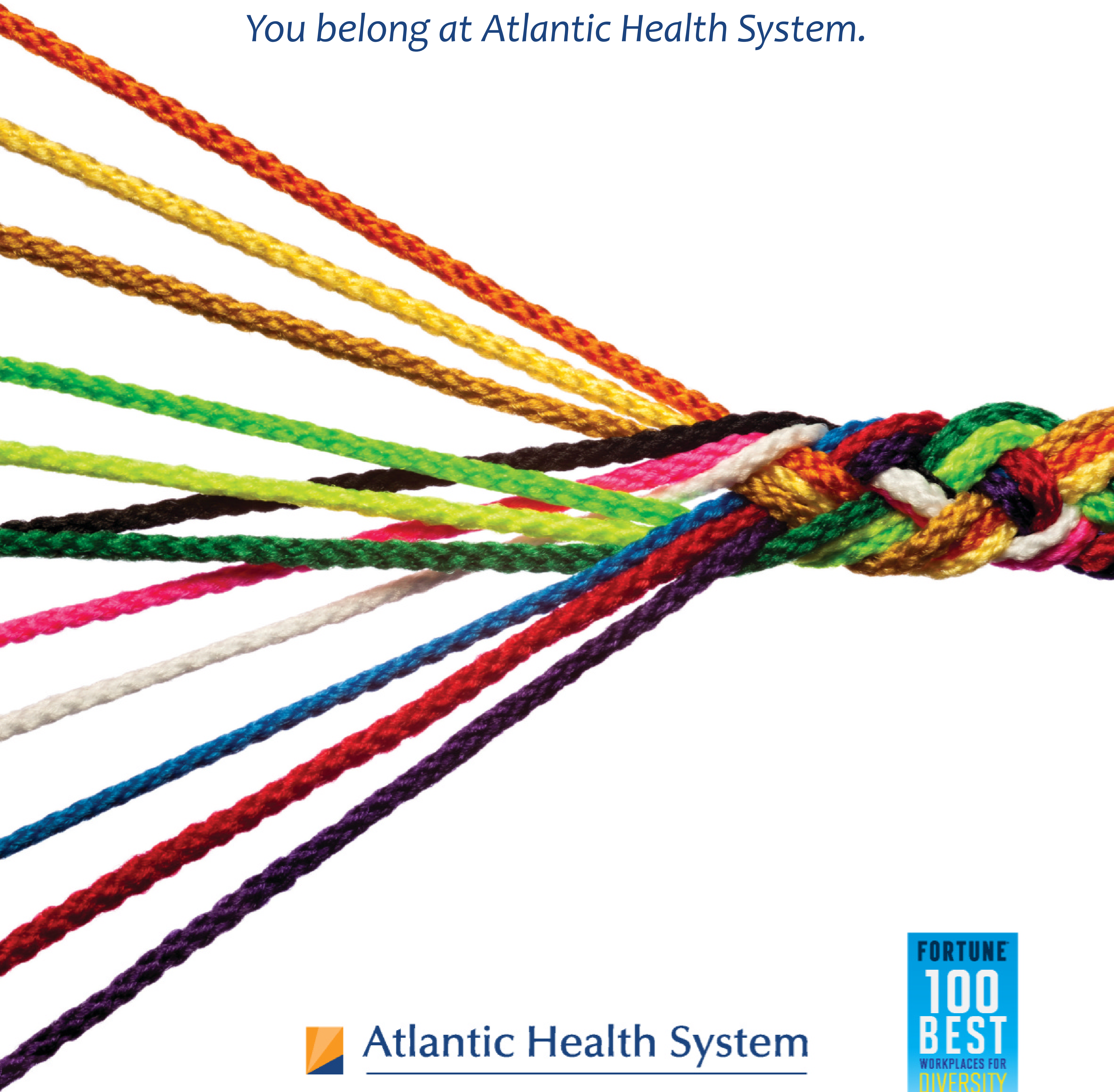

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FACEBOOK AND LIBRA

HANGING IN THE BALANCE

Lessons from the fall and possible rise of a pioneering digital currency.

BY ROBERT HACKETT

ILLUSTRATION BY **BENEDETTO CRISTOFANI**

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THE DECOR INSIDE the offices on Facebook's campus in Menlo Park, Calif., can best be described as "unfinished." Steel girders crisscross overhead. Piping and air ducts pop out of plywood walls. Lighting, fire alarms, and support structures dangle from the underside of the floor above—all exposed to view.

The state of incompletion is not for want of funds. Despite scandals, Facebook continues to post record profits—$6.1 billion in the most recent quarter. Rather, the inchoate quality intentionally reflects the design philosophy of Mark Zuckerberg, the company's founder and autarch. Zuckerberg likes to say that Facebook is only ever 1% finished. So the space appears under perpetual construction.

The stripped-down look feels particularly appropriate in Building No. 52. These are the offices that incubated Libra, Facebook's audacious digital payments proposal. Here, the incompleteness creates the impression that the company isn't certain whether to continue construction or just close up shop. And after the brutal reception that greeted Libra's rollout over the summer and fall, you could hardly blame Facebook if it opted to not only shut but also raze the place. Nonetheless, the company remains committed to launching Libra—and so a team of engineers continues to toil here.

Facebook and the partners it has recruited aim to create a new kind of money, backed by a basket of international currencies—such as the U.S. dollar, the euro, and the Japanese yen—and based on blockchain technology. The currency backing would make Libra a "stablecoin," a digital currency that maintains a relatively stable value, unlike Bitcoin and other cryptocurrency forebears, and which can be used as a planet-wide medium of exchange. After coming up with the idea, Facebook corralled more than 20 other firms into the (technically independent) Libra Association. The pitch: They could own a stake in a supranational currency that could extend financial services to the world's 1.7 billion "unbanked" people, knock down obstacles to e-commerce, and generally make it easier and cheaper for money to fly around the globe. Or they could miss out.

Libra's critics see far more threat than opportunity. The project is unique for having touched off an international firestorm before coming anywhere close to launching. At this point, Libra "is probably the best-known startup without a product that ever existed," says Patrick Ellis, general counsel of payment processor PayU and a Libra Association board member.

Trouble signs appeared early. Last spring, well before the project's official debut, David Marcus, the former PayPal president who now heads Facebook's Libra efforts, pitched his vision to Treasury Secretary Steven Mnuchin. As Marcus detailed the early designs, Mnuchin delivered his verdict. "I hate everything about this," he said, according to a person familiar with the conversation.

When the Libra project was announced in June, the pile-on continued publicly. Federal Reserve Chair Jerome Powell said he had "serious concerns regarding privacy, money laundering, consumer protection, and financial stability." President Trump tweeted that Libra "will have little standing or dependability." India's top economic official dismissed its viability. Bruno Le Maire, France's economic minister, called Libra "a threat to national sovereignty"—and spearheaded its prohibition in the European Union. By mid-October, seven of the Libra Association's biggest prospective participants—including payment titans Visa, Mastercard, PayPal, and Stripe—had backed out amid fears of hostile regulatory scrutiny.

Regulators' concerns were hardly unfounded, and Facebook aggravated matters by being underprepared to address many of them. One prime sticking point: How would Libra comply with know-your-customer and anti–money laundering laws to prevent misuse? Facebook had already demonstrated a reluctance and inability to police its media platforms—so how could it be trusted to police a new form of money? While security experts tell *Fortune* it should be possible to track the flow of assets through Libra, given the network's design, skeptics aren't convinced. "There are people who go to a western, and they root for the bad guy," says Rep. Brad Sherman (D-Calif.), who heads a House subcommittee on capital markets. "Libra may very well succeed—in facilitating terrorism, drug dealers, human traffickers, and especially tax evasion."

Critics also saw Libra as a threat to global financial stability. Deployed to Facebook's 2.8 billion users, a Libra coin might attain a scale that diminished the standing of the U.S. dollar and other fiat currencies and the sovereignty of the world's central banks. Especially galling to many was that the association would empower a council of private-company representatives to tweak the composition of the currency basket by which Libra would be backed. "I back off at the concept of a global consortium potentially having so much power," says David Andolfatto, an economist at the Federal Reserve Bank of St. Louis. "Unless you elect Jesus to run it, you're putting a lot of faith in mankind."

> **Libra started a firestorm without coming anywhere close to launching. One backer calls it "the best-known startup without a product that ever existed."**

A censorious Congress raked Zuckerberg himself over the coals during a House financial services committee meeting on Oct. 23. "I don't actually know if Libra's gonna work," he admitted.

And yet, for all that, Facebook and its allies are plowing ahead. The Libra Association still counts 21 corporations, startups, venture capital firms, and NGOs as members. Uber, Lyft, Spotify, telecom multinational Vodafone, and cryptocurrency broker Coinbase are among those still on board. And the association says it still hopes to launch Libra in 2020.

In an interview just two days after Zuckerberg's

House testimony, Marcus—who heads Calibra, Facebook's Libra-focused digital wallet subsidiary—exuded sanguinity. "I'm a 'glass half-full' kind of guy," he says, draping an arm over the back of his chair in one of several Calibra conference rooms named after Bill Murray flicks. (This is the *What About Bob?* room.) "Everyone is now talking about digital currencies around the world—everyone. And if it hadn't come from us, that timeline—to make progress in having the right framework for digital currencies—would have taken much longer."

Indeed, the race for a global e-currency has only grown more heated since Facebook's face-plant. Banks, other tech companies, and national governments—most notably, China's (see sidebar)—are readying digital currency pilots of their own; Libra's stumbles might ease the path for those that come later, or at least force regulators to clarify what they'll allow. Libra itself, meanwhile, promises to course-correct based on the (often scorching) feedback it has received.

How will Libra, or any new currency, satisfy global regulators? What will it look like in its final form? Will Libra be the first globally viable, price-stable e-cash? Or will someone else beat the association to it? To explore those questions and others, *Fortune* canvassed the financial and digital worlds for this account.

1. WHY FACEBOOK NEEDS LIBRA

IN THE TECHNOLOGY sector, there's a concept called "platform risk," the danger that another company, or a newer, trendier technological innovation, could kneecap your business by wooing or coercing your users away.

If you want to understand what Zuckerberg might see in Libra, consider Facebook's $2 billion 2014 acquisition of Oculus, says Hunter Horsley, a former Facebook product manager who runs Bitwise, a cryptocurrency investing startup. At the time, neither Oculus nor VR was anywhere near mainstream (they still aren't). But the possibility that they could take off posed an existential threat to Facebook; if the world started chatting and "liking" via VR, Facebook's dominance would evaporate. Why not own the leader of a platform that could become the Next Big Thing? "Companies historically always die by not adapting to new paradigms quickly enough," Horsley says.

For Facebook's executive team, cryptocurrencies and blockchains—the database innovation upon which those currencies are based—became unignorable in 2017, when the prices of Bitcoin and other currencies began an improbable, months-long climb. The company's leaders realized that cryptocurrency, or something like it, could help it break into financial services, an area in which it has struggled to gain traction. Everyone at Facebook had seen how China's digital upstarts—Tencent's WeChat Pay and Alibaba spinout Alipay—had bypassed the traditional banking system and become behemoths, weaving themselves tightly into people's daily lives. (In 2018, Chinese mobile payments hit $38 trillion in transactions.) Maybe by tapping into the crypto-zeitgeist, Facebook could achieve something similar.

Through 2017, Morgan Beller, then a junior corporate-development employee at Facebook, researched and met with blockchain startups. She penned a memo that helped persuade higher-ups that Facebook had a unique opportunity to take a leading position in the industry—and that if they slept on it, they could be disrupted. Beller ultimately won over Marcus, one of Zuckerberg's top deputies and one of Bitcoin's earliest acolytes in Silicon Valley.

Zuckerberg and Marcus sat down to chat in depth about cryptocurrency around the year-end holidays in 2017. Marcus says they shared frustrations about the incumbent financial system: International payments are an expensive hassle. Settlements can take days to clear. Different systems don't interoperate. And the poorer you are, the more you pay.

A blockchain-inspired approach might allow Facebook to cut out pesky middlemen, avoiding the fees associated with payment card–issuing banks and money transmitters by routing around them. Facebook could succeed where PayPal, Marcus's old employer, had capitulated: realizing the libertarian dream of a pure, borderless Internet money, rather than a market-by-market approach in which costs and delays persisted.

By May 2018, Marcus was leading a blockchain team full-time. Zuckerberg, in turn, committed to studying privacy, decentralized systems, and cryptography—foundational principles of blockchain tech and cryptocurrencies—as his 2018 New Year's resolution. A little over a year later, in March 2019, Zuckerberg published a privacy-themed manifesto in which he described his decision to adopt strong encryption across many of Facebook's services, including WhatsApp, Messenger, and Instagram.

Public reaction to the manifesto focused on the implications for consumers. But blockchain experts saw something else: One of tech's most powerful leaders was gravitating toward their platform. Jeremy Allaire, CEO of Circle, a cryptocurrency startup, says that Zuckerberg was recognizing that blockchain tech "is not just this digital currency thing. It's this building-block infrastructure for how information is exchanged." It was, in other words, a platform where Facebook couldn't afford not to play.

2.

THE REVENUE PLAN

LIBRA IS A revenue-generating opportunity for Facebook, though not in the ways observers might expect.

Given that virtually all of its revenue comes from advertising, it's tempting to see Libra as a conduit through which Facebook could sell ads against people's financial data. Joseph Lubin, a cofounder of the cryptocurrency Ethereum and a Facebook critic, says, "It'd be a big surprise if they didn't find a way to link [Libra] information to everything they already know" about their users. But Facebook has been adamant that the systems underpinning its digital wallet, Calibra, will be firewalled off from the company's broader data-hoovering operation. A Libra user's purchase history, in other words, would not feed Facebook's marketing engine, at least by default. (If you grant permission, however, your data is as good as theirs.)

Facebook also doesn't envision making money from fees. In a digital-currency context, the costs exacted by payment providers will effectively drop to zero, Marcus says—like the price of email or texting.

So how does Facebook plan to convert Libra into moolah? For starters, members of the Libra Association plan to collect interest on its reserves, in the form of a dividend. If the reserve pot grew big enough, that could spin off big bucks over time.

Another way Facebook could profit would be by making its marketplaces even more valuable to its advertisers. In theory, in a Libra world, paying for things through Facebook's apps will become seamless. That dress you liked on Instagram? Click "buy with Libra," and avoid the dreaded "enter your credit card information" page. Fewer abandoned transactions means boosted "conversion" rates, or the frequency with which ads directly generate sales, says Avivah Litan, a Gartner analyst. And that, in turn, should persuade marketers to spend more bidding on ads.

By offering easy money transmission through Facebook apps, Libra could also entwine itself and Facebook in the lives of people all over the world. Want to transact abroad without worrying about steep fees? Use Libra. Want to accept instant

> **Everyone is talking about digital currencies around the world—everyone. If it hadn't come from us, that would have taken much longer."**

E-VANGELIST David Marcus, who runs Facebook's Libra division, says the project will eventually benefit from its high-profile stumbles.

© ALEX WONG—GETTY IMAGES

payments through any (participating) digital wallet? Libra. Want to stream Spotify tunes or hail Uber and Lyft rides for a discount? Again, Libra.

The biggest potential impact lies in up-and-coming economies. Matthew Davie, a Libra board member and chief strategy officer for Kiva, a nonprofit microloan provider in emerging markets, notes, "This isn't about trying to make your Blue Bottle coffee a little cheaper." In Davie's vision, anyone with access to a mobile phone—that is, increasingly, everyone—can join the global financial system. And this would widen another business opportunity: Facebook's Calibra unit could one day offer loans, a major profit engine in financial services.

3. LESSONS IN HINDSIGHT

THERE WAS no avoiding it: Facebook had to tell the public about Libra before figuring everything out. "The main criticism that we get around the rollout has been, 'Shouldn't you have kept this under wraps for much longer until you had more answers to all of the questions?'" Marcus says.

The way Marcus explains it, his hand was forced. His team had started meeting with potential partners—payment processors, tech firms, banks, and regulators—and news of the project began to leak "profusely" in the press. Since Facebook was already seeking input, he figured it would be wise to make the news public—and perhaps regain control of the narrative.

Instead, the narrative spun out of control; privacy scandals, data breaches, and disinformation at Facebook had turned public sentiment against it. Marcus says he has just one regret. "If I had to do it all over again, I would probably just focus on what this thing really is, which is a new payment system," he says, rather than framing it as a new currency. "That created more emotions than were actually warranted."

Reframing Libra as a payment system might help the project recover—especially given that the departure of payment processors from the Libra Association was what brought the project to its nadir. PayPal bailed out on Oct. 4, in what was, in part, a reaction to regulatory pressure. On Oct. 8, two senators sent letters to some of the biggest companies involved in Libra—Visa, Mastercard, and Stripe—asking them to reconsider their participation until everyone got clearer answers from Facebook. Those companies had rooms booked at the hotel in Geneva where the founding association meeting was to take place on Oct. 14, according to someone familiar with the bookings. But they dropped out of the group on Oct. 11, also citing the ugly regulatory climate.

"Given the crazy amount of pressure they were under, it was the right trade-off for their shareholders and stakeholders," Marcus says. If Libra were to get a regulatory thumbs-up, however, nothing is

HARD HEARINGS
Mark Zuckerberg's seat at a recent House session on Libra, where lawmakers aired objections that could be tough to overcome.

stopping those processors, or other dropouts like eBay, travel-site owner Booking Holdings, and Argentine fintech Mercado Libre, from adding the payment option across their networks or from rejoining the association. The quitters have "all the option value, none of the heat," Marcus says. As PayPal CEO Dan Schulman recently told *Fortune,* "Maybe later, there are ways we can work together."

Visa, or Stripe, enabling the company to fly a "mission accomplished" flag. And the majority of cryptocurrency experts and entrepreneurs *Fortune* interviewed said they expect Calibra to add integrations with existing digital stablecoins.

One partnership may be close to launching: Facebook has had quiet talks with Coinbase and Circle about joining Centre, an industry consortium that mints USD Coin, a U.S.

> **"Unless you elect Jesus to run [the Libra Association], you're putting a lot of faith in mankind."**

4. BEFORE LIBRA, CALIBRA

WHILE FACEBOOK and its partners work out the kinks in the Libra currency, Facebook can still build digital-payment businesses around its Calibra unit. "It's foolish to think Facebook will not proceed with this," says Meltem Demirors, chief investment officer for CoinShares, a digital asset management firm. "The opportunity is too big for them not to do anything."

Bitwise's Horsley thinks Calibra could start by integrating with traditional payment providers like PayPal,

dollar-pegged digital currency, *Fortune* has learned. Calibra could also work with stablecoins issued by startups such as Gemini, Paxos, and TrustToken.

Right now, stablecoins are used almost exclusively in cryptocurrency trading, where investors deploy them as a cash equivalent. But blockchain advocates say their stability makes them promising candidates for future use in digital payments. And because they're pegged to just one currency, says Bill Barhydt, CEO of cryptocurrency wallet startup Abra, they offer "a very clear path from a compliance perspective." He adds

China on a Blockchain

WHEN MARK ZUCKERBERG appeared in October to defend Libra before a House committee, he warned, "The rest of the world isn't waiting." Indeed, at press time, the U.S.'s leading economic rival was poised to become the first major country to implement a national electronic currency.

The People's Bank of China (PBOC), China's central bank, plans to put a digitized version of the renminbi—dubbed the Digital Currency Electronic Payment (DCEP)—into people's hands before the end of 2019, according to *Caijing,* a Chinese financial magazine. The central bank is reportedly working with state-owned banks and telecom companies on a small-scale pilot that will start in the cities of Shenzhen and Suzhou. (The PBOC did not reply to *Fortune*'s request for comment.)

The digital yuan will be partly based on blockchain technology, which underpins cryptocurrencies. The virtual banknotes are expected to be compatible with China's wildly popular WeChat Pay and Alipay payment apps. People will be able to use the DCEP to pay for goods and services related to transportation, education, medical treatment, and retail, allowing the government to see which scenarios gain the most traction, according to *Caijing.*

The PBOC has been actively investigating the digital currency idea since 2014, but it kicked the effort into high gear after the Libra project was announced in June. Why the enthusiasm? Digital currency could help China keep closer tabs on its money supply, clamp down on capital outflows, and expand its influence in emerging markets where demand for digital payments is high. Ultimately, it's about supervision and control.

In his House testimony, Zuckerberg intimated that Libra could be the democratic counterbalance to China's authoritarian aims. But skeptics have pushed back against that as a rationale for rallying behind Libra. "Private power can be just as scary as excessive government power," says Saule Omarova, a Cornell Law School professor who specializes in financial regulation.

that Facebook "probably should have done that out of the gate ... it would have basically eliminated a lot of those sovereignty questions."

5. WHAT'S NEXT IN THE CURRENCY RACE?

TO GET A GREEN light to launch as a currency, Libra needs to satisfy regulators that it isn't a coup by the private sector to usurp authority over money—and that it will be stable enough to avoid precipitating a worldwide financial crisis. One way the Libra Association aims to prove itself is by promising a "fully backed" reserve. Every Libra coin in circulation would be backed by low-risk assets of equal value, made up of various currencies, as well as short-term government Treasury bills. (Members of the Libra Association would put up the initial assets, at a minimum buy-in of $10 million.)

A fully backed reserve would theoretically make Libra less vulnerable to a panic. Marcus notes that much of the "money" people use today—checks, credit cards, loyalty points—is backed by far fewer real reserves. "There's more money creation in a Baskin-Robbins gift card than in Libra," he says.

Regulators outside the U.S. will soon weigh in on Libra's merits. The Libra Association says it will apply soon for a license as a payment system with FINMA, a financial regulator in Switzerland. Crucially, in April, a task force assembled by the Financial Stability Board, an international body in Basel, Switzerland, will offer a preliminary version of a paper on the risk to financial stability posed by "global stablecoins" like Libra. The Treasury Department and the EU have similar reviews underway.

A thumbs-down from any of these bodies might be fatal. But if Libra gets approvals, expect smaller rollouts in specific countries rather than a grand, world-conquering unveiling. The association will likely look to friendly locales for pilot tests, with Switzerland, Singapore, and emerging economies in Southeast Asia and Africa as candidates.

In the U.S., Congress will get a say—and there, some critics, skeptical of Big Tech in general, will likely stay implacable. Asked whether the Libra partners could do anything to assuage his concerns, Rep. Sherman erupts into uproarious laughter, then retorts: "What could Beelzebub do? Put on a new suit of clothes and get into heaven?" But others are more open to experimentation. Rep. Patrick McHenry (R-N.C.), Sherman's colleague on the House financial services committee, describes the sovereignty fears of his peers as "hyperventilation." He believes Libra is "likely to launch." And he adds: "We should not be directly legislating a business into or out of existence."

> "What Libra indicates is how quickly things are moving now" in digital currency, says one economist. "Time isn't waiting for anyone."

While it waits, the association is searching for a managing director and is aiming to bring its membership ranks up to 100 organizations. Marcus hopes for a 2020 rollout, but acknowledges, "The ball is not really in our court."

If Libra remains stymied, it's likely someone else will quickly step up in its place. PayPal, a Libra deserter, is eyeing digital currency partnerships, according to someone familiar with its plans. Financial services startups like Square, Robinhood, and SoFi have thrown their weight behind more decentralized cryptocurrencies, like Bitcoin. Banks such as JPMorgan Chase and Wells Fargo are testing versions of dollar-pegged digital currencies. And many observers believe it's only a matter of time before Google, Amazon, Microsoft, and other tech giants advance digital currency proposals of their own, though they have been mostly quiet about their interests to date.

While the private sector may be waiting to see how Libra shakes out, central bankers have been shocked awake. Plans by the People's Bank of China to issue a digital renminbi were imminent at press time. The Bank of France plans to run a blockchain-based digital currency pilot in the first quarter of 2020. Task forces assembled by the European Central Bank, Canada's central bank, and others are accelerating their research and development timelines. And over the summer, Mark Carney, the Bank of England's outgoing governor, called for a "synthetic hegemonic currency" backed by a basket of international currencies—like Libra, but run by central banks.

One thing is certain: All the interested parties, private and public, have had a fire lit under them. "What Libra indicates is how quickly things are moving now," says Gabriel Söderberg, a senior economist at Sweden's Riksbank, which has been exploring the feasibility of an e-Krona since 2017. "It really shows central banks that time isn't waiting for anyone." And time, as any business leader knows, is money. ■

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MURKY PICTURE Negative headlines about its home rentals have competed with Airbnb's rollout of new services like its Cooking Experiences.

PHOTO ILLUSTRATION BY *FORTUNE*

COPING WITH A BAD TRIP AT AIRBNB

As it prepares to go public, the hospitality upstart is on a roll—and even getting close to turning a profit. But recent stumbles and scandals have forced it to confront persistent fraud and safety problems in its home-rental service. Can Airbnb lay down the law?

BY ARIC JENKINS

FOR AIRBNB, HALLOWEEN STARTED OUT FESTIVE—AND QUICKLY TURNED FRIGHTENING.

Inside the company's San Francisco headquarters on the morning of Oct. 31, employees wore costumes and smiles. Cofounder and CEO Brian Chesky was grinning in chef's whites, handing out "Chesky's Chips" cookies to staffers. One of tech's best-known CEOs was role-playing as a pastry chef in a nod to an upcoming product launch—a new category of "Experiences," centered around cooking, that travelers could book through Airbnb.

But even as they snacked, employees were hearing about an exposé published earlier that morning, one that was inching closer to virality with each furious retweet. The website Vice had uncovered an Airbnb scam that spanned at least eight cities and nearly 100 listings. A shady management company was relying on fake identities to con guests, booking them in attractive-but-phony listings and then redirecting them to flophouses. The article illustrated how easy it was to exploit Airbnb's lax oversight and how little Airbnb did to help victims, logistically or financially. The reporter, Allie Conti, had been ensnared in the scam; she would later tweet that the FBI had contacted her about her article but that she "still [hadn't] been able to have a meaningful conversation with a human being at Airbnb."

The news would get far grimmer before Halloween was over. Just before 11:00 p.m. in Orinda, Calif., an affluent Bay Area suburb, inside a home booked through Airbnb, gunfire erupted during a party, leaving five dead and four others injured. The gathering had been promoted on social media as a "mansion party"; more than 100 people were present when police arrived. The home's owners did not hide their frustration. "Airbnb does not release the customer information before they really book, so we have no way to know [their intentions]," Michael Wang told the *San Francisco Chronicle*. His listing included a guest limit and an explicit prohibition against parties, Wang continued, "but people lie."

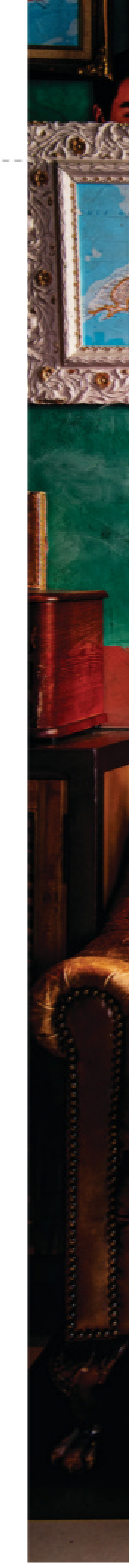
Concerns about fraud and safety have shadowed Airbnb throughout its rise. But the shooting and the Vice article, both widely picked up by other news outlets, dragged those issues into the foreground at a particularly inopportune time: Just six weeks earlier, Airbnb had announced its intention to go public in 2020.

With trust plummeting among investors and customers, Airbnb's leaders scrambled. Over the ensuing week, while in New York City for a conference, Chesky canceled meetings and cleared his schedule. He spent hours on the phone with Airbnb executives and board members, along with some outsiders. "I was calling early customers, people I had known, people who had criticized us," Chesky tells me. The agenda for each call: What Airbnb would have to do to restore confidence. On Nov. 6, Chesky announced the most sweeping changes to Airbnb's rules since its founding in 2008. Among them: "100% verification" of the providers of Airbnb homes and Experiences, a 24/7 hotline for neighbors with complaints, and a clearer policy for rebooking and refunds for guests.

Many of those moves had been in the works, Chesky now says, but he acknowledges that some had been "many, many years away," until the Halloween crisis forced the company's hand. He tries to give that timeline a positive spin: "It allowed us to operate with more urgency than I think I could have naturally asked the company to do."

The work has just begun—and the company is far from nailing down how it will do it. Considering there are more than 7 million Airbnb home listings, in roughly 100,000 cities and towns across almost every country on earth, this is a massive undertaking. And the fact that Airbnb has built a global brand, a $35 billion private-market valuation, and a business that analysts estimate will generate between $4 billion and $5 billion in revenue in 2019, all without having implemented most of those security steps, goes to the heart of the challenges it faces.

In the subject line of an email to employees days after Halloween, Chesky said that Airbnb is "in the business of trust." The slogan cuts two ways. The company has built its rapid growth on a system that essentially requires hosts and guests to trust each other. Case in point: Under many circumstances, a would-be host or guest can list or rent a property on Airbnb without



PREVIOUS PHOTO: COURTESY OF AIRBNB

Kathleen Smith, who has studied Airbnb as a principal at Renaissance Capital, a firm that specializes in pre-IPO research. "But they've been in business for a long time. That they haven't done this so far is ... astounding."

Airbnb faces this trustworthiness crisis even as it seeks to show that it has a winning long-term business model. Underwhelming post-IPO performance by tech darlings Lyft, Uber, and Slack, and the pre-IPO meltdown of WeWork, mean that any Airbnb offering will be watched particularly closely. And Airbnb has strived for years to demonstrate that it can mature beyond budget home rentals.

In an interview on Oct. 23, Chesky told me he had wanted to wait to pursue an IPO until the company could give investors "a sense of the future." His goal is to build an end-to-end travel service with varied revenue streams—where customers can book lodgings, transportation, meals, and excursions, all under one corporate umbrella. Experiences are a key element of this push, but hardly the only one. Over the past few years, Airbnb has expanded into luxury homes and conventional hotel rooms, while taking steps toward offering museum and landmark tours—bolstered by acquisitions of companies with relevant expertise (see sidebar). But the expansion won't succeed if consumers, investors, and regulators mistrust Airbnb—so the once-humble startup finds itself at a crossroads.

Airbnb has announced that it was profitable before interest, taxes, depreciation, and amortization in 2017 and 2018 (2019 results aren't in yet). In the near term, policing itself more strictly will threaten the bottom line, both by reducing the number of listings and by boosting costs. But if the company is transparent about

ever presenting a government ID or undergoing a background check. But now, as it seeks the validation of an IPO, Airbnb has to prove that it can be trusted to monitor its own platform and lay down the law.

Crime and fraud are problems for other home-rental services, too, as well as for hotels. But the negative effects of Airbnb's home-rental business in many markets, including the gobbling-up of

EMPIRE-BUILDER, INTERRUPTED
CEO Brian Chesky's goal of broadening Airbnb's offerings has temporarily had to take a back seat to safety concerns.

rental-housing stock by landlords and bad behavior by renters, have drawn particularly intense scrutiny, and have already spurred municipalities to clamp down on or even ban the business. "Now there's the scrutiny of the public markets," says the effort, it should pay off, says Raymond James analyst Justin Patterson: “There will be upfront costs, but once that’s done, it then turns into a unique trust and safety advantage.”

Looming over this struggle is a philosophical question: As Airbnb scales up and commits itself to monitoring users more closely, does the company risk abandoning the “Live like a local” mantra that attracted independent-minded travelers in the first place? Kristin Luna, a Nashville-based journalist who’s been a high-standard “superhost” on Airbnb for almost six years, says she’s already seen changes for the worse: “It feels like a big corporation where you’re just another number.”

Chesky and his colleagues wouldn’t like being described that way—but growing up as a company may mean embracing the definition.

AIRBNB’S MATURATION is as much about developing and expanding new businesses as it is about improving security on the original one. The week before Halloween, Chesky and a dozen colleagues were in a conference room, preparing for the launch of the Cooking category. The chief executive, wearing a faded sea-green T-shirt with tiny, tattered holes in the collar, stood up and moved closer to the wall-size screen. He was staring intently at a photo of people seated around a table of food, high on a plateau, overlooking a countryside at sunset.

Experiences are meant to offer travelers unique activities with local hosts; the one on-screen advertised “handmade pasta with Grandma” in Rome. Which is why Chesky was not satisfied with the gorgeous vista. The grandma in question, Nonna Nerina, was standing at the table, but she was not rolling dough. “Are there any images where she’s actually cooking, though?” It was the third time Chesky had raised this issue. The images promoting a Cooking Experience shouldn’t lose the idea of participation, he insisted—otherwise, how would it be different from just going to a restaurant?

Chesky has long been fascinated by the idea of offering not just places to stay but also things to do. Launched in November 2016, Airbnb Trips originally gave guests the option to coordinate a home rental with any of a range of 500 activities—while avoiding the hotels and clichéd excursions associated with the package tour label. The Trips’ off-the-beaten-path ethos dovetailed with Airbnb’s homes business. “You don’t sleep in a tree house to get a good night’s sleep, so to speak,” Chesky says. “You could just stay in a boxlike hotel environment to do that.”

But Trips didn’t catch on, and Chesky was forced to go back to the drawing board. Some inside the company wondered why its CEO was so gung ho about this side project. “A company full of bright people are going to ask difficult and smart questions,” says Dave Augustine, a software engineer who was an early member of the Trips team. The team would

WAY PAST COUCH SURFING

Since 2016, Airbnb has either acquired or invested in multiple smaller travel companies. The company aims to build a portfolio of companies outside of its original short-term, low-priced home-rental model, the better to pitch itself to customers and investors as a full-service travel company. Here are some of the key additions:

LUXURY RETREATS

Acquired in 2017 for a reported $300 million, its offerings reflected its name: At one point, they included an entire island owned by Richard Branson. Its portfolio is now the foundation of Airbnb Luxe, where rates top $1,000 a night.

HOTELTONIGHT

Airbnb bought this last-minute hotel-booking site in March for $400 million. It was the startup’s biggest acquisition yet, and one of its biggest departures from its couch-surfing roots, since its rooms are predominantly in conventional hotels.

RESY

Airbnb in 2017 led a $13 million investment round into Resy, the restaurant-reservations app. Their partnership allowed guests to book tables through Airbnb’s website or app. (Airbnb recently discontinued that service.)

URBANDOOR

Airbnb claims that 500,000 companies use its Airbnb for Work service. In August, it bought Urbandoor, a company that focuses on corporate extended stays, for an undisclosed sum. The big prize: the housing Urbandoor controls in some 1,500 cities.

TIQETS

Airbnb led a $60 million funding round for this ticket-technology startup in October. Tiqets specializes in connecting customers to traditional excursions like museum and landmark tours, a business in which Airbnb is eager to expand.

SEEKING TO BREAK AN IPO LOSING STREAK

Silicon Valley investors hope that Airbnb will buck a recent trend in which disappointing public-market debuts by tech companies have outnumbered strong ones.

	UBER	LYFT	PINTEREST	SMILEDIRECTCLUB	PELOTON
MARKET VALUE AT FIRST-TRADE-DAY CLOSE	$69.7 B.	$22.4 B.	$12.9 B.	$6.4 B.	$7.2 B.
CURRENT MARKET VALUE	$51.3 B.	$14.3 B.	$10.2 B.	$3.0 B.	$8.8 B.
CHANGE FROM FIRST DAY OF CLOSE	–27.7%	–38.8%	–25.4%	–52.3%	+21.7%

SOURCE: BLOOMBERG; S&P GLOBAL
VALUES AS OF DEC. 16, 2019.

eventually find a winning formula by simply offering the activities à la carte. In 2017, the company rebranded Trips as Airbnb Experiences, under the leadership of Joe Zadeh, and relaunched. Two years later, there are about 40,000 Experiences in 1,000 cities and towns. Since June, the company has announced three categories: Adventures, Animals, and Cooking. Chesky says new categories will soon launch "on an almost monthly basis."

Experiences remains a small business, and there have been rumblings that it still isn't doing as well as hoped. Tech news site The Information reported that through the first three quarters of 2018, Experiences generated $15 million in revenue, a tiny fraction of Airbnb's sales. This fall the company confirmed reports that Zadeh would step down as head of Experiences once a successor is named (which hadn't happened at press time). But Airbnb characterized this as a lateral move, not a demotion, with Zadeh taking a broader strategic role. Zadeh tells *Fortune*, "We've gotten to a place where I think there are people that can take [Experiences] to the next level." And Airbnb says the product is making strides: It says Experiences bookings increased nearly sevenfold year-over-year in 2018.

If the glitches get ironed out, Experiences could give Airbnb a foothold in a huge market. The tours and activities industry—a category that includes activities as diverse as staid big-bus sightseeing tours, freehand rock-climbing classes, and songwriting seminars—will generate $183 billion in revenue in 2020, according to estimates by travel research firm Phocuswright. And as cultural shifts lead more people to prioritize experiences over material goods, hospitality brands want to be associated with more than pillow-top beds and heated pools.

Indeed, this isn't a new business, and Airbnb faces established competitors. Travel website TripAdvisor offers more than 250,000 "Experiences" listings; it brought in $125 million in revenue from experiences and dining in the second quarter of this year. Booking.com and Expedia are also players, and even big hotel chains are in the game. Hyatt, for example, specializes in health and wellness experiences through its "Find" brand. "Our guests tend to be higher-end customers [focusing] on their holistic well-being," says Hyatt CEO Mark Hoplamazian. "There are many meta-search sites that allow you to buy the double-decker open-air bus tour. For us, that's not really providing extra value."

Beyond these players, though, remains a fragmented ecosystem of tour and activities providers—most of which have little digital presence. "One of the key features of the experiences marketplace is that about 80% of it is offline still," says Dermot Halpin, TripAdvisor's president of experiences and vacation rentals.

Reaching that untapped reservoir is a big opportunity for a company with Airbnb's size, name recognition, and tech savvy. In October, Airbnb led a funding round, worth $60 million, to invest in Tiqets, a ticket-technology startup that focuses on mainstream attractions, such as museums and landmark tours. The investment signals Airbnb's willingness to get involved with the standard tourist activities it used to shun, the better to become a full-service travel company. Chesky says Airbnb is developing an Experiences category based around "landmarks with a twist." For example, he says: "What if there was a different way to see the Louvre, with an art history professor? And what if it's at night now, without all the lines?"

> "IF THERE'S A [SAFETY] STANDARD WE CAN STAND BEHIND IN A DEEPER WAY THAN BEFORE, THEN I THINK MORE PEOPLE WILL USE AIRBNB."
> —BRIAN CHESKY, CEO AND COFOUNDER

MANY AIRBNB Experiences, like many Airbnb rentals, are operated by enthusiastic semi-amateurs. On an unseasonably hot fall afternoon, I joined one of them on one of the more popular offerings: Hidden Stairways of San Francisco.

"The best part about these stairs is that nobody really knows they're here," host Greg McQuaid told my group of four. Each of us had paid $34 to join him. Perhaps the heat had kept others away, but four people on an Experience is in line with Airbnb's usual maximum of 10 guests, designed to foster intimacy. The staircase we were standing at the base of, in the Golden Gate Heights neighborhood, was covered by a colorful tile mosaic of sparkly flowers and fauna. Our guide offered to take each of our photos, and then we ascended to panoramic views of the city.

Some hosts have found that Experiences can be quite lucrative. Tia Clark runs Let's Go Crabbing in Charleston, S.C., an excursion that lets users catch their own crustaceans by casting nets from a dock. She says she was able to quit her job as a bartender to operate her Experience full-time. Clark charges $75 per person, and if she books all 10 slots, she can pull in roughly $600 from every two-and-a-half-hour trip. (Airbnb takes a 20% cut of hosts' earnings.) McQuaid, who used to work as a radio producer, also runs his walking tour as a full-time gig, though he says money can be tight at times; he says he likes Experiences because "people can make money out of their passions."

Chesky has said that Experiences could emerge as a less fraught business than its core homes offering, one less likely to spark conflicts with local governments. But after its Halloween from hell, Airbnb isn't taking anything for granted. As part of its sweeping overhaul, the company says it will verify 100% of Experiences.

Details on what that will entail remain unclear. Airbnb already requires aspiring Experience hosts to apply for acceptance by completing 24 online prompts that involve questions about themselves and their work. Specialized activities, such as operating certain vehicles, already require proof of licenses, permits, and certifications, and other "heightened review," Airbnb says. Now it's expanding that classification to include outdoor activities near bodies of water, high-altitude hiking, and backcountry skiing, to name a few examples. The company uses a third-party vendor to verify licenses. Most Experience hosts and guests are insured for up to $1 million under an Airbnb liability policy.

The importance of such precautions was illustrated this autumn by a tragedy in Puerto Rico. A young couple from the mainland U.S. were killed by a flash flood on Oct. 11 during an Experience

BOOKING HIS NEXT TRIP Joe Zadeh, who helped rebuild the Experiences group after its early struggles, is leaving it to take a broader strategic role at Airbnb.

hike in El Yunque National Forest. Airbnb's connection to the deaths was first reported in late October; the fatalities were believed to be the first involving an Airbnb Experience. While no evidence has emerged of negligence in the incident, it underscores the legal and regulatory responsibilities to which Airbnb's expansion exposes it. "Our hearts break for those who have been impacted by this tragic accident, and we have offered our full support" to the families, Airbnb said in a statement. It declined to answer questions about the host's vetting or licensing.

IT WAS 11 YEARS ago that Chesky and cofounders Joe Gebbia and Nathan Blecharczyk first launched Airbedandbreakfast.com. Since then, the platform has facilitated more than 500 million "guest arrivals," earning hosts more than $80 billion. With guests now checking in at a rate of six per second, homes remain by far Airbnb's biggest business and the one where fixes matter most.

Airbnb says in the 12-month span that ended July 31, 0.05% of its trips had a safety-related issue reported by a host or guest. That's a tiny share—but given that estimates peg Airbnb as hosting at least 80 million guest arrivals a year, that share represents at least 40,000 that reported safety problems. If you widen the definition of a "problem stay" to include issues like fake or misleading listings and last-second cancellations, the percentage likely rises much higher.

Chesky says addressing these issues is Airbnb's "No. 1 priority." He's quick to point to steps the company had already taken, but he acknowledges, "A lot of these things, they needed more meat behind the bones... much more investment, much more training." Until now, for example, the site has sometimes run background checks on hosts and guests. But they are limited to U.S.-based

▲ PHOTOGRAPH BY **WINNI WINTERMEYER**

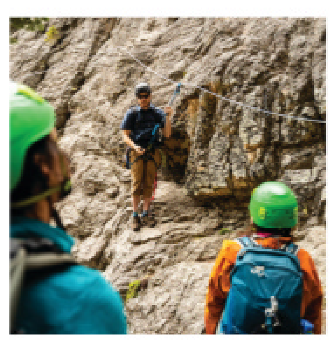
users. And Airbnb often doesn't have enough data to run such checks.

Some of Airbnb's new rules went into effect in mid-December. The looming challenge is "100% verification" of hosts and listings, which the company aims to achieve by the end of 2020. That will entail the review of photos, addresses, cleanliness, basic amenities, and above all the identity of hosts. Airbnb says it will do this using human review, technology, and "community feedback"—with the latter point suggesting that complaints from guests will get more attention. It will sometimes be impossible to completely verify information—particularly when a brand-new host lists a property for the first time. In that case, Chesky says, the company will explicitly tell guests what it doesn't know—flagging that it's a new listing, without enough data.

Other changes address "bad tenant" problems. Airbnb already operates neighbor hotlines for complaints in some cities: They will soon be worldwide, available 24/7 and staffed by real people rather than automated. The hotlines are now live in the U.S. and "will roll out globally" in 2020, Airbnb says. A new party policy will explicitly bar open-invite parties and events, as well as any large parties and

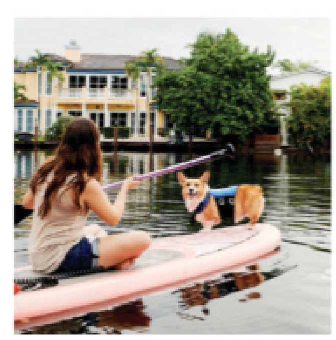
MUCH ADO ABOUT DOING

Airbnb has made "Experiences"—activities and excursions organized by hosts—a major focus ahead of its IPO. In 2019, it rolled out these three categories:



ADVENTURES

These are multiday trips, often with an outdoors element, that include meals, activities, and accommodations; Airbnb's earlier Trips business fit this model. Examples include an "Epic motorbike trip through Vietnam" (four days, $379/person) and a "Malibu Beginner Surf Camping Retreat" (two days, $349/person). Adventures made their debut in June.



ANIMALS

These tours and activities involve interacting with or observing critters. They're operated under safety guidelines developed with the nonprofit World Animal Protection. Examples include "Groom and walk miniature ponies" (1.5 hours, $61/person)or "Learn to Track Wild Otters in Cape Point" (2.5 hours, $59/person). It launched in October.

COOKING

The newest category (it was launched in November) focuses on culinary activities involving guest participation and local recipes. Examples: "Soba noodle making in a traditional home" (two hours, $23/person); "Make Traditional Vermont Maple Syrup" (one hour, $25/person). Guests get access to an archive of 3,000 recipes from 75-plus countries.

COURTESY OF AIRBNB (3)

events in multifamily residences. (Airbnb announced the party policy Dec. 5, only to see the news collide with bad publicity the next day, when 55 shots were fired and one person injured at a house party in Portland, Ore.)

Another significant change is the guest guarantee. It offers either booking in an equal-or-greater-value listing or a 100% refund in the event that a listing is subpar. That will include situations in which a host cancels a reservation within 24 hours of check-in, or switches guests to another listing without their consent. It also applies when a rental seems structurally unsafe or unclean or needs heavy repairs, Airbnb says.

Do the changes go far enough? Critics of the company say it's too early to tell. Rep. Bonnie Watson Coleman (D-N.J.) led a group of House Democrats who wrote to Chesky after his November announcement to ask for more specifics. She calls the plans a step in the right direction but says she plans to keep a watchful eye on Airbnb's progress.

Other observers see the changes as useful but late. Matthew Kepnes, a travel writer who runs the blog Nomadic Matt, points to past instances when Airbnb shut down problem rentals only after they drew media attention. "They're very reactive, and I think they're trying to become more proactive as they go public," says Kepnes. "If they weren't going public so soon, I'm not sure they would have taken these measures so quickly. What good is a public company that can't operate in countries and cities around the world?"

ALONG THE corridors at Airbnb's headquarters, colorful posters depicting Experiences line the walls. There's Pauline's Fromage French (cheese), Kevin's Tokyo Joe (coffee), Lofti's Let's Longboard (skateboarding). Photo portraits of hosts hang next to the posters, along with museum-like description panels. "I always had a passion for hospitality," reads a quote from Pablo, from Salamanca, Spain.

Policing all these far-flung hosts will carry a price tag that could eat into future profits. Chesky says the new safety commitment will require an investment of $150 million over the next year—a figure that doesn't include any revenue impact from lost listings. But he's adamant that it won't dent long-term growth. "[If] there's a standard we can stand behind in a deeper way than before, I think more people will use Airbnb," he says.

Chesky frames tighter safety rules as a way to enable Airbnb to push ahead—with safety and governance as well as growth in mind—by doubling down on its hosts. Verification, he asserts, will enable Airbnb to "make sure there's a host's spirit to the listing, that it's actually people-powered." It'll be less about standardization than about relying on its hosts to mature with the company: "The hard work is trying to mobilize millions of people and level up their game."

Back on Oct. 23, before trouble erupted, I had asked Chesky what it felt like to sit atop a company that was large enough to affect that many people's lives. "You know how every day you stand in front of the mirror, brush your teeth, and don't really feel like you look any different?" he replied. "And then somebody shows you an old picture, and you're like, 'Wow, I've really changed.' "

So has Airbnb. And to endure, it will have to keep changing.


Express Box

stand and deliver

UPS's $20 billion bet on e-commerce is already starting to pay off. Can a fleet of drones and a seven-day-a-week delivery strategy help "Brown" and CEO David Abney stay ahead of Amazon?

BY **AARON PRESSMAN**

EVERYONE KNOWS THE UPS delivery service, with its ubiquitous brown trucks that ramble through every neighborhood in America. But to really understand what makes UPS tick, you must check out the massive facility in western Atlanta known as the UPS Southeast Metro Automated Routing Terminal (or SMART).

This whirling dervish comprises 18 miles of conveyor belts, moving at 600 feet per minute on three levels inside a single sprawling building the size of 19 football fields. To an outsider it looks like the kind of thing cartoonist Rube Goldberg would have dreamed up as a machine to, say, fold the world's largest napkin.

But unlike Goldberg's deliberately nonsensical and wasteful contraptions, the year-old super terminal is super-efficient, one of the crown jewels in UPS's global logistics and shipping empire. It's just one of six similar highly automated, gigantic, spanking new UPS package-sorting centers spread across the U.S. It's also one of the reasons the

PARCEL PUSHER
Abney in the lobby of UPS's Atlanta headquarters. Under his leadership, UPS has launched delivery by electric bike (shown here) and drone.

▲ PHOTOGRAPH BY **MELISSA GOLDEN**

company stands more than a fighting chance in its uneasy rivalry with Amazon, the e-commerce giant that is UPS's biggest customer but is increasingly expanding into logistics and delivery work too.

Every day, hundreds of tractor-trailer trucks from UPS and big customers like Walmart, Target, and, yes, Amazon trundle into the Bankhead neighborhood and pull up at one of the hub's 104 unloading bays. UPS workers quickly roll up each truck's back door and unload the contents onto an intake conveyor belt. That belt cleverly extrudes deeper into the truck as the "UPSers" empty the contents, shortening the distance that the worker needs to carry packages.

But it's not until the package exits the truck that the technology gets truly mind-blowing. It sounds impossible to believe, but the average box spends only seven minutes inside the terminal, a building that's so large, I can barely see from one end to the other. UPS doesn't usually allow outsiders into the center during its busy season—from Black Friday through Christmas—but made an exception for *Fortune* the day after Cyber Monday.

Each intake belt zips boxes of almost every size and shape up away from the trucks to larger consolidating belt lines, which in turn move them toward the center of the building. (Really big packages, like your 80-inch LCD screen TV, are known as "irregs" and get shunted off to a special area.) Once consolidated, each wave of boxes approaches one of the brains of the operation: the scanner tunnels.

Approaching one of the tunnels isn't for the faint of heart. Clambering three stories up on the slatted metal catwalks has already put me on edge. The noise from the whirring belts drowns out any conversation below the volume of a yell. And when I get up close to the belt, I involuntarily jump back—the speed of the packages pouring down the line triggers a reflexive, defensive reaction in my brain. Despite the hundreds of UPSers on the job at the facility, our four-person tour group seems to be far from the nearest help if something goes wrong.

Taking a deep breath and focusing on the task at hand, I can see that the stream of packages offers evidence to back up a boast that UPS CEO David Abney made to me earlier that day. The company delivers for nine of the 10 largest U.S. retailers by revenue, Abney says, not to mention much of the rest of the industry. Sure enough, the boxes streaming past show a grab bag of logos of every company I can think of that sells online, from Amazon's smile to Wayfair's box cross to Target's bull's-eye. (Plus some I've never heard of—Etrailer.com?)

The scanning tunnel, it turns out, isn't really a tunnel: It's a metal frame the size of a small SUV. The frame holds six high-speed cameras, made by Italian automation specialist Datalogic, that perch over, next to, and underneath

the line. Via a small gap in the conveyor belt and a system of carefully placed bright red lights and mirrors, the cameras snap pictures in a fraction of a second of all six sides of every box, without slowing their flow. An image-processing system instantly decodes the destination information inscribed on each box's label and decides which of more than 300 exit bays in the facility has the correct departing truck to take the box on the next part of its journey, whether to a nearby home or business, or to another city, state, or country.

As packages zip out of the scanner, each is joined by a shadow companion moving at the same speed along the side of the conveyor. They take the form of little black rectangles—UPS calls them "shoes," and they're about that size. Each package gets accompanied by a pair, or a bunch, depending on its size and weight. These are some smart shoes, though: They whiz down the line, escorting a box, and then, just when the

inside the super-sorter

Inside UPS's routing terminal in Atlanta, a scanning tunnel (left) confirms each package's destination; an elaborate system of "shoes" (top right) then guides it to the right truck, with human backup in the control room (above). The average package spends just seven minutes in the terminal before hitting the road.

COURTESY OF UPS (3)

box is passing its correct "off-ramp," the exit chute to a smaller belt that will take it to the appropriate departing truck, they pop out and push the box down that chute. The shove happens so fast, you can miss it if you blink. The boxes seem to fly about by magic—Harry Potter minus the wand. Soon the box is on a new truck and off to a customer—wrapping up a ritual that takes place hundreds of thousands of times a day.

THE ATLANTA FACILITY, which cost about $400 million and employs some 3,000 locals across three shifts per day, is a far cry from what Abney experienced when he started at UPS back in 1974. His first job involved memorizing zip code locations and moving boxes around the old-fashioned, manual way as a part-time loader at a sorting facility in Mississippi. The SMART building's system, he says, is 30% to 35% more efficient than the old way in terms of package handling productivity, having replaced the need for human sorters for all but the largest boxes.

Those factors make the super-sorter a crucial element of Abney's bold $20 billion, three-year transformation plan—a bid to make sure 112-year-old UPS is around for the next 112 years. The company has been the world's largest and most profitable commercial delivery service for decades, but it faces ever-hotter competition to deliver packages faster, cheaper, and more often—thanks in large part to the unstoppable growth of e-commerce. FedEx and DHL are also battling for package hauling supremacy. Even the dowdy U.S. Postal Service is expanding its weekend deliveries and horning in on the private companies' turf.

And then there's Amazon, which has already declared that it plans to become a global power in shipping and logistics. It's currently UPS's largest customer. Oppenheimer analyst Scott Schneeberger estimates Amazon accounts for almost 10% of UPS's revenue. (UPS itself doesn't break out such numbers.) But the e-commerce heavyweight is shipping a fast-growing share of its own deliveries through its Amazon Logistics unit, and it's widely seen as only a matter of time before it not only withdraws its own business from its delivery rivals but also begins poaching other retailers from them. At the same time, some of UPS's historically best customers, department stores and retail chains, are shrinking or dying—thanks again, in part, to e-commerce.

It's a fast-changing, treacherous landscape—and one in which UPS was stumbling when Abney was chosen as CEO, in 2014. During the prior year's holidays, the company made the worst kind of headlines when it failed to provide the shipping capacity it had promised retailers. The upshot: Millions of people had to open their Christmas presents in January. Subsequent years exposed deeper problems. As consumers started ordering more items online, UPS was making a growing share of deliveries to homes, where it dropped off an average of just one package per stop, and relatively fewer to businesses, which typically take more than three per stop. The changing mix—more stops, slower throughput—was crushing UPS's profitability even as delivery orders to retail chains dwindled. "They had fallen behind," says Schneeberger. "They should have seen the writing on the wall with e-commerce." When UPS reported weak fourth-quarter results for the end of 2016, its stock dropped 10% in a day.

It took visits with the heads of all of the big retailers for the real lessons to sink in with Abney. The world was moving to e-commerce, with consumers expecting rapid delivery of their purchases seven days a week. Amazon had lit a fire under those big retailers, and as they moved to respond, UPS had to evolve too. "Going in, I thought I had a pretty good picture of what UPS needed to look like in the future," he recalls. "Coming out, I had a lot more input."

The plan he and his team eventually formulated—and announced in mid-2018—required changing or even abandoning some of UPS's cherished strategies. Abney describes it as shifting from a mindset of "constructive dissatisfaction," which meant making incremental changes to fix existing programs, to one of "continuous transformation," which emphasizes reconsidering all of the company's programs regularly. In practice, going to seven-day home delivery required a more flexible—and less expensive—delivery fleet. Investing in new technologies like automation, robotics, and drones required finding other cost savings. And truly understanding customers' needs meant the company's senior leadership ranks needed to include more people with outside expertise, an unheard-of change to a culture that had long relied on developing talent from within (Abney himself included, of course).

Today, Abney is presiding over an incipient turnaround. Revenue, which was nearly flat in his first few years, is expected to top $74 billion for 2019, up 20% since the end of 2016. More important, analysts expect earnings before interest and taxes to jump 10% this year and that much again each of the next two years. UPS's stock, which had been on a wild ride for several years, is up 21% in 2019, crushing rival FedEx.

Admitting that UPS "stubbed its toes" at first with online shopping, Abney explains, "We invested wholeheartedly in e-commerce and now ... we've got competitors trying to catch up."

"The scope of the changes is quite transformative to the pace at which UPS has historically operated," says analyst Ben Hartford, who follows the industry at Baird. "It's still early, and they still have work to do. But we've seen enough evidence that it's beginning to work."

THE COMPANY KNOWN as "Brown" may have a steady, venerable veneer, but UPS has transformed itself multiple times in the past. It started in 1907 as the American Messenger Company, founded with borrowed money by two teenagers, James Casey and

medical airlift

In Raleigh, N.C., UPS uses drones to ferry blood and urine samples across the WakeMed hospital complex. Health care providers, which need fast delivery, have emerged as an ideal test case for commercial drone use.

COURTESY OF UPS (2)

Claude Ryan, who delivered notes, packages, and even hot meals, mostly on foot or by bicycle, across the city of Seattle. The company slowly spread down the West Coast, changing its name to United Parcel Service in 1925. It reached the East Coast by 1930 and started regular air cargo service in 1953, via UPS Blue Label Air.

Abney has been with the company for 45 years, or 40% of its long existence. His first job helped him pay for college at Mississippi's Delta State University. Moving up through the ranks, Abney went from Tennessee to New Jersey and Utah. He headed UPS's air delivery service, then ran the international unit starting in 2003, overseeing major acquisitions that sped its growth in overseas markets, including China. Starting in 2007 and for all six years of predecessor Scott Davis's tenure as CEO, Abney was the chief operating officer.

Abney's rise has been fueled by both an encyclopedic grasp of global trends and a down-home humility and ability to connect, says Jeff Rosensweig, a professor at Emory University's Goizueta Business School who has known the CEO for decades. "David is the only person I know, in any profession, who can say something useful about most of the world's 220 nations," Rosensweig explains. And "he's equally comfortable sitting down with the associates who load and deliver packages as he is with the leaders of major nations."

Walk into Abney's fourth-floor office at UPS headquarters in Sandy Springs, Ga., near Atlanta, and you'll see how seriously he values the task of both sustaining and overhauling his company's culture. On the wall opposite his desk is a huge framed poster that looms over his conference table section. It looks a bit like something out of children's author Richard Scarry's book *Busy, Busy World*. A closer look shows scores of cartoon-like figures performing all kinds of tasks that UPS workers and its customers engage in every day, amid text blocks explaining UPS values, strategies, and business segments. In one vignette, workers and customers are using new apps and tools to route packages; in another, delivery trucks are filling up with compressed natural gas for fuel instead of gasoline.

It's a busy, busy chart, a little hard to take in all at once. But the big idea is to emphasize the critical pieces in the transformation agenda. The chart combines elements of old and new UPS and maps out the way forward, Abney says. He has had versions distributed to UPS offices around the world. Look even more closely, and you'll find Abney's fingerprints all over the glass display because he likes to jab at specific images that back points he's trying to make during meetings. Still, the chart is over three years old (it predates Abney's $20 billion plan), and it's ready for an update. "In transformation, anything more than about three months old can start to get dated," Abney says.

For help implementing his wall art, Abney turned to Walmart. One of Abney's biggest and most controversial changes has been to add outsiders to the company's 12-person

airing their differences

In a delivery industry made feverishly competitive by e-commerce, drones could help the top players deliver more packages more efficiently. Here's how they stack up in the air race.

FedEx

EMPLOYEES: 448,000*

REVENUE LAST FISCAL YEAR: $69.7 billion

AVERAGE DAILY DELIVERIES: 15.16 million/day**

VEHICLES: 188,000

AIRCRAFT: 681#

DRONES: FedEx has partnered with Google's Wing unit to test delivery service from Walgreens pharmacies. Wing won permission to launch from the FAA—a so-called Part 135 exemption—in April. FedEx made its first drone deliveries in Christiansburg, Va., in October. The Wing craft can carry up to three pounds, with a range of six miles.

UPS

EMPLOYEES: 481,000

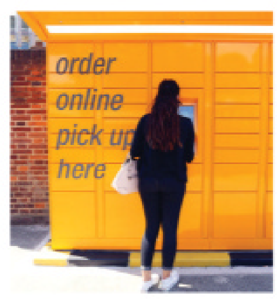
REVENUE LAST FISCAL YEAR: $71.9 billion

AVERAGE DAILY DELIVERIES: 20.7 million/day

VEHICLES: 123,000

AIRCRAFT: 564#

DRONES: UPS was the first company to win the most wide-ranging version of a Part 135 exemption. UPS is working with startup Matternet to test delivery from doctors' offices to hospitals in Raleigh, N.C. It's also testing deliveries from CVS stores to customers' homes. The Matternet M2 drone can carry 4.4 pounds and travel 12 miles.



Amazon

EMPLOYEES: 647,500

REVENUE LAST FISCAL YEAR: $232.9 billion

AVERAGE DAILY DELIVERIES: N.A.

VEHICLES: 40,000

AIRCRAFT: 47

DRONES: Amazon is working on its own drone projects, designing aircraft and software. It does not yet have a Part 135 exemption, but the FAA says seven applications are pending, and Amazon's is widely believed to be one of them. Its Prime Air drones, unveiled in June, can carry five pounds with a range of 15 miles.

*INCLUDES ALL FEDEX DELIVERY UNITS ** INCLUDES FEDEX EXPRESS, FEDEX GROUND
INCLUDES OWNED AND LEASED AIRCRAFT

FEDEX: ROBERT ALEXANDER/GETTY IMAGES; UPS: COURTESY OF UPS; AMAZON: CHRIS RATCLIFFE—BLOOMBERG VIA GETTY IMAGES senior leadership team. His first major outside hire: Scott Price, who joined UPS from Walmart two years ago as its first ever "chief strategy and transformation officer." Price has become the point person on overhauling UPS's processes and structure. He had a similar role at the world's largest retailer, where his title was executive vice president of global leverage, but he also knows the shipping world, having previously run DHL's Asia-Pacific unit.

Price's initial brief from Abney was to find places where UPS could save money, so that it could invest more behind a few big bets. The bets Abney wanted to make were on home delivery for e-commerce, specialized health care deliveries, helping small and midsize businesses compete online, and expanding in the fastest-growing overseas markets. None of the bets were cheap, as Abney's $20 billion price tag made clear, but they have already been impactful.

One way to think about the evolution of UPS's business, Price explains, is to consider the basic unit of shipping that the company can keep track of in transit. For decades, the company focused on tracking industry-standard, semi-truck-size containers filled with goods. As logistics operations got more computerized, UPS could track smaller pallets of goods. Now, with scanning systems in place throughout the system like those in the Atlanta super-sorter, the unit of shipping is what Price

back to the bike

TOURISTS around the Pike Place Market in Seattle might be getting a sense of 20th-century déjà vu.

That's because UPS, which got its start in that city in 1907 delivering letters and parcels by bicycle, is back in town delivering by pedal power again. UPS's new bike has three wheels, a large cargo compartment in the rear, and an electric motor to assist the UPSer making the deliveries.

It's all part of a global trial, now in 30 cities. UPS hopes the bikes will reduce pollution and improve service in dense urban areas, while avoiding the traffic and (increasingly common) vehicle prohibitions that would slow UPS's standard brown vans. In some cities, UPS drives a big trailer as close as possible to overcrowded zones and then finishes the deliveries by foot or e-bike.

UPS transformation chief Scott Price got to pedal one of the e-bikes on a recent trip to London, but he didn't make any actual deliveries. "I wasn't allowed on the street" by the company, he recalls. "I wasn't in my Browns."

COURTESY OF UPS

calls "each's," or single items that can be uniquely tracked around the world inside UPS's highly automated network. "We're down to each one—your shaving cream to your front door," he says.

To customers, the each's system brings new flexibility too. Using UPS's mobile app, it's easy to delay a delivery or reroute it to a UPS store or other drop-off point. Behind the scenes, the network figures out where the package is in the system and redirects it, even contacting delivery drivers in real time if necessary. UPS has lately started incentivizing customers via a rewards program in the app to skip home delivery in favor of picking up at its stores (cheaper for the company).

An early riser who likes to get to the office by 6 a.m., Price is also responsible for UPS's venture capital investments in Silicon Valley, covering such arenas as drone startups, sustainability, and automation. The entrepreneurs there tend to sleep a little later, he's found. "You say, 'Let's meet at 8 o'clock,' and they look at you like you're from outer space," he says.

For a guy focused on the future, Price's office—right next-door to Abney's—is adorned with a striking assortment of older memorabilia, including an 1876 American flag and an 1826 copy of the Declaration of Independence, that reflects his fixation on American history.

Holding its own among the older items, however, is an important recent artifact: a single-page certificate from the FAA granting UPS permission to start its commercial drone program. It was the first such certificate that the agency awarded for wide-scale drone operations under its innovative Part 135 rule, and Price credits UPS's long reputation as a steady and reliable corporate citizen for winning the right to fly experimental drones in previously untested ways. "They were thoughtful about who they were going to award the first full airline opportunity," he says.

ONE OF THE projects where that opportunity is taking shape starts with a brown metal box sitting in a doctor's office in Raleigh, N.C. Decorated with only a small UPS logo, the toaster-size box hardly looks like the leading edge of a technological revolution. But whenever patients at the Raleigh Medical Park have samples of blood or urine taken for analysis, the tubes of fluid end up in plastic bags put into the box. Then, once an hour, eight times a day, Monday through Friday, a UPS employee grabs the box, walks outside, and attaches it to the underside of an unmanned aerial vehicle—known more commonly as a drone.

From a distance, this drone looks like the four-bladed quad copter models popular with amateur flying enthusiasts. But up close, it's bigger—a lot bigger. Called the M2 and made by California startup Matternet, the craft is nearly three feet across and powerful enough to carry cargo weighing up to 4.4 pounds. It also carries heavy batteries that can power long flights.

Once the box is locked in place, the drone zooms almost straight up to a 300-foot altitude, then flies itself to a landing pad half a mile away, across the campus of the WakeMed hospital complex, the central player in the health care network that includes the medical park. At the hospital, the drone zooms down, locking on an infrared signal on its landing pad. Once it's on the ground, another UPS worker grabs the box and walks it inside to the pathology lab where the fluids get tested.

It's a short journey, but it's already making money for UPS: The company says it's the first revenue-generating commercial drone delivery service in the country. Soon, UPS will take another big step by adding deliveries to WakeMed from a doctor's office more than 10 miles away. The idea is to capture a whole new market for UPS in the health care segment, where the big providers need fast, reliable delivery service and don't appear to be excessively price conscious. "We're going to expand this very quickly," Abney promises. (The CEO will leave the piloting to others, though, as he crashed his own drone into his swimming pool while trying to impress his grandkids.)

UPS's next, more ambitious drone program is part of a growing partnership with pharmacy and retail giant CVS. UPS has already done a trial delivering prescription items from a CVS in Cary, N.C., to consumers' homes, and it will expand the effort in 2020. (UPS also has a new deal to allow plain old non-drone package pickup and drop-off at CVS stores.) Other experiments, further from fruition, are exploring whether drones can perform some deliveries when launched from the top or back of a UPS truck during its daily route, shortening the distance the truck drives. The company thinks larger autonomous craft might also be able to move thousands of parcels at a time from its own warehouses to smaller distribution locations. That would require "probably like a Cessna, size-wise," Price says.

Still, drone delivery is in the early innings. Regulators haven't drawn up rules yet to govern most commercial services, and just how those rules come out—along with how quickly the technology improves—could determine whether UPS's experiments ever turn into real, profit-making businesses. "We don't believe we are going to be flying hundreds of thousands of drones delivering dog food and things that we deliver every day," Abney says.

"It needs to be profitable," Price agrees. That's why the opportunities around same-day delivery of more valuable goods—like medicines or blood samples—look "very compelling," he adds. "It could be like the first smartphone—no one could imagine the extent that it augments life now. The same thing will be said 10 years from now about drones."

N**OT ALL** the changes in UPS's transformation program involve high-tech solutions that get good press. To fund Abney's growth initiatives while keeping Wall Street happy, Price has focused on cost savings. A 2018 early retirement plan sent 2,000 of the most experienced UPS managers out the door, with savings from the departures projected at $200 million a year. That move involved a tiny fraction of UPS's nearly 500,000-person global workforce, but it included some of the most highly paid staff and disconcerted many who remained.

Even less popular: a five-year contract with UPS's unionized workers that created a new tier of workers who are lower paid and who could take weekend shifts as the company transitioned to making more deliveries on Saturdays and Sundays. A slim majority of unionized employees voted in October 2018 not to accept the contract, but under union rules, two-thirds would have had to vote "no" to reject the pact.

UPS's worker-friendly reputation has also been tested by the

COMPANY MAN
David Abney in uniform for one of his first UPS jobs, in Mississippi, in 1977.

UPS is known for its in-house nurturing of talent, but Abney has been willing to reach outside the ranks for key hires.

e-commerce battle and the longer hours it demands. Amazon and FedEx use lower-paid contractors for many home deliveries. Abney says that some UPSers told him that the company should just let big customers hire their own contractors for weekend deliveries. "My answer was, 'Hey, we're not gonna have to worry about Monday through Friday either if we don't transform to seven days a week,'" he says.

At a company known for its in-house nurturing of talent, Abney's willingness to hire outside the ranks no longer seems as jarring as it once did. One-third of UPS's 12-person senior management team is now made up of outsiders, including Price. "I don't know what that number might be five years from now," Abney says. But he emphasizes that he's an "avid supporter" of promoting from within and that he's supplementing, not replacing, the practice.

Despite the growing pains, UPS is maintaining its lead in the delivery wars—and Abney's moves may well help the company sustain it. Amazon is likely to remain more of an opportunity for UPS than a true threat, at least for the next few years. Dave Clark, Amazon's senior vice president of North America operations, is spearheading the delivery push, which he's said may take three to five more years to come to fruition. "It's a fun space to be in for the next few years," he told Amazon workers at a recent staff gathering, reported by Business Insider. But as of now, the Seattle juggernaut has a fleet of 20,000 trailers, an equal number of local delivery vans, and fewer than 50 planes; UPS has five or six times as many vans and owns five times as many planes.

What's more, Amazon's decisions to offer more next-day deliveries and to dump FedEx have benefited UPS financially while reinforcing Abney's transformation plan, says Hartford, the Baird analyst. He expects the mutually beneficial coexistence to persist for quite some time. "Amazon has given UPS the opportunity to make their network more flexible and profitable," he says.

As it turns out, working for Amazon may make UPS even better at competing with Amazon. Abney says UPS is taking what it learned from making Amazon's e-commerce deliveries more efficient and using those lessons to help all its other retail customers, especially smaller and midsize businesses. "The real key is to help them compete with Amazon," Abney says. "We would never sacrifice the ability to meet the needs of those customers based on any one customer. It's all about balance." F

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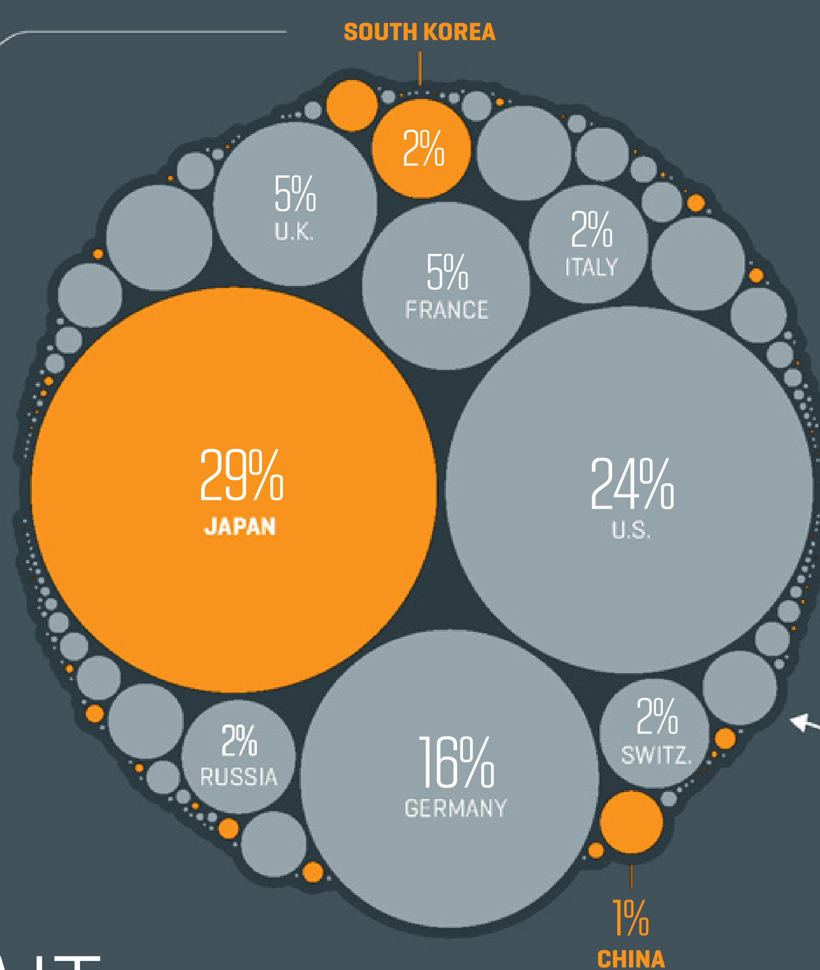

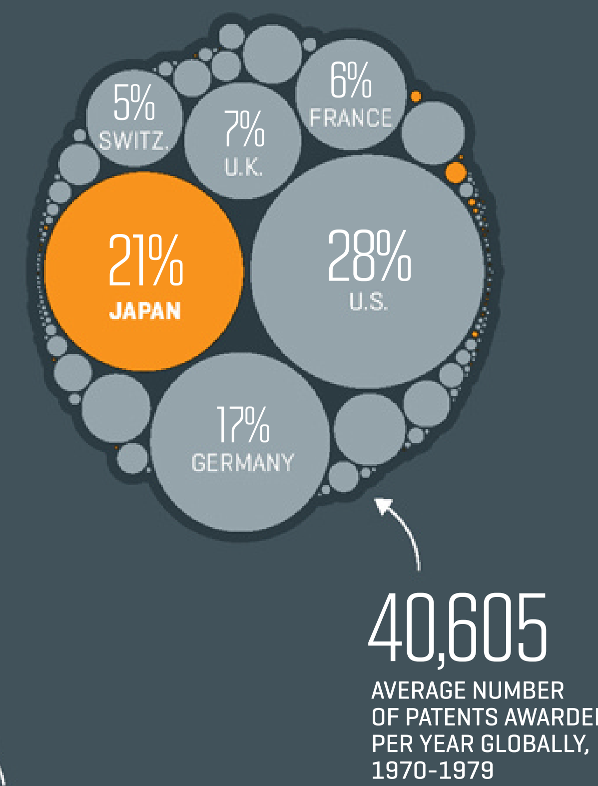

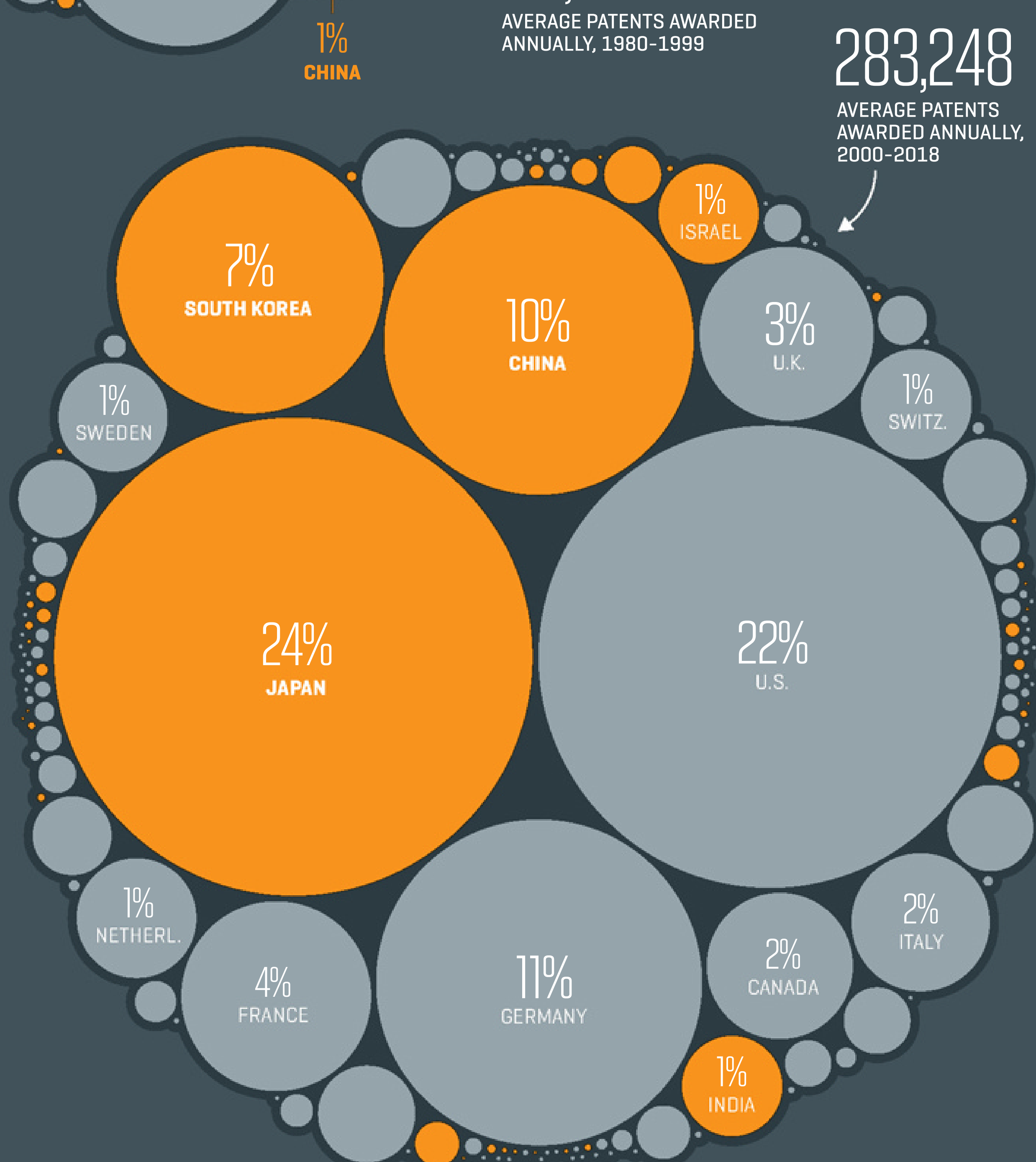

PATENT POWER TILTS TO ASIA

THE CENTER OF GRAVITY IN intellectual property is shifting east. Outside of Japan, the U.S. and Western Europe used to dominate the patent game. But since 2000, according to data from the World Intellectual Property Organization, the portion of patents granted for IP developed in Asian countries has soared—with China leading the way. While the most recent annual patent-approval figures aren't final, the trend is clear: From 2000 to 2015, the number of patents awarded in China jumped 10-fold, from 5,680 to 56,312. And in 2018, China's IP office received a record 1.54 million patent applications, or nearly half the global total. —BRIAN O'KEEFE

SOURCE: **WORLD INTELLECTUAL PROPERTY REPORT 2019, WIPO.**
DATA SHOWN ARE FOR INTERNATIONAL PATENT FAMILIES, WHICH REFER TO WHOLE SETS OF PATENTS COVERING THE SAME INVENTION IN ONE OR MORE COUNTRIES.

GRAPHIC BY **NICOLAS RAPP**


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