These Stocks Could Get the Next 'TRUMP BUMP'

FORTUNE

FEBRUARY 1, 2017

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HOW GOOGLE'S OWN DEEP DIVERSITY EFFORTS COULD CHANGE THE WAY YOU SEE THE WORLD

HUAWEI PHONES GAIN GROUND ON APPLE AND SAMSUNG

HOW FACEBOOK READS YOUR MIND—AND CATERS TO IT

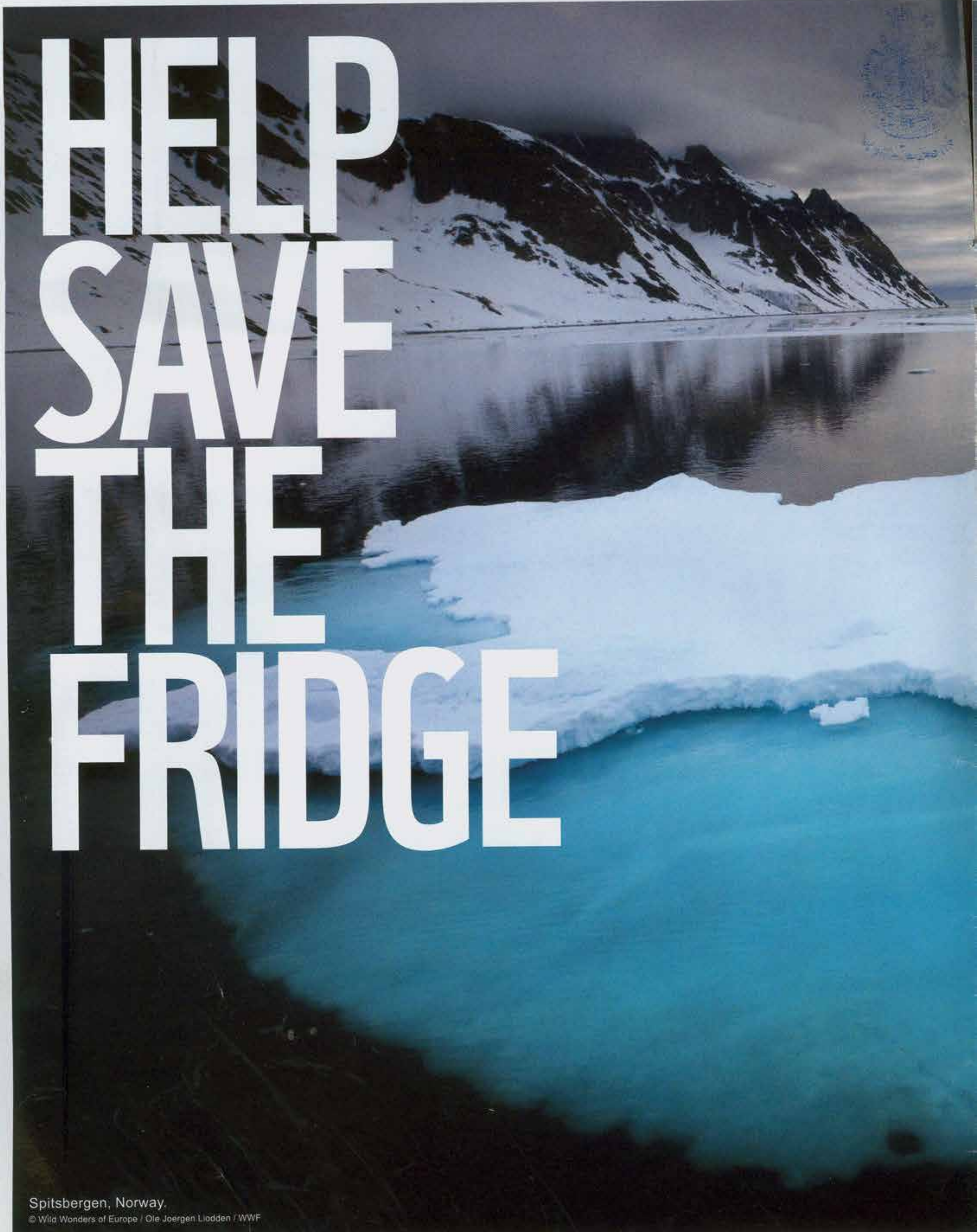
COULD SYNTHETIC DNA BE THE NEXT TECH BREAKTHROUGH?

THE ACCOUNTANT: PWC'S QUIET REVOLUTIONARY

BUY. SQUEEZE. REPEAT.

Kraft Heinz's recipe for global food domination.

ASIA PACIFIC EDITION NUMBER 2



Spitsbergen, Norway.

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The fridge needs help. Much of the energy we need to power it produces waste and changes the climate. The world has come to an agreement on how to tackle catastrophic climate change. Now we need to put that plan into action, shifting from fossil fuels to renewable energy. Your votes, your voice and your actions can help – stand with WWF to create a sustainable future. Let's look after our shared home together. **panda.org/togetherpossible**
WWF


Ad Council
I am very sensitive to lights and sounds
Jacob Sanchez
Diagnosed with autism
Sensory sensitivity is a sign of autism.
Learn the others at autismspeaks.org/signs.
AUTISM SPEAKS

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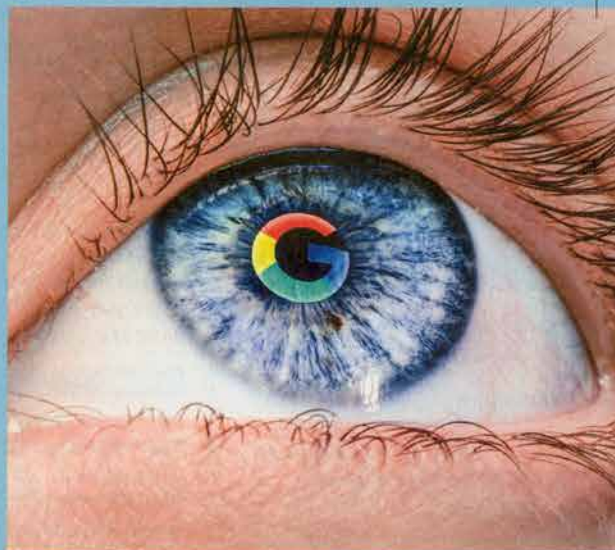

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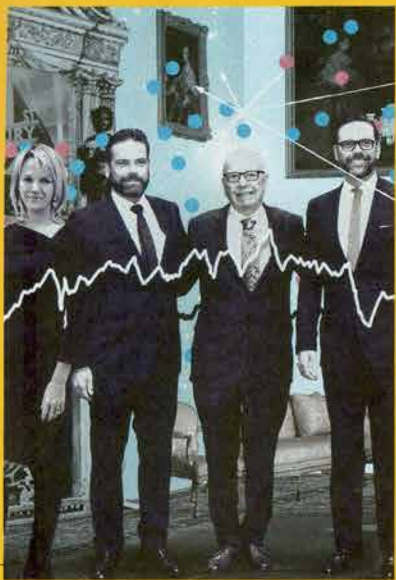

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Dow 20,000 is a momentous milestone, and thanks to a post-election rally, it's within reach. **Text by JEN WIECZNER; graphic by NICOLAS RAPP**

CORRECTION

"Payback Time" [Jan. 1] incorrectly stated that SAC Capital did not plead guilty to criminal charges. In fact, the hedge fund did plead guilty to criminal insider-trading charges.

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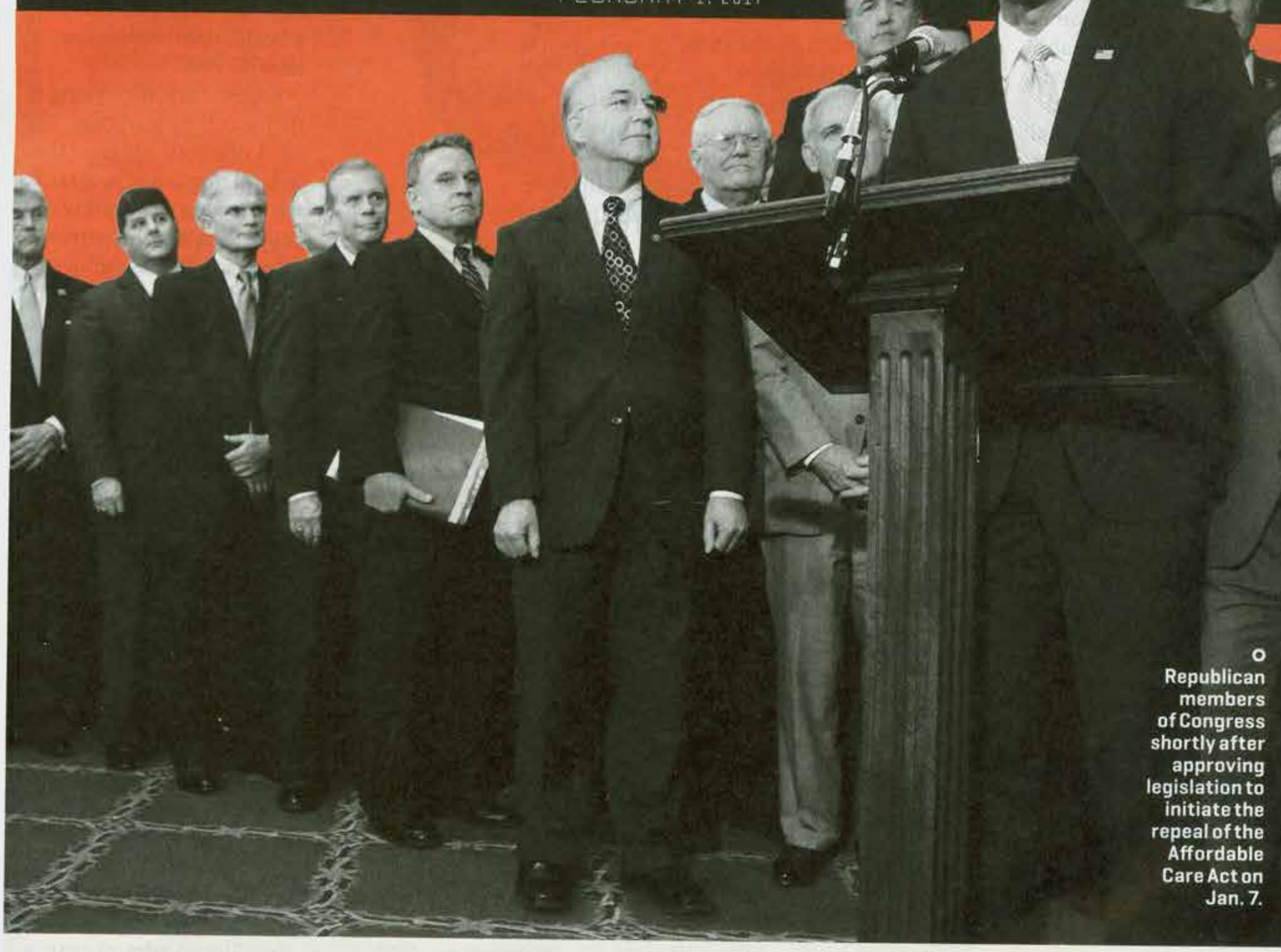


Republican members of Congress shortly after approving legislation to initiate the repeal of the Affordable Care Act on Jan. 7.

Repeal Is Easy. Replace? Not So Much

The GOP hasn't budged on its pledge to repeal and replace Obama's sweeping Affordable Care Act. But finding a workable solution won't be nearly as simple as it might sound.

BY TORY NEWMYER

OBAMACARE **REPUBLICAN** promises to rip up President Barack Obama's signature health care overhaul have formed the spine of their pitch to voters since the law's 2010 passage. Now, with unified control of Washington finally in hand, the GOP faces the daunting prospect of delivering. And it's already ▷▷

CHIP SOMODEVILLA—GETTY IMAGES

▷▷ finding out that replacing an intricate framework for one-sixth of the economy is easier said than done.

President Donald Trump has set the bar, pledging in his first post-election press conference "a health care that is far less expensive and far better"—and soon. Some congressional Republicans want to slow down the process to allow the party more time to forge consensus, a delay that seems likely. But even with an extension, the challenge remains maddeningly complex. Key Republicans in the administration and on the Hill have committed to ensuring that none of the estimated 20 million Americans who have gained coverage under the Affordable Care Act will lose their care. And policymakers on the right agree on the need to preserve some of the law's hallmark consumer protections, including the ban on denying coverage for those with preexisting conditions and the provision allowing young people to stay on their parents' insurance until they're 26. At the same time, the party is eager to scrap the least popular pieces of the law (think: the individual mandate) that help the private market cover the cost of the coverage expansions.

Can the GOP accomplish both? Not without significant tradeoffs, and Republicans are still working out how to make up the gap. It appears they will do so in part by allowing insurers to charge older people more while paring back plans for younger, healthier enrollees. And they could allow insurers to jack up premiums on sick people who don't maintain continuous coverage.

AS OBAMACARE REPEAL PROGRESSES, REPUBLICANS MAY FIND MARGINAL TWEAKS MORE PRACTICABLE THAN A WHOLESALE GUTTING.

Those who lose their coverage, fall ill, and then can't afford to buy into the individual market could be eligible for a "high-risk pool" designated for the neediest patients—a popular conservative idea before the health care overhaul. But those programs have historically gone underfunded. "There is definitely a need to understand how these pieces go together," says Sandra Hunt, a health care reform specialist with PwC.

GOPers are also eyeing major cuts to Medicaid. The ACA dramatically grew the federal insurance program for the poor, accounting for roughly half of the coverage expansion the law achieved. Most Republicans would like to see it transformed into a block-grant program to give states greater flexibility in administering the funds. They would also cap the growth in federal support, putting an increasing squeeze on states to come up with savings.

Finally, Republicans are likely to get stingier with the tax credits that the current law offers to help people afford insurance, though the details remain a point of contention within the party. Indeed, no element of the Republican replacement plan is fixed. "We're at the talking-point level right now," says Larry Levitt, a top health policy adviser in the Clinton administration now with the Kaiser Family Foundation. "We're at the beginning of the beginning of the debate." As it progresses, Republicans may find marginal tweaks more practicable than a wholesale gutting. That is, their best repeal-and-replace strategy may be simply to "don't" and say they did. ■

BY THE NUMBERS

SIX YEARS after its passage, the Affordable Care Act is showing that it's far from perfect. But replacing such a complex law on an accelerated schedule presents steep political and practical problems.

22%
The amount the average cost of health insurance under the Affordable Care Act is expected to rise in 2017, though for many that will be offset by higher subsidies. Rising premiums have driven popular discontent with the program.

18
Number of millions of Americans the Congressional Budget Office said could lose their health insurance in one year after major provisions of Obamacare are repealed and not replaced.

100
The number of days that House Speaker Paul Ryan has given for repealing and replacing the law, though most health care experts believe that's unrealistic: Too many questions about that elusive replacement remain.

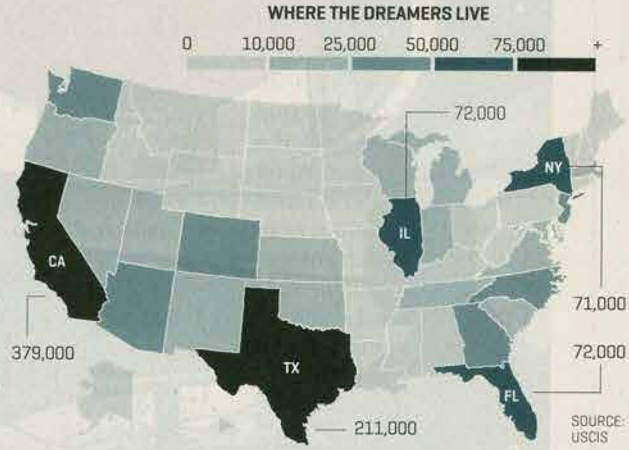
ANALYTICS

SEEING TRENDS IN THE DATA

IMMIGRATION

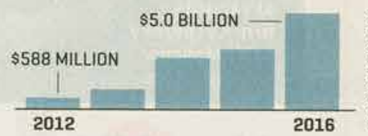
ARE "DREAMERS" WORTH BILLIONS TO STATES?

THE 750,000 immigrants granted work permits and temporary residency under the Deferred Action for Childhood Arrivals program may lose their legal status in the new administration—but there's a business case for keeping them here. The left-leaning Center for American Progress estimates repealing the act would cost $433 billion in growth over 10 years, including an annual $11 billion hit to California alone. —**ERIKA FRY**



ANNUAL ARTIFICIAL INTELLIGENCE DEALS

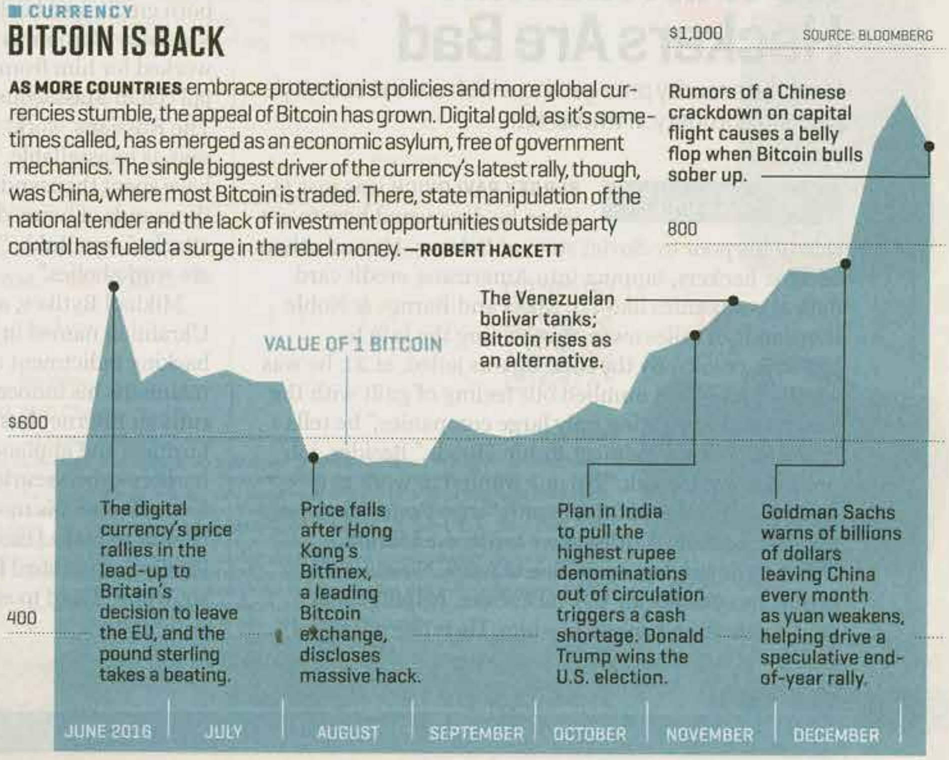
THE PACE of dealmaking and venture capital funding overall may have slowed in 2016, but artificial intelligence kept booming. Investors poured a record $5 billion into 658 deals in the space.



CURRENCY

BITCOIN IS BACK

AS MORE COUNTRIES embrace protectionist policies and more global currencies stumble, the appeal of Bitcoin has grown. Digital gold, as it's sometimes called, has emerged as an economic asylum, free of government mechanics. The single biggest driver of the currency's latest rally, though, was China, where most Bitcoin is traded. There, state manipulation of the national tender and the lack of investment opportunities outside party control has fueled a surge in the rebel money. —**ROBERT HACKETT**



SAFETY

U.S. WORKERS ARE SAFER, BUT NOT IN ALL JOBS

FOUR DECADES AGO, 14,000 U.S. workers were killed on the job each year. Now that number is closer to 5,000. One reason it isn't down even further: a construction rally.

FATAL WORKPLACE INJURIES IN THE U.S.

Construction workers hold some of the most dangerous jobs available (logging is still No. 1). Fatalities in the industry have been rising steadily as the industry climbs back toward its pre-recession peak.

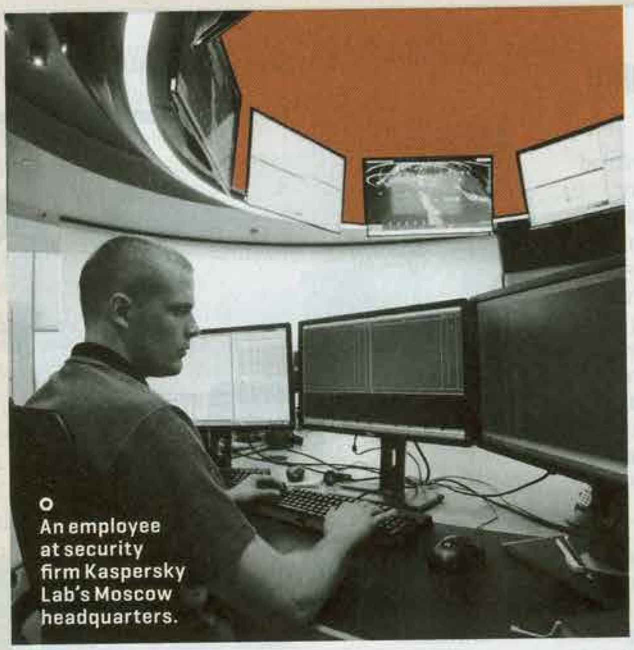
GROWTH IN FATALITIES

RETAIL

EXPECT MORE STORE CLOSURES IN 2017

THE YEAR got off to a grim start for brick-and-mortar retailers. Ailing giants Macy's and Sears announced 250 store closings between them in January, and mall staple the Limited shuttered its retail presence altogether. While traditional outlets downsize and younger chains opt for fewer stores, the square footage of retail space in the U.S. is dropping [see chart]. And it may fall further: The U.S. still has about 10% more shopping space than it needs, according to CoStar.
—**PHIL WAHBA**

SOURCES: CENSUS BUREAU; COSTAR PORTFOLIO STRATEGY



An employee at security firm Kaspersky Lab's Moscow headquarters.

Not All Russian Hackers Are Bad

Meet the security pros getting a lift from the country's hacking notoriety. BY VIVIENNE WALT

CYBERSECURITY

SERGEY PAVLOVICH was just 14 when he discovered how to get rich in his poor ex-Soviet state of Belarus. He and others became hackers, tapping into Americans' credit card data at companies like T.J. Maxx and Barnes & Noble thousands of miles away, then selling the info to big-time crooks. By the time he was jailed, at 21, he was a millionaire. "We numbed our feeling of guilt with the idea we were targeting only large companies," he tells *Fortune*. "We were almost Robin Hoods." Besides, job prospects were bleak. "No one wanted to work at a factory and make $200 a month," says Pavlovich, whose hacking memoir is titled *How to Steal a Million*.

But Pavlovich has a new line of work. Now out of prison, he consults for U.S. businesses, helping them secure data from hackers like him. He is one of several cybercrime experts from the former Soviet world in increasingly high demand, despite—or perhaps because of—the escapades of Russian hackers dominating the news cycle.

"Russian software engineers are among the best in the world," says Costin Raiu, director of global research and analysis at the Moscow cybersecurity firm Kaspersky Lab. "Russian cybercriminals tend to be very good in what they are doing."

In New York City, criminal lawyer Arkady Bukh has hired Pavlovich and other hackers to stress-test data for clients. Bukh says the Ukrainian-born credit card hacker Vladislav Horohorin has worked for him from his jail cell in Massachusetts. The Russians' work, Bukh says, is unassailable. "They have spent thousands and thousands of hours doing attacks," says Bukh. "These are workaholics."

Mikhail Rytikov, a Ukrainian named in a U.S. hacking indictment (he maintains his innocence), runs an Internet hosting business and applauds the hackers' cybersecurity efforts. He says his motto is, "Better to make [money] legally than to steal from someone." Hard to argue with that.

© ALEXANDER ZEMLIANICHENKO JR.—BLOOMBERG/GETTY IMAGES

The Hidden Figures of the Oscars Ad Blitz

BY TOM HUDDLESTON JR.

AWARDS

FEBRUARY is Oscars season in Hollywood. It's the time of year in Tinseltown when prestige dramas (and this year, a musical) shove big-budget action franchises out of the limelight.

Hollywood studios usually shell out millions of dollars promoting their films—not to moviegoers, but to Academy Award voters—in a crush of digital and print ads, screening parties, DVD shipments, and the occasional billboard.

Hollywood spends an estimated $100 million a year trying to win Oscars.

Studios typically stay mum on the subject of how much they spend to bolster their respective Oscar hopefuls. But Tom O'Neil, a Hollywood journalist and founder of awards website GoldDerby.com, cites the most common estimate, pegging the total at $100 million each year for the whole industry. With just over 7,000 Academy members, that's at least $14,000 per voter.

At stake is the coveted "Oscar bump": Oscar-nominated films tend to earn more money once they win a golden statue. That was the case last year, when *Spotlight* saw a 140% spike in domestic ticket sales a week after it was named Best Picture.

But that return on investment is far from assured. Says O'Neil: "Hollywood spends more than $100 million per year to win a statuette that costs only $1,000 to manufacture—that's proof that the whole town is crazy."

PAYCHECKS

HOW MUCH IS SECURITY WORTH?

The recent election hacking has raised questions about how safe Uncle Sam's computers really are. One point to notice: The government is being outgunned by the private sector when it comes to paying for top talent.
—JEFF JOHN ROBERTS

CHIEF INFORMATION SECURITY OFFICER PAY

FEDERAL CONSUMER PROTECTION AGENCY
$160,000

PRIVATE SECTOR NATIONWIDE
$204,000

PRIVATE SECTOR, WASHINGTON, D.C.
$225,000

SOURCES: SILVERBULL, USAJOBS

TECH

WAITING ON THE WEARABLE REVOLUTION

IN OCTOBER 2015, analysts predicted that a whopping 86.7 million people would be using wearables by 2019. So much for that. As athletic add-ons like Fitbit and the Apple Watch floundered, industry watchers slashed expectations for the genre. Instead of having 63.7 million users in 2016 as was predicted in 2015 (see chart), there were just 39.5 million. Projections of future growth were docked too.
—AARON PRESSMAN

OCT. 2015 SALES FORECAST FOR SMART WEARABLE DEVICE USERS

SOURCE: EMARKETER

ISTOCK/GETTY IMAGES

New York's new Second Avenue subway is the world's most expensive—and it's not even done.

The U.S. Is Getting a Really Bad Deal on Infrastructure

BY STEPHEN SMITH

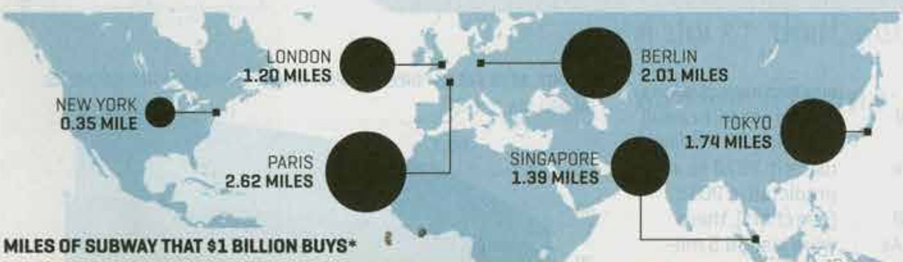
TRANSIT "**NEW YORK** is about building the tallest building and then coming back and building a taller building," Gov. Andrew Cuomo intoned in late December at one of several opening ceremonies for the long-awaited Second Avenue subway.

But New York City hasn't had the world's tallest building since 1974. What it does have: the world's most expensive subway. At a shocking $2.4 billion per mile, the Second Avenue line set a global cost record, besting one set a few years earlier for a $1.8-billion-per-mile rail extension on the city's West Side.

It's not just New York where infrastructure prices have lofted into the stratosphere. U.S. cities including San Francisco and Boston consistently spend vast sums on relatively little transit, while cities like Paris and Tokyo build subways in tougher conditions for a small fraction of our costs (see chart).

The precise reasons for the disparity are not well understood, but a good place to start is the iron triangle of rent-seeking contractors and consultants, fief-protecting transportation agencies, and unionized building trades—all with an interest in protecting the status quo and its attendant inefficiencies.

That's particularly worrisome as the U.S. gears up to spend big on infrastructure renewal—a rare point of agreement between Donald Trump and congressional Democrats. Unless U.S. cities can rein in their eye-popping costs, that money is more likely to fund special interests than speed your commute.



MILES OF SUBWAY THAT $1 BILLION BUYS*

SOURCE: DAVID SCHLEICHER, YALE LAW SCHOOL *ADJUSTED FOR RELATIVE PURCHASING POWER, 2014

POLITICS

FROM WALL STREET TO PENNSYLVANIA AVENUE

Donald Trump's economic top dogs have this much in common: success in the private sector, and not much time in the public one.

STEVEN MNUCHIN
POSITION: Treasury Secretary
* **GOVERNMENT EXPERIENCE:** 0 years
PRIVATE SECTOR WINDFALL: May have earned more than $200 million from the sale of bank OneWest, which he co-owned.

GARY COHN
POSITION: National Economic Council Director
GOVERNMENT EXPERIENCE: 0 years
PRIVATE SECTOR WINDFALL: Would likely have to sell more than $200 million in Goldman Sachs shares if appointed.

WILBUR ROSS
POSITION: Commerce Secretary
GOVERNMENT EXPERIENCE: 0 years
PRIVATE SECTOR WINDFALL: His net worth is estimated at $3 billion.

*Years spent working full-time in the public sector

SUBWAY: WANG YING—XINHUA/GETTY IMAGES; MNUCHIN: EDUARDO MUNOZ ALVAREZ—AFP/GETTY IMAGES; COHN: ALBIN LOHR-JONES—BLOOMBERG/GETTY IMAGES; ROSS: MIKE SEGAR—REUTERS

WHERE HAVE ALL THE PUBLIC COMPANIES GONE?

65% **Decline in the number of U.S. IPOs from a 2014 high of 363.** The flow of initial public offerings slowed considerably in 2016, hitting just 128—the lowest number since the financial crisis—with few signs of picking back up.

37% **Decline in the number of U.S.-listed companies since its 1997 high.** With more companies opting for private fundraising over the hassle of public markets [looking at you, Uber], the number of public companies has fallen to 5,734, about on par with the early '80s.

Why You Click on Those Cat Videos

The surprising lesson Facebook can teach publishers—and, really, any company—about how to give an audience what it wants. BY DEREK THOMPSON

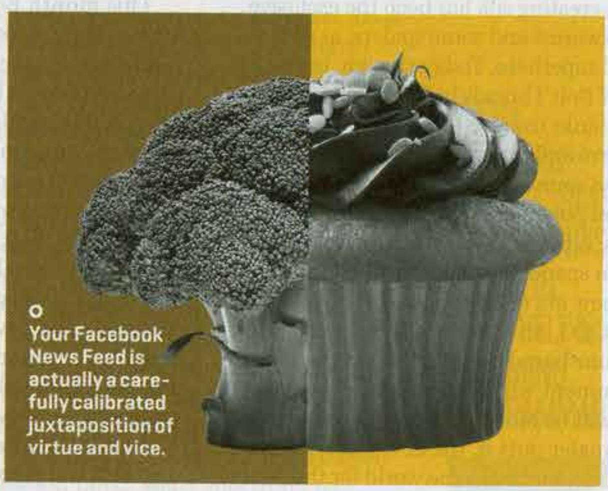
INSIGHT **FACEBOOK** terrifies news publishers—and for good reason. The company was eating the media's advertising pie even before the election's "fake news" fiasco. But publishers would benefit from studying the unappreciated subtlety of Menlo Park's audience philosophy.

Facebook's News Feed is an algorithmically organized stack of content, with the most relevant and meaningful stuff at the top. The social media giant has found that every user has two distinct taste profiles: what they like, and what they say they like. For example, many people tell Facebook in surveys that they like news stories, but then they almost exclusively click on baby photos and funny videos.

Customers' stated preferences are often lies. Their revealed preferences are often sordid. You might assume that the company maximizes clicks by appealing to these base tendencies. But, in fact, says Adam Mosseri, Facebook's vice president overseeing the News Feed, the company's strategy is more nuanced. Facebook, he says, is most popular when it serves both the aspirational self and the behavioral self with the same feed. Lots of wedding photos, yes, but also a smattering of current affairs.

The psychology of our media diets isn't so different from the psychology of our actual diets. In the early 2000s, McDonald's promoted salad on its menu but saw rejuvenated revenue growth from burgers and fries. In 2010, Duke University researchers studying the phenomenon called it "vicarious goal fulfillment": merely considering a salad granted license to indulge in grease.

The critical lesson: To understand what consumers want, you can't just ask them. Don't just watch them either. You need both consumer anthropology and consumer surveys to see their behaviors and their aspirations—who they are and who they wish they were.



Your Facebook News Feed is actually a carefully calibrated juxtaposition of virtue and vice.

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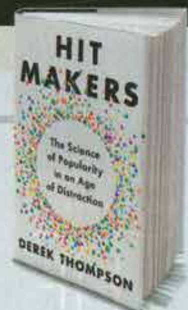


BUSINESSES THAT REALLY (REALLY) KNOW THEIR CUSTOMERS

Three industries that cleverly use customer psychology, from Derek Thompson's book *Hit Makers: The Science of Popularity in an Age of Distraction*, out in February.

1 **Gyms** in January sign up scores of idealistic members whose workout ambitions [and maintenance costs] tank by February.

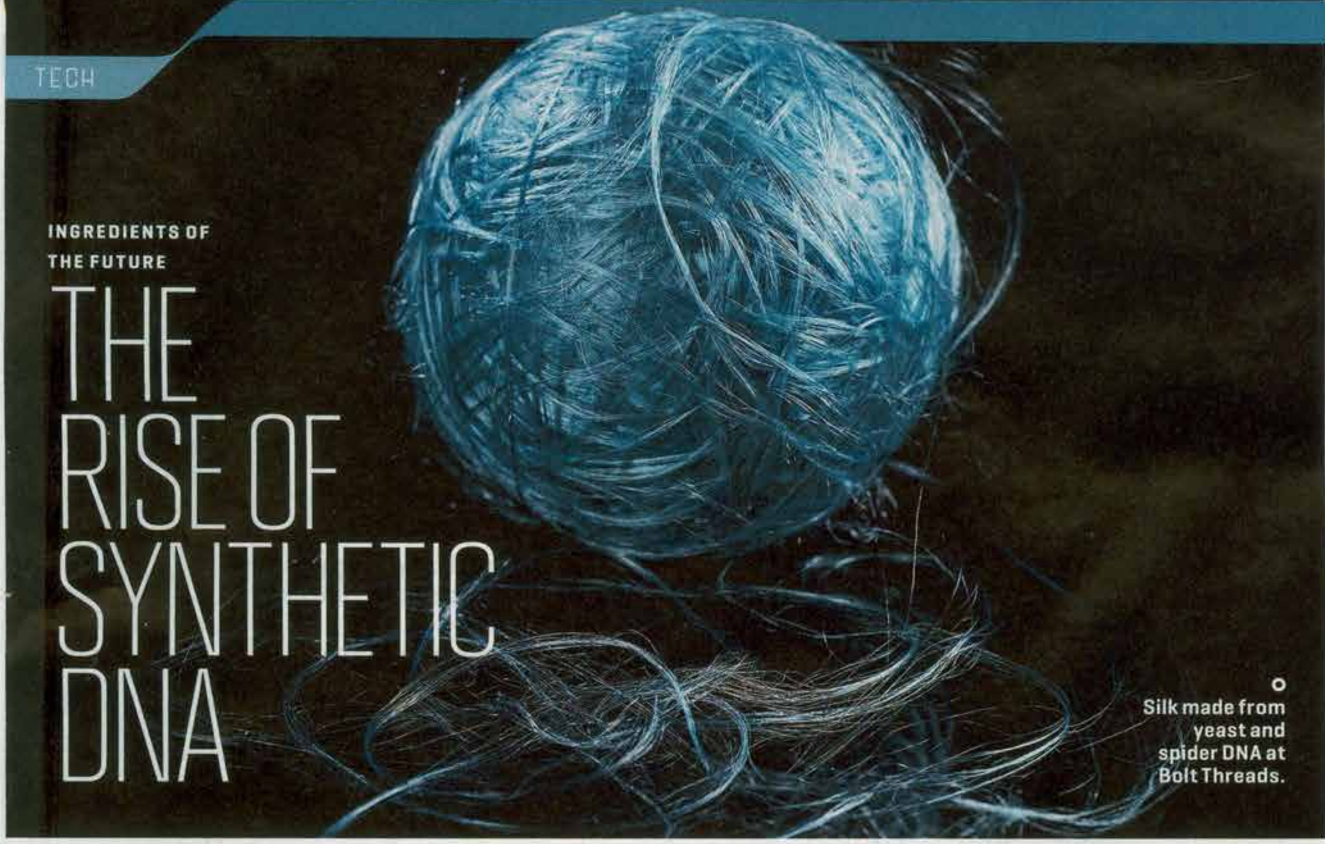
2 **Buzzfeed** and other sites know not only what readers click on, but also where they come from and how long they stay.

3 **Charities** try to sign up donors for automatically renewing gifts, knowing altruism often fades fast.

PRACTICAL EXPERTISE

FOCUS

TECH



INGREDIENTS OF THE FUTURE

THE RISE OF SYNTHETIC DNA

Silk made from yeast and spider DNA at Bolt Threads.

Will we soon be buying silk, wood, and more fabricated out of genetic code and scientific brilliance? Or will the nascent industry suffer the same fate that befell the companies that wanted to make biofuel out of algae?

BY JENNIFER ALSEVER

UNTIL RECENTLY, creating silk has been the exclusive domain of silkworms and some spiders, as well as the occasional superhero. Today, though, inside the laboratories of Bolt Threads in Emeryville, Calif., fermentation tanks use yeast, sugar—and some DNA code borrowed from spiders—to form a material that is then spun into fibers the way traditional silk, rayon, and polyester is made. The result, the company says, is fabric that is stronger than steel, stretchier than spandex, and softer than silk.

"This is a new era of materials," says Dan Widmaier, Bolt's CEO. Most textiles today are made from petroleum-based polyester, which is harmful to the environment when disposed of. By contrast, Bolt's fabric will be biodegradable, the company says. As Widmaier puts it, the new material "has massive potential to change the world for the better."

This month Bolt will undertake a make-or-break challenge: expanding its lab-size process into a commercial-scale operation for three customers, including the apparel company Patagonia. (Eventually, Bolt hopes to produce its own branded clothing.) If the company succeeds, the development will be a key marker for the emerging field called synthetic biology.

Bolt is only one startup using such technologies, which

▲ PHOTOGRAPHS BY WINNI WINTERMEYER

let scientists reengineer the genetics of living organisms to make products ranging from food sweeteners to "leather" to woodlike composites. Investors have taken note. Last year synthetic biology companies nabbed $1 billion from investors, including tech names like Peter Thiel, Eric Schmidt, Marc Andreessen, Max Levchin, and Jerry Yang. That's double the amount from 2014, according to SynBioBeta, a consulting firm that tracks the industry.

There's a reason the Silicon Valley stars are drawn to synthetic biology. DNA, made up of four nucleotide molecules in a sequence, is a code that can be edited and written—not unlike software. The commercialization of DNA sequencing (the reading of an organism's code) and synthesis (the writing of that code) has accelerated since the mapping of the human genome was completed in 2003.

In the past few years new robotics, computational biology, and gene-editing and gene-synthesis technologies have emerged to make synthetic biology efficient and cost-effective. The highly touted Crispr tool, for instance, can snip DNA sequences and insert desired features, while technology from startup Twist Bioscience speeds up gene synthesis by miniaturizing the chemical reaction on silicon. Costs are also falling fast.

"We're decoding biology," says Bryan Johnson, partner in the OS Fund and a vocal proponent of the field. "Life itself is becoming programmable." Believers like Johnson offer audacious predictions. One day, they say, we'll be able to grow tissue, cars, and houses using DNA, energy, and sunlight. Computers might be assembled out of brain cells.

Of course, more than a dollop of caution is in order. One need look back only a few years for a sobering reminder. In 2008 some startups promised to use synthetic biology to produce biofuels from pond scum. But microorganisms behaved differently in factory settings, it turned out, than in labs. When oil prices fell, several of the startups failed.

This time synthetic biology companies are focusing on materials—proponents assert they have higher margins and fewer market fluctuations than fuels—and specialty chemicals. Today the industry believes it has better tools for editing, measuring results, and automating the way chemicals and microorganisms are produced in large quantities.

A flurry of innovation is underway. In Boston, Ginkgo Bioworks churns out organisms used for new perfume fragrances and food sweeteners, using DNA code from hard-to-grow plants and extinct flowers. Says CEO and cofounder Jason Kelly: "Things have really accelerated in just the past two years." Fueled by $154 million from investors, Ginkgo recently opened its second "foundry," an 18,000-square-foot factory stocked with fermentation tanks, mass spectrometers, software, robots, and traditional bench biology tools to design, build, and test DNA.

Synthetic thread on spools at Bolt's lab.

"WE'RE DECODING BIOLOGY," SAYS THE OS FUND'S JOHNSON. "LIFE ITSELF IS BECOMING PROGRAMMABLE."

Kelly says Ginkgo can cut the costs of production of these fragrances and flavors by 50% to 90%, offer customers entirely new scents for their products by mixing and matching DNA letters—and the company can do it without the environmental costs.

Take rose oil, for instance, which is used for perfumes. The plant is hard to grow, produces very little oil per plant, and is increasingly in short supply. Ginkgo's executives request the gene code for the oil from an outside provider. Within two to six weeks, they receive a vial with a liquid DNA sample by mail. They test it, then rearrange the DNA letters and request more samples until they come up with a unique-smelling oil that could be reproduced synthetically for half the cost of traditional oils. In the past nine months, Ginkgo says, it has landed 10 new customers who placed orders for dozens of new organisms.

In Germany, a Bolt competitor called AMSilk is working to develop another spider-based fiber called biosteel for high-performance, biodegradable shoes. In Brooklyn, Modern Meadow, backed by $53 million from investors, creates "leather" using engineered cells rather than animal skins.

A company called Ecovative, based in Green Island, N.Y., is "growing" living room tables, acoustical panels, and packaging. Ecovative takes a fiber made from wood or plants, chops it up, adds mycelium (the root system in mushrooms), and lets the mycelium grow through and around the fibers. Ecovative takes that composite and uses standard presses to shape it, creating a solid surface that looks laminated. Says Ecovative CEO Eben Bayer: "I like to think of it as a new kind of wood, and you can't get a more sustainable piece of furniture on the planet." The Department of Defense awarded Ecovative a preliminary contract to develop "programmable materials" to grow temporary living structures for the military that are sustainable and reduce waste.

Now the synbio manufacturers have to achieve what many biofuel startups could not: transferring what works in a lab to large-scale commercial operations. "Production can be fickle and can be hard to control in a vat the size of a bus," says Mark Bünger, who follows the sector at Lux Research.

Widmaier says making that leap to commercial production has been far more difficult for his company than establishing the complex technology to make spider silk from DNA. This month, when Bolt flips the switch on its 11,000-square-foot factory, it will draw on the expertise of more than two-dozen Ph.D. scientists, many of whom will bring lessons learned from the biofuel bust. "Now," Widmaier says, "the real challenge begins."

Lucas Dixon, Jigsaw's chief research scientist, at Google's offices in New York City.

TROLL HUNTERS

A little-known department at Alphabet has a strategy that might just save social media. BY JEFF JOHN ROBERTS

▲ PHOTOGRAPH BY REBECCA GREENFIELD

TECH

HAVE YOU EVER BEEN ATTACKED by trolls on social media? I have. In December a mocking tweet from white supremacist David Duke led his supporters to turn my Twitter account into an unholy sewer of Nazi ravings and disturbing personal abuse. It went on for days.

We're losing the Internet war with the trolls. Faced with a torrent of hate and abuse, people are giving up on social media, and websites are removing comment features. Who wants to be part of an online community ruled by creeps and crazies?

Fortunately, this pessimism may be premature. A new strategy promises to tame the trolls and reinvigorate civil discussion on the Internet. Hatched by Jigsaw, an in-house think tank at Google's parent company, Alphabet, the tool relies on artificial intelligence and could solve the once-impossible task of vetting floods of online comments.

To explain what Jigsaw is up against, chief research scientist Lucas Dixon compares the troll problem to so-called denial-of-service attacks in which attackers flood a website with garbage traffic in order to knock it off-line.

"Instead of flooding your website with traffic, it's flooding the comment section or your social media or hashtag so that no one else can have a word, and basically control the conversation," says Dixon.

Such surges of toxic comments are a threat not only to individuals, but also to media companies and retailers—many of whose business models revolve around online communities. As part of its research on trolls, Jigsaw is beginning to quantify the damage they do. In the case of Wikipedia, for instance, Jigsaw can measure the correlation between a personal attack on a Wikipedia editor and the subsequent frequency the editor will contribute to the site in the future.

The solution to today's derailed online discourse lies in reams of data and deep learning, a fast-evolving subset of artificial intelligence that mimics the neural networks of the brain. Deep learning gave rise to recent and remarkable breakthroughs in Google's translation tools.

In the case of comments, Jigsaw is using millions of comments from the *New York Times* and Wikipedia to train machines to recognize traits like aggression and irrelevancy. The implication: A site like the *Times*, which has the resources to moderate only about 10% of its articles for comments, could soon deploy algorithms to expand those efforts 10-fold.

While the tone and vocabulary on one media outlet comment section may be radically different from another's, Jigsaw says it will be able to adapt its tools for use across a wide variety of websites. In practice, this means a small blog or online retailer will be able to turn on comments without fear of turning a site into a vortex of trolls.

Technophiles seem keen on what Jigsaw is doing. A recent *Wired* feature dubbed the unit the "Internet Justice League" and praised its range of do-gooder projects.

But some experts say that the Jigsaw team may be underestimating the challenge.

Recent high-profile machine learning projects focused on identifying images and translating text. But Internet conversations are highly contextual: While it might seem obvious, for example, to train a machine learning program to purge the word "bitch" from any online comment, the same algorithm might also flag posts in which people are using the term more innocuously—as in, "Life's a bitch," or "I hate to bitch about my job, but..." Teaching a computer to reliably catch the slur won't be easy.

"Machine learning can understand style but not context or emotion behind a written statement, especially something as short as a tweet. This is stuff it takes a human a lifetime to learn," says David Auerbach, a former Google software engineer. He adds that the Jigsaw initiative will lead to better moderation tools for sites like the *New York Times* but will fall short when it comes to more freewheeling forums like Twitter and Reddit.

Such skepticism doesn't faze Jigsaw's Dixon. He points out that, like denial-of-service attacks, trolls are a problem that will never be solved but their effect can be mitigated. Using the recent leaps in machine learning technology, Jigsaw will tame the trolls enough to let civility regain the upper hand, Dixon believes.

Jigsaw researchers also point out that gangs of trolls—the sort that pop up and spew vile comments en masse—are often a single individual or organization deploying bots to imitate a mob. And Jigsaw's tools are rapidly growing adept at identifying and stifling such tactics.

Dixon also has an answer to the argument that taming trolls won't work because the trolls will simply adapt their insults whenever a moderating tool catches on to them.

"The more we introduce tools, the more creative the attacks will be," Dixon says. "The dream is the attacks at some level get so creative no one understands them anymore and they stop being attacks." ■

DRIVEN FROM SOCIAL MEDIA BY TROLLS

2015–16
Increasingly, popular media sites and blogs, from NPR to Reuters, are eliminating comments from their pages.

JULY 2015
Ellen Pao, interim CEO of Reddit, resigns in the wake of what she calls "one of the largest trolling attacks in history."

JULY 2016
Movie actress **Leslie Jones** quits Twitter after trolls send a barrage of racist and sexual images. In one of her final tweets, she writes, "You won't believe the evil."

SUMMER 2016
Trolls vandalize Taylor Swift's Wikipedia page and social media accounts with snake images.

PAO: DAVID PAUL MORRIS—BLOOMBERG/GETTY IMAGES; JONES: LLOYD BISHOP—NBC PHOTO BANK/GETTY IMAGES

NEXT GIN

A tech industry veteran reinvents his career by embracing a family pastime: distilling spirits. BY JOHN KELL

TECH **ALEXANDER STEIN** found himself at a crossroads in the Motor City. The 35-year-old German was in Detroit working for Nokia, where he helped steer auto-focused projects for the Finnish phone manufacturer. A new adventure beckoned.

Almost overnight, Stein gave up smartphones for spirits. He soon found himself meandering through Germany's famed Black Forest on an unlikely quest: He wanted to produce the perfect handcrafted gin. Helpfully, liquor distilling was in his blood. Stein's father and grandfather produced German brandy.

But Stein had never worked in the industry. After his decade-long stint at Nokia, he soon began to collaborate with distiller Christoph Keller to compose a new gin—performing 120 test cycles over the course of six months. Finally settling on a single recipe, they spent an additional year refining it.

"I thought, That's my gin," Stein says. "It is my interpretation of what a gin should taste like."

Called Monkey 47, the dry gin is now beloved by swanky bartenders and has become one of the more popular brands fueling a burgeoning craft-spirits industry that is following in the footsteps of craft brewing. Its success prompted Pernod Ricard, the French beverage giant, to buy a majority stake in the company a year ago.

"Everything is different about Monkey 47. Everything," says Pernod Ricard CEO Alexandre Ricard, who is also the grandson of a distiller. "And Alexander Stein—he's different."

The "47" in Monkey 47 alludes to the exact number of botanicals in the liquid, including classics like juniper and coriander and more unusual Black Forest–based notes, like lingonberries and spruce. Most gins use about a dozen botanicals.

While vodka is traditionally odorless and whiskey gets flavoring from aging in wood barrels, gin finds its flavor from the distillation process. "When you develop liquor, either you want to produce alcohol or an aroma," Stein says.

Stein's work at Nokia provided a sound base for the Monkey 47 formula. "When you work on a project [in tech], you develop without rushing things and focus on quality," he says.

The distillery in which Stein makes Monkey 47 also contributes to the gin's unique profile. Built in the Black Forest, home to 28,000 micro-distilleries, the facility makes use of unusually small stills—just 100 liters of capacity, about one-tenth the size of a standard still.

The smaller size reduces percolation—the part of the gin distillation process that extracts aromas and flavors from botanicals—by one-sixth. But less distilling time doesn't mean fewer flavors; the botanicals lose their aroma after about 40 minutes as it is.

"If you cook for 1,000 people, it won't be as good as cooking for four," Stein explains. Monkey 47 also prepares all ingredients on site—employees peel fruits and prep lavender by hand—justifying the "handcrafted" tag.

Monkey 47's process combines ancient traditions with modern tech as well. While the maceration and distillation aren't revolutionary, the third step gets a tech jolt. For percolation, Stein forces alcohol vapors to go through plant material like lavender in two different spots of the still.

Stein explains, "It is like an orchestra. You need to make sure everything is harmonic." ■

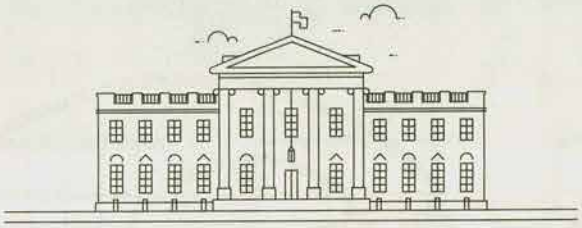

COURTESY OF MONKEY 47

Monkey 47's small-batch gin distillery in Germany's Black Forest region.

IF SILICON VALLEY WENT TO WASHINGTON

What if Donald Trump filled his cabinet with the best that tech has to offer? BY ROBERT HACKETT

TECH



YES, MUCH OF SILICON VALLEY'S elite backed Hillary Clinton over Donald Trump last year. *Awkward.* But in recent weeks the chill between the new POTUS and the technorati has thawed a bit—after all, they share common affinities for generating wealth and disrupting, well, everything. • While Trump has put forward an eclectic list of names to fill his cabinet, it's tempting to imagine a world where the President stocked the government's most powerful posts with tech's captains of industry. Here's a fantasy lineup that Trump may want to consult next time he has a vacancy.

VICE PRESIDENT

TIM COOK
[CEO, Apple]
If Mike Pence ever leaves town, Cook could step in. He knows how to run a huge organization under a larger-than-life boss [see Jobs, Steve]. And he was on Clinton's VP short list, so he's probably already been vetted.

SECRETARY OF STATE

SHERYL SANDBERG
[COO, Facebook]
Sandberg has already helped hundreds of millions of Facebook users reconnect with high school exes and weird second cousins. Reconciling, say, China and Taiwan seems like the next logical step.

U.S. TRADE REPRESENTATIVE

JEFF BEZOS
[CEO, Amazon]
Trump would be thrilled to have an aggressive dealmaker like Bezos renegotiating NAFTA. Thousands of U.S. retailers would be thrilled to have a few years off from competing with Bezos.

SECRETARY OF LABOR

STACY BROWN-PHILPOT
[CEO, TaskRabbit]
The President has promised to create great jobs for frustrated middle-class workers. In the meantime, Brown-Philpot can draw on her TaskRabbit expertise to hook them up with gig-economy jobs running errands, babysitting, and assembling Ikea desks.

SECRETARY OF ENERGY

ELON MUSK
[CEO, Tesla and SpaceX]
POTUS isn't enamored with green-energy advocates, but he might make an exception for someone who has channeled his environmentalism into building slick luxury sedans. And Trump can get a twofer, since the SpaceX founder would probably also want to run NASA.

SECRETARY OF TRANSPORTATION

RACHEL HOLT
[Head of North American operations, Uber]
Holt could be a valuable source of opposition research for a Trump White House. As former general manager of Uber's Washington, D.C., operations, she may know which politicos get negative ratings from their drivers—and why.

ILLUSTRATION BY MARTIN LAKSMAN; PHOTOGRAPHS: COOK: ANDREW BURTON—THE WASHINGTON POST/GETTY IMAGES; SANDBERG: MICHAEL NAGLE—BLOOMBERG/GETTY IMAGES; BEZOS: MIKE BLAKE—REUTERS; BROWN-PHILPOT: BENJAMIN RASMUSSEN; MUSK: TRISTAR MEDIA/WIREIMAGE/GETTY IMAGES; HOLT: COURTESY OF RACHEL HOLT

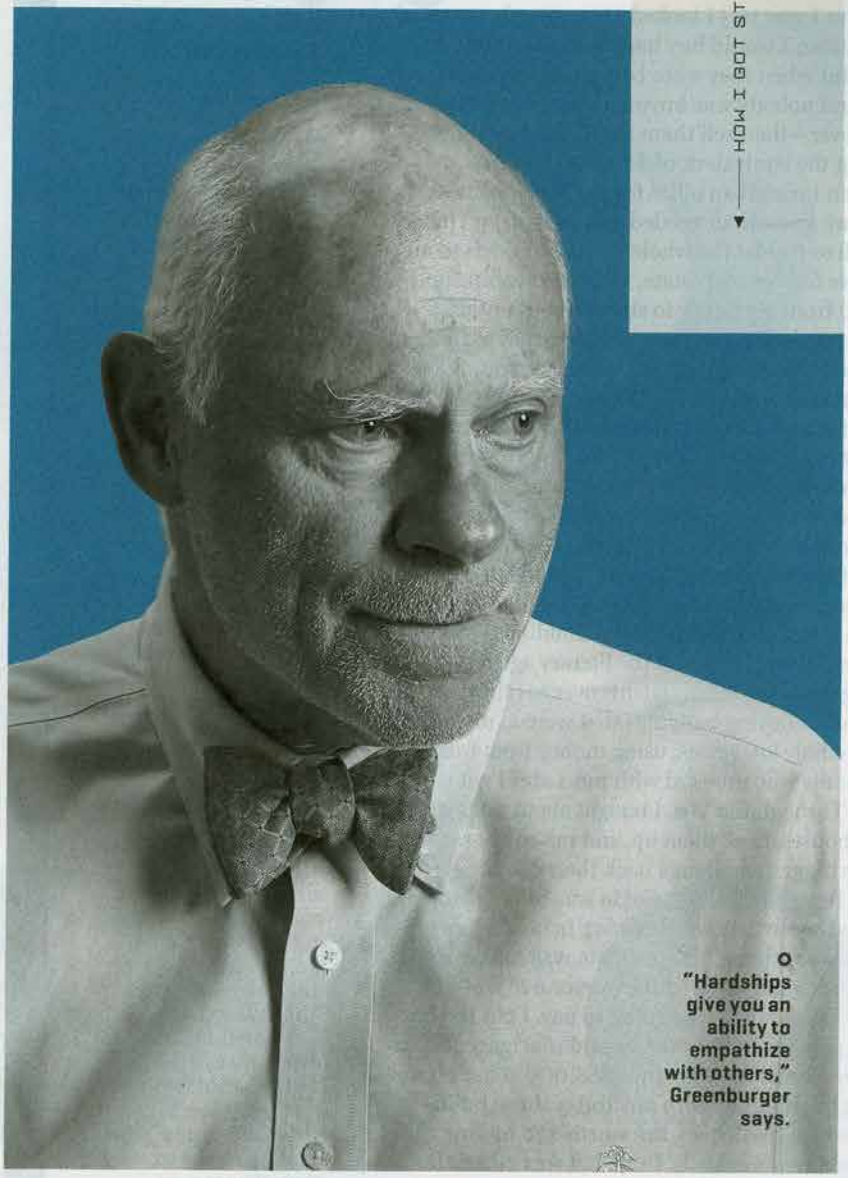
HOW I GOT STARTED

MAN OF PROPERTIES

Real estate, publishing, philanthropy—and optimism in the face of troubles—form the core of Francis Greenburger's fascinating life.

INTERVIEW BY DINAH ENG

FRANCIS GREENBURGER never shied away from hard work. By age 12 he was doing bookkeeping for his dad's literary agency, Sanford J. Greenburger Associates in New York. Bit by the entrepreneurial bug as a teenager, he left high school for real estate, spinning deals with no capital of his own. He bought rundown properties, fixed them up, and made millions, thriving in the face of personal tragedies. Today, Greenburger, 67, owns a real estate development and investment company whose assets are valued at some $4 billion. Revenue in 2016 was $336 million, and the literary agency he still oversees represents bestselling authors such as Dan Brown. Greenburger's story:



"Hardships give you an ability to empathize with others," Greenburger says.

© MICHAEL MCWEENEY

VENTURE

WHEN I WAS very young, I'd hang out in my dad's office, where he ran a two-person literary agency, representing writers and international publishers. When I was 12, to keep me occupied, he gave me some simple bookkeeping work, and I did pretty well. It was his hope that I'd take over the business.

My family didn't have a lot of money. Once a week I'd get a nickel and could buy a Coke. I figured out it would be nice to have money. So I delivered newspapers, shoveled show, and was used to working.

At 14, I represented Bertelsmann, a German book club, in buying American books to distribute in Germany. My dad wanted to avoid a conflict with another German publishing house he represented, so he told Bertelsmann I could help them. [He didn't men- ▷▷

▷▷ tion I was 14.] I looked 18, so people assumed I was older. I would buy hardcovers for 50¢—at the point when they were being sold in paperback and nobody was buying them anymore in hardcover—then sell them for $1.25. At 14, I was making the equivalent of $60,000 a year.

When I rented an office for my book business, I got more space than needed, sublet half, and made enough to pay for the whole place. I discovered an intuitive feel for real estate, so I borrowed around $5,000 from my father to start Time Equities. I was so involved in business dealings that at 16, I decided to leave high school. I finished my studies at night school, then later attended Baruch College.

My father had a friend at a real estate company struggling with some office buildings they couldn't rent. I couldn't buy the properties, so I entered into a lease deal. I paid $1 for the lease, and we split any rent I collected.

My father died in 1970, and I decided to concentrate on real estate. Most books get sold to publishers for thousands of dollars. Buildings sell for millions. I remained with the literary agency as a manager but turned my clients over to other agents.

I started buying buildings that were in disrepair at incredibly low prices, using money from friends and family who invested with me. Later I got bank loans. Through the '70s, I bought about 20 apartment houses, fixed them up, and raised the rents.

The biggest challenge back then was money. I didn't have any. In 1975 SoHo was full of warehouses, but artists were moving in, and I knew things were changing. An estate was selling two buildings, and I offered the lawyer $75,000. I didn't know how I was going to pay. I got the lawyer to give me a $20,000 second mortgage, and a banker loaned me the other $55,000. That's how I bought buildings with air. Today those buildings, which I still own, are worth $75 million.

I lived very modestly. In 1975, I was 26 and living with a girlfriend in a loft with no windows. If I went to the bathroom in the middle of the night, there were always mice running around. One night I woke up with a mouse on my shoulder; we moved the next day to an apartment in a building I owned.

In the late '70s, I moved into co-op sales, which made three to four times what you'd get in a private investment sale. Over the next seven years, we converted 100 buildings in New York, approximately 10,000 apartments, into co-ops.

Not long after, I had room to breathe. I realized that all the property I owned was in New York City. I began to look for markets that others were ignoring or not seeing potential in. Around 1985 I started buying property out of town. Two years later there was a change in real estate tax law, and Black Monday occurred. Suddenly we were in a major recession that spiraled into the S&L collapse.

It was a very difficult time for us. We had loans we couldn't pay because our buyers couldn't get mortgages. The value of the buildings went down, and I owed more than the buildings were worth, so we sold some buildings to pay the loans. Somehow we survived.

Then, in 1990, my first son, Alexander, died in an accident. I cried every day for one year. I had two choices: to join him in the hereafter, or go on living and know that I will join him eventually. I chose the latter.

Hardships give you an ability to empathize with others. My second son, Morgan, has suffered from mental illness since he was 3. In 2012 he was arrested for stealing $20 from a taxi driver. When he was tried, I started studying what happens to mentally ill people in the justice system. Sending them to prison is not the answer, so I founded the Greenburger Center for Social and Criminal Justice to do advocacy work.

Part of what drives me is a sense of optimism. Things are not as bad as the market indicates. Berlin was depressed after Germany unified in 1990, and real estate became inexpensive, so we bought there. Today, Berlin is one of the favored real estate places in Europe. We're now buying a lot in Holland.

I didn't see 2008 coming at all. I felt a great deal of fear, but my job was to do the best I could. We made sacrifices, taking decreases in pay to avoid firing people.

Every successful businessperson should get involved in philanthropy. One of the best ways to use the fruits of success is to give back to society. My father worried a lot about money. I think he'd be quite astonished and proud of the things I've done. ■

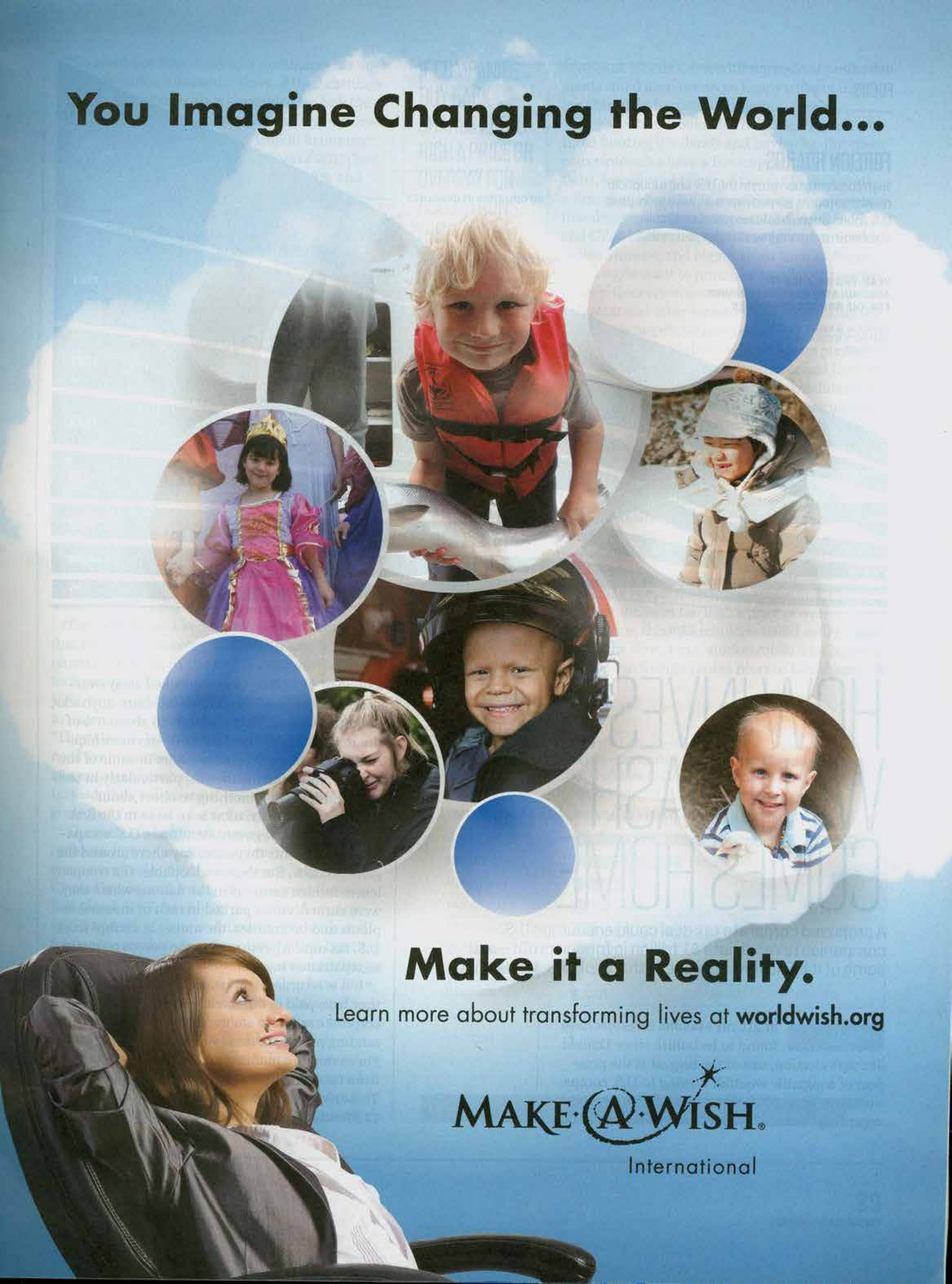
MY BEST ADVICE

FRANCIS GREENBURGER
CEO,
Time Equities

EXERCISE INDEPENDENT THINKING. A lot of the world thinks New York is a wonderful place to invest, and it is, but not if prices are too high. I don't think the upside of New York's investment real estate value is in balance with the downside right now.

GO TO THE PERSON WHO CONTROLS THE PROBLEM. If you don't have rent money, you might want to go to the family or the bank for a loan. But the person who really controls the problem is the landlord. So talk to your landlord and work out a solution, before the rent is due.

START EARLY AND STAY ORGANIZED. I start my workday around 4 a.m., doing emails and correspondence until around 9 a.m., when meetings start. I am very organized and extremely well supported by two executive assistants and a chief of staff. I also maintain a virtual office and work discipline so that when I travel, I remain up to date.

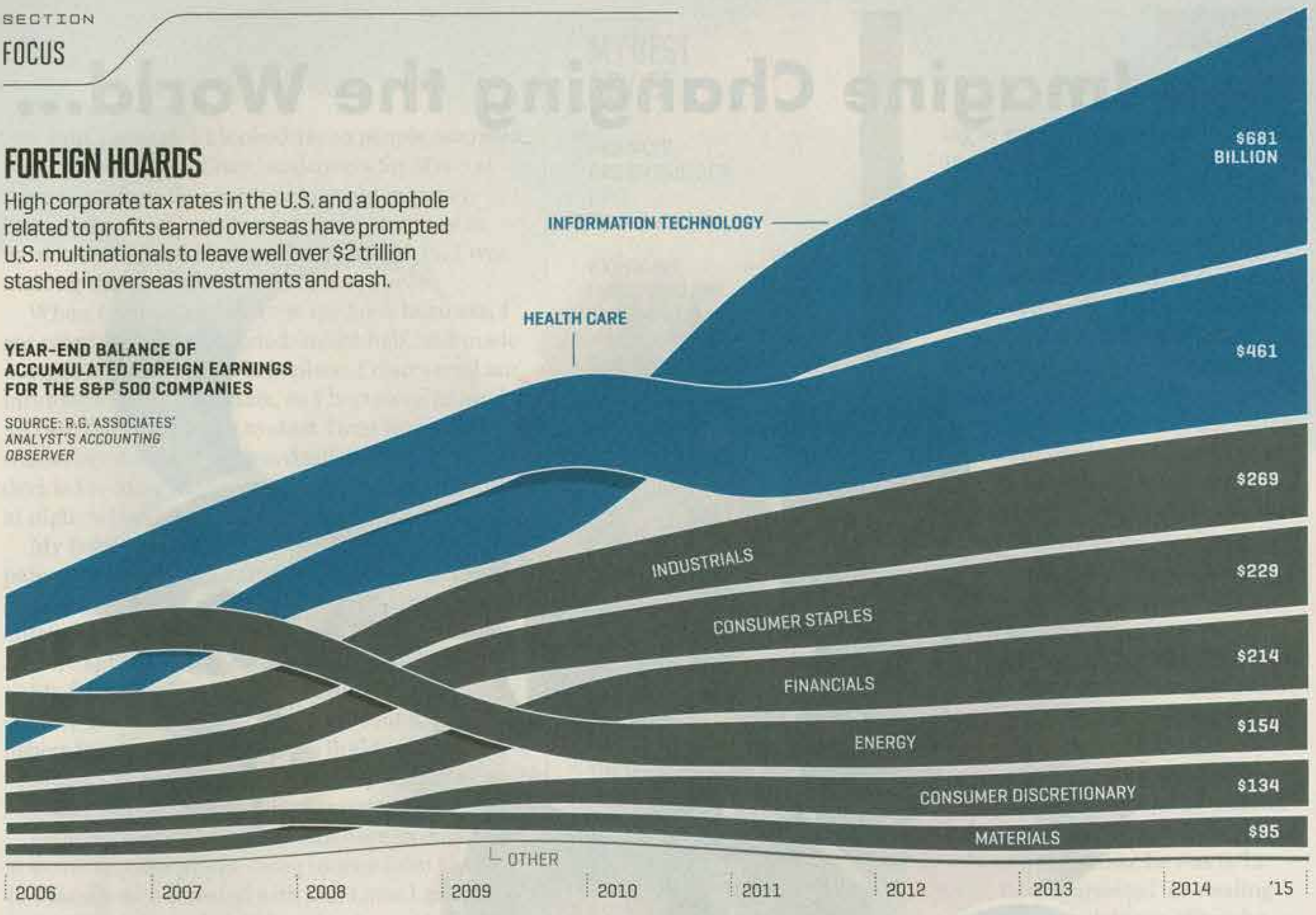

You Imagine Changing the World...
Make it a Reality.
Learn more about transforming lives at worldwish.org
MAKE-A-WISH
International

FOREIGN HOARDS

High corporate tax rates in the U.S. and a loophole related to profits earned overseas have prompted U.S. multinationals to leave well over $2 trillion stashed in overseas investments and cash.

YEAR-END BALANCE OF ACCUMULATED FOREIGN EARNINGS FOR THE S&P 500 COMPANIES

SOURCE: R.G. ASSOCIATES' *ANALYST'S ACCOUNTING OBSERVER*



HOW INVESTORS WIN IF CASH COMES HOME

A proposed corporate tax deal could encourage U.S. companies to repatriate $1 trillion in foreign profit—and some of it could flow straight to shareholders. **BY SHAWN TULLY**

INVEST **OF ALL THE REASONS** investors have found to be bullish since Donald Trump's election, one of the biggest is the prospect of a gigantic windfall flowing to U.S. companies from abroad. If a Trump campaign proposal regarding untaxed foreign earnings becomes law, a flood of $1 trillion or more locked away overseas could be freed for dividends, share buybacks, and acquisitions. That amounts to about 5% of the market cap of the S&P 500—no mere blip. And its return would give investors in some of the biggest American businesses, particularly in tech and health care, something to cheer about.

Here's why repatriation is an issue in the first place. The federal government taxes U.S. companies on all profits they earn, anywhere around the globe, at 35%. But there's a loophole: If a company leaves foreign earnings in the nations where they were earned, either parked in cash or invested in plants and inventories, the money is exempt from U.S. tax until it's returned to the parent company as repatriated income.

If it is returned, companies get a credit for tax they have paid in other nations. But since U.S. corporate rates are among the world's highest, sending profits stateside still generates a big bill. For example, a manufacturer transferring profits from tax-haven Ireland to the U.S. would owe the Treasury the difference between the Irish rate of 12.5% and our levy of 35%.

To avoid that bite, America's multinationals now routinely park a substantial share of their earnings abroad. According to data assembled by Jack Ciesielski, author of the *Analyst's Accounting Observer,* S&P 500 companies held $2.2 trillion in untaxed foreign earnings, or UFE, at the close of 2015; add non–S&P 500 companies and 2016 profits, and today's total is most likely closer to $2.6 trillion.

Many legislators favor breaking the logjam with a repatriation "holiday," in which companies get a one-time shot to bring money back at a lower rate. (The U.S. last held such a holiday in 2004.) On the campaign trail, Trump proposed taxing repatriated UFE at 10% instead of 35% and using the resulting bump in tax revenue to pay for infrastructure; that idea has earned some early bipartisan support.

If Congress enacted such a deal, of course, only a fraction of the $2.6 trillion would reach shareholders. It's important to note that much of the UFE is not actually in cash; it's invested in overseas plants or provides working capital for foreign subsidiaries. At press time, specifics of a plan hadn't emerged, and figuring out which assets will ultimately get taxed, and at what rate, will be thorny. But based on Trump's earlier proposal and on past holidays, investing pros estimate that about 40% of the UFE, or around $1 trillion, will come back to the U.S.—and that companies would net at least $850 billion after taxes.

Two sectors are likely to account for much of that money: technology and health care, chiefly pharmaceuticals. At the end of 2015, S&P 500 tech and drug stalwarts held some $1.14 trillion of UFE, or 51% of the total. Neither industry is likely to use much of the money for R&D or new plants. "They already have access to all the cash they need for investment," notes Michael Faulkender, a finance professor at the University of Maryland. Instead, they will channel their windfalls toward goals that could be a boon for investors.

The cash will help tech titans solve a vexing problem: how to pay shareholders without taking on an overdose of debt. Today **Apple, Microsoft, Cisco, Oracle,** and **Intel,** which account for over half of tech UFE, have been paying out between 84% and 94% of their cash flow in dividends and buybacks over their past three fiscal years. But they generate half of that cash overseas, and since they can't repatriate it without a tax hit, they have been funding their payouts by borrowing. Since 2013, Apple's long-term debt load has risen from nearly zero to $75 billion, and Cisco's has risen from $13 billion to $35 billion. Continuing to borrow at that pace is highly problematic. "Investors will say, 'Do I really want more exposure to Apple after they owe $150 billion?'" notes Rick Lane, a senior analyst at Moody's. But with repatriated funds, the giants could keep investors happy without increasing their debt burden to dangerous levels.

Repatriation would also help Big Pharma continue funding dividends and buybacks. But these companies also have a fresh appetite for acquisitions, says Brad Loncar of Loncar Investments, a firm that offers ETFs specializing in companies that develop cancer therapies. Eli Lilly, Sanofi, and Gilead have drug pipelines in urgent need of replenishment, and bigger rivals such as Pfizer and Amgen want to purchase smaller companies to keep their revenues waxing.

Loncar and other investors and analysts say the most likely targets for acquisition—and an accompanying share-price bump—are midsize players with innovative treatments for cancer and liver disease. Among the attractive takeover candidates are **Tesaro,** developer of an ovarian-cancer drug that is in late-stage trials; **Incyte,** maker of a pioneering treatment for blood disorders; **Exelixis,** a maker of therapies for melanoma and thyroid cancer; and **Acadia,** a developer of small-molecule drugs for treatment of Parkinson's and Alzheimer's diseases.

In the ideal scenario, permanent new tax policies will erase the need for companies to park cash overseas in the first place. For now there's no guarantee that a repatriation bonus will help investors in the long run. If the world's Apples and Pfizers buy back shares at too high a price or overpay for acquisitions, their shareholders could suffer later. Still, in the short term, stocks will do a lot better if $1 trillion in foreign profits flows to U.S. shores. ■

IF COMPANIES BUY BACK SHARES AT TOO HIGH A PRICE OR OVERPAY FOR ACQUISITIONS, THEIR SHAREHOLDERS COULD SUFFER LATER.

UNTAXED POTENTIAL

Technology and health care—particularly pharmaceuticals—have ranked among the most profitable sectors in recent years. Not surprisingly, they account for more than half of all untaxed foreign earnings.

UNTAXED FOREIGN EARNINGS GENERATED IN 2015 (ESTIMATED)

SOURCE: R.G. ASSOCIATES' *ANALYST'S ACCOUNTING OBSERVER*

WHEN SHAREHOLDERS ARE SPECTATORS

At companies controlled by their founders, it's hard for stockholders to pressure management to do the right thing. Here's how to tell which corporate dictatorships can be benevolent for investors. BY RYAN DEROUSSEAU

INVEST **OVER THE PAST THREE** years the Sumner Redstone saga shaved more than 55% off the value of Viacom's stock. As company-crippling feuds erupted over the health, mental capacity, family, and mistresses of Redstone, now 93, shareholders could either sell low or brace for the next scene of the soap opera to unfold. But with Redstone-owned National Amusements controlling 80% of the voting shares of the media conglomerate, investors had virtually no leverage to get the company to clean up its act.

Viacom's plummet illustrates what can go wrong at a "controlled" company—a publicly traded firm where voting power is concentrated in the hands of founders, the founding family, or a handful of executives. Even more than other public companies, these businesses rise or fall on the whims of just a handful of people. And it sometimes seems that for every huge success story at a controlled company—think Berkshire Hathaway, where Warren Buffett holds a decisive number of voting shares, or Facebook, under founder Mark Zuckerberg's grip—there's a Viacom-like cautionary tale.

Just over 100 of the companies in the S&P 1500, or around 7%, qualify as controlled, according to the nonprofit Investor Responsibility Research Center Institute (IRRCI). They fall into two categories: those where founders control 30% or more

The Murdoch family—whose members include Elisabeth, Lachlan, patriarch Rupert, and James—controls voting power at 21st Century Fox.

ORIGINAL PHOTOGRAPHS, ELISABETH MURDOCH: GARETH CATTERMOLE—GETTY IMAGES; MURDOCH AND SONS: KARWAI TANG—WIREIMAGE

ILLUSTRATION BY MAX-O-MATIC

of the total voting shares, and those that use dual-class or multi-class share structures, in which only a few people own "super-voting" shares that far outweigh the common shares they offer to outsiders. Google (now Alphabet) famously went public with the latter structure, and later strengthened the voting rights of founders Sergey Brin and Larry Page and chairman Eric Schmidt by issuing a nonvoting class C share. The three men now hold nearly 60% of the voting power.

For owners, running a controlled company means being insulated from pressure to satisfy other shareholders and from the threat of being ousted by activists seeking better returns. It also means being able to stock their boards with like-minded folks. (Perhaps not coincidentally, multi-share-class controlled companies pay their CEOs more than average.)

So how do their non-empowered shareholders fare? It's a mixed bag. UBS says family-run midcap stocks worldwide returned 113% since 2005, compared with 64% for all midcaps. Belen Villalonga of New York University has found that controlled companies have higher-than-average profitability. Performance seems to weaken as companies get bigger, however. Over the past 10 years, controlled U.S. large-cap companies underperformed noncontrolled ones in shareholder returns and revenue growth, according to the IRRCI (see graphic).

In any case, a controlled structure puts more onus than usual on shareholders to figure out whether they can trust a company's management and owners. A tale of two brewers shows the difference an owner can make. At **Boston Beer Co.**, creator of Sam Adams, founder Jim Koch holds the vast majority of voting rights. The company rode high on the rise of craft brews and ciders. But the stock has fallen 44% in the past two years, and revenue has shrunk as Sam Adams came to be seen as corporate "big beer." Koch, 67, makes some investors uneasy because he still holds most decision-making power and hasn't announced a succession plan. "He's one of those 'not going to die' type of guys," says Cowen analyst Vivien Azer.

For a contrast, look at the multinational **Molson Coors.** The Molson and Coors families control 80% of the board. But the firm has let nonfamily CEOs manage day-to-day dealings, and the families "benefit as the business prospers," says Azer. Since its 2016 buyout of SABMiller's stake in U.S. brewer MillerCoors, investors have been bullish: The stock is up 72% over the past three years, compared with 11% for the S&P Food and Beverage Select index.

> SOMETIMES A COMPANY'S LONGEVITY IS THE BEST SIGN THAT ITS CONTROLLING FAMILY LETS GOOD LEADERS LEAD.

When family members are poised to take over a controlled company, experience matters. Media giant **21st Century Fox** has been gradually transferring power from Rupert Murdoch to his children. His sons have taken on significant roles at the company, gaining experience and testing their readiness for greater responsibility. Rupert remains co-executive chairman, but his son James, who became CEO in July 2015, understands the business well enough that there's "potential strong leadership" in place, says Michael Morris, an analyst at Guggenheim Securities.

Sometimes longevity is the best sign that a controlling family lets good leaders lead. A.O. Smith, a maker of water heaters and treatment systems with about $2.6 billion in revenue, has been around since 1904. The Smith family retains 96% of the shares that select the majority of the board, but it has given management the flexibility it needs. A.O. Smith recognized China's importance early: The country now accounts for 31% of sales and helped the firm ride out the U.S. housing crash. KeyBanc analyst Jeff Hammond expects 8% growth in 2017, which would outshine competitors. And its stock has returned almost 700% over the past 10 years—about 12 times as much as the S&P 500.

Of course, the risk remains that another Smith could decide the family should take over. Your shares wouldn't stop that—but you could always vote with your feet. ■

THE COST OF CONTROL Family- and founder-controlled companies are insulated from pressure from outside shareholders. But their performance may suffer as a consequence, as this comparison of 10-year results suggests.

FIRM CONTROL TYPE	REVENUE GROWTH*	AVERAGE TOTAL SHAREHOLDER RETURNS	AVERAGE BOARD & COMMITTEE INDEPENDENCE
NONCONTROLLED	12.8%	8.5%	81.6%
CONTROLLED	7.7%	6.9%	67.1%
MULTI-CLASS STRUCTURE	7.8%	7.4%	66.3%
SINGLE-CLASS STRUCTURE	7.6%	5.7%	69.3%

*OUTLIERS EXCLUDED SOURCE: INVESTOR RESPONSIBILITY RESEARCH CENTER INSTITUTE

DISRUPTED

JOB HUNTING? ERASE YOUR PAST

Age bias is real—but that doesn't mean it has to stop older professionals from making their next career move. Below, a veteran's advice. BY DAN LYONS

THE NEW ADMINISTRATION has put some wind in the sails of the market and, some would say, the economy too—which is potentially good news for job seekers. But if you're one of those seekers and you're of a certain age, career guru Marc Cenedella has some critical advice: "Don't list any dates on your résumé before the year 2000."

Just zap it. Erase it. Pretend those years never happened.

Cenedella, founder and executive chairman of Ladders, a professional career site aimed at job seekers in the top 25% of the market, riled up some of his 9 million newsletter subscribers when he offered this guidance in December. "I definitely got some blowback," he says.

To be clear, Cenedella, who is 46, isn't saying that age bias is okay. He's saying that it exists. The first person who reads your résumé will be an HR department screener who will be right out of college. "They'll say, 'Wait, this guy was working in newspapers in the 1980s? No way will he understand Snapchat.'"

DAN LYONS is the bestselling author of *Disrupted: My Misadventure in the Start-Up Bubble.*

Boom, like that, your paperwork goes into the trash. Sure, this is biased and unfair. But these are the gatekeepers, and you need to get past them.

Trimming the early experience from your résumé might feel dishonest, but the document isn't supposed to be comprehensive. "Your résumé is an advertisement, not a product manual," Cenedella says. Confining a résumé to a single page is good advice for anyone.

Fair enough, but once I've slipped past Doogie Howser the résumé screener (yes, I've just aged myself with reference to a 28-year-old TV show), I still have to go to an interview, right? I've heard from countless people who wangled their way into an interview and then could tell, in the first 30 seconds, that the hiring manager had taken note of their graying temples and ruled them out.

Cenedella says you should expect to encounter age bias and have a plan to get ahead of it: "Show them you're flexible and adaptable. You can collaborate. You can take direction and feedback from younger people." You might also point out that your more extensive background can be an asset and that the team ought to perform better after adding an experienced hand.

After studying the most successful late-career movers, Cenedella recommends the following:

▶ **BE SPECIFIC.** Talk about a time when you embraced a new technology or took direction from a younger boss or colleague, he says.

▶ **BE PASSIONATE.** "You're going up against candidates who don't have your experience. They're selling enthusiasm and passion. You have to bring that too."

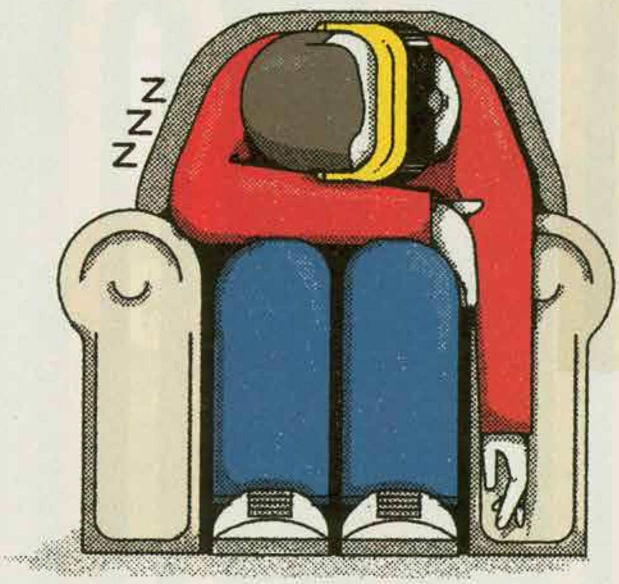
▶ **BE YOUR AGE.** "You're never going to adequately mimic the behavior of a younger generation." So don't dress like a college kid or try to use millennial lingo.

Age bias pervades every industry, Cenedella says. Maybe someday things will change. For now I'm going to take Cenedella's advice. I just fixed my LinkedIn profile. ■

O LYONS: GRETCHEN ERTL

FEEDBACK: **LETTERS@FORTUNE.COM** ▲ ILLUSTRATION BY **SAM ISLAND**

A BOOM WITH A VIEW



(VIRTUAL) REALITY BITES

Will this be the year that VR finally goes mainstream? I'm not convinced. BY ERIN GRIFFITH

VIRTUAL REALITY IS GREASY. That's all I could think as I wandered through the vast labyrinth of digital screens—the widest, flattest, clearest, shiniest, newest models in the world—at this year's CES in Las Vegas. At the sprawling technology trade show, I was eager to sample the latest in VR, a technology that's been hyped for a generation but remains a novelty to most people. Each headset I tested left me with a distinct urge to rub hand sanitizer all over my face.

Still, the view from inside the virtual world is striking. In one demo I was transfixed by a trio of body-painted Cirque du Soleil contortionists five feet in front of me. I looked to my left and let out a tiny gasp as a tiger waltzed by. Later, I carefully traversed a (real) rope bridge over a (virtual) snowy overpass. I took in the Milky Way while reclining in a $7,000 full-body massage chair. (I endure these hardships for you, dear reader.) On the CES show floor, long lines formed around VR "experiences" that looked like carnival attractions: a virtual boat ride with nausea-inducing seats, a virtual plane ride with *Top Gun*-style twists and flips, a scream-inducing virtual spaceship ride.

FOR MORE
Follow Erin Griffith on Twitter (@eringriffith) or at fortune.com/boom.

I could tell which people were experiencing VR for the first time by their dazzled expression after they removed the goggles. But without the trade show's spinning chairs or relaxing massages, the novelty of virtual reality quickly wears off—especially when you notice the $800 price tag (excluding accessories). Cheaper headsets feel heavy after a few minutes. Some models are difficult to focus. All of them feel greasy. With the exception of elaborate gaming setups, you're unable to move around (you can't even see your hands), so the fun part—taking in the 360-degree views—requires awkwardly swiveling your head.

Worst of all, VR is isolating. Beyond the delight of watching someone else's first virtual reality experience (a moment Samsung promoted aggressively in a holiday ad campaign for its Gear VR headset), secondhand VR is no fun. The headset-headphones combination that virtual reality requires takes "phubbing"—snubbing your real-world companions for the digital distractions of your phone—to a new level.

VR amounts to exhilaration followed by discomfort and apathy—an emotional journey that mirrors the technology's trajectory as a business. After years of barely containable buzz, Facebook's Oculus Rift and HTC's Vive became available last year, only to suffer from shipping delays and order cancellations. VR headsets and software missed sales predictions by 29% last year, bringing in just $2.7 billion, according to Digi-Capital, an M&A advisory firm. As a result, Digi-Capital slashed its sales projections for the market to $25 billion by 2021. It estimated that VR's more social cousin, augmented reality (e.g., *Pokémon Go*), would generate a whopping $83 billion by the same date.

The hype surrounding VR today reminds me of the early days of 3D printers: In the future, every home will have one! Except every home didn't need one, and they remain an expensive curiosity to most. Based on price and entertainment value, VR is in the same spot. Right now virtual reality is best experienced in a crowded, noisy convention center in Las Vegas—a place anyone would be eager to escape. Just bring your own Purell. ■

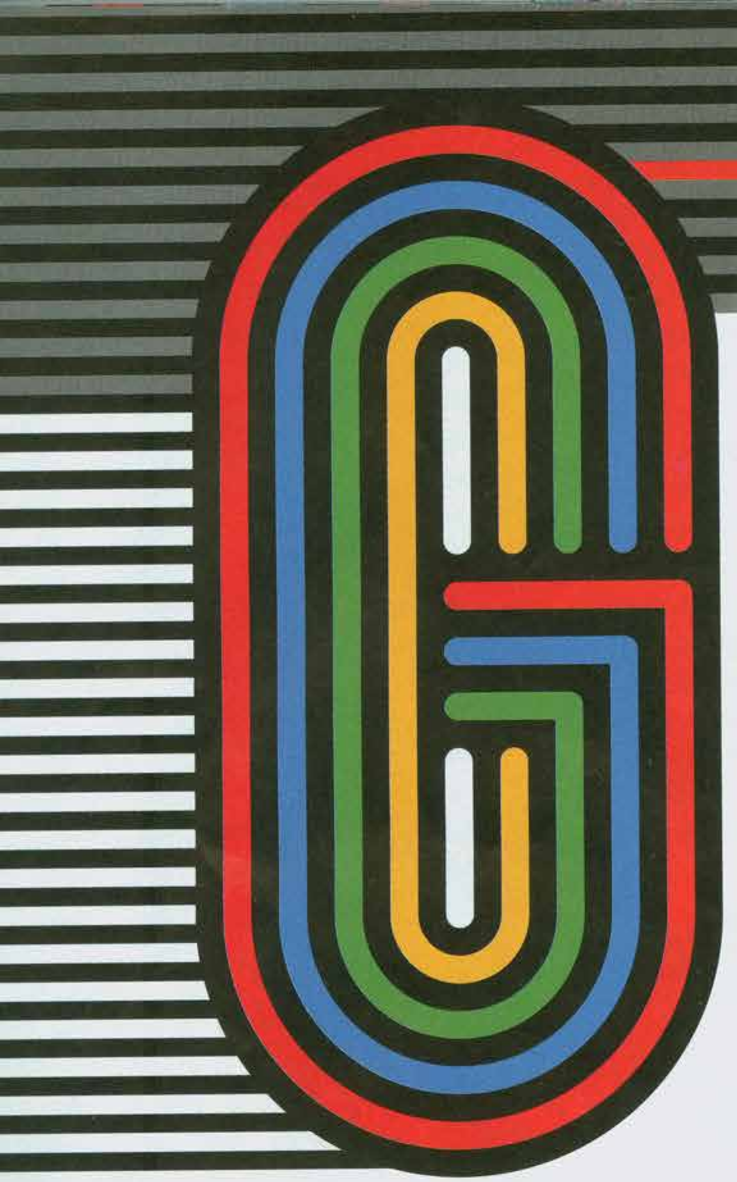
▲ ILLUSTRATION BY **MICHAEL GEORGE HADDAD**


GOOGLE

GOOGLE SEARCHES ITS SOUL

BY ELLEN MCGIRT

Inside the search giant's effort to get more diverse—and to change the way we all see the world.



GOOGLE IS OUR EYE into the world. The search giant has earned an intimate role in the lives of billions of people through its astounding ability to find, sort, and deliver information instantaneously. Google handles trillions of queries per year—or 80% of all Internet searches on the planet.

It's the portal through which we channel our collective curiosity. Should I worry about that weird rash on my leg? What's Brexit? Who was the winning pitcher for the Kansas City Royals in game seven of the 1985 World Series?

Google brings the world to us. Would you like a bird's-eye view of the vacation house your cousin is renting in Panama? Google it. Want to see what the Lascaux cave paintings in France look like? Google Image them. Wish you could go back and see Prince's performance of "Purple Rain" at the American Music Awards in 1985? Search Google's YouTube and you can experience it.

The company's hegemony in search has laid the foundation for an incredible business built on ad sales. Alphabet, the parent of Google, last year ranked No. 36 on the *Fortune* 500, with some \$75 billion in sales—up from No. 92 and \$29 billion just five years earlier. According to estimates from S&P Global, Alphabet will report more than \$19 billion in profit for 2016 on \$89 billion in revenue.

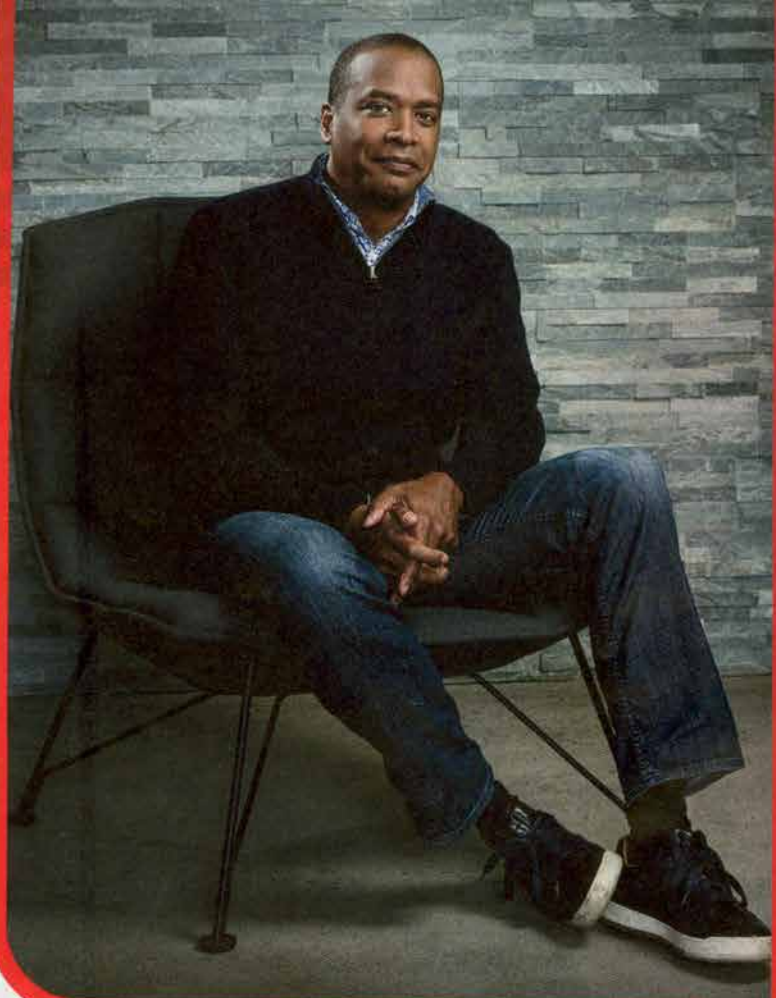
Google has vanquished all challengers in search over the years—sorry, Yahoo and Bing—through the consistent refinement of its algorithmic wizardry. As the world around the Googleplex shifts, so must its products adjust to keep its otherworldly ability to serve up the correct information.

Recently, however, the company has identified a lingering problem that needs fixing: For a company built on delivering the rich diversity of human experience, the tech titan is not itself a diverse place to work—and it's moving to change that. Google has decided to search its soul.

Why now? There is perhaps a dollop of public relations in the effort and certainly an element of doing the right thing. (Might the company's oft-mocked motto of "Don't be evil" apply?) Silicon Valley in general has been harshly criticized in recent years for being overwhelmingly male and largely devoid of non-Asian people of color.

But there is another potent factor in play too: A growing realization inside the company's Mountain View, Calif., headquarters that not embracing diversity might impede Google's ability to keep growing. How can it learn to better serve the billions of people on the planet for whom its search has not thus far been optimized?

In that sense, Google is playing catch-up. Over the past few years, the corporate world has had a powerful awakening on the subject of race, diversity, and inclusion. Last September, for example, Thomson Reuters created the first ever Diversity and Inclusion (D&I) Index, an analysis of the practices of over 5,000 companies, crunched down to 100 standouts who have been building on the growing body of research that shows that diverse companies create more innovative products, happier customers, and better financial returns. "We have found that companies who have proactively built and consistently fostered a diverse workforce often financially outperform their peers," reported



Thomson Reuters. Companies such as Procter & Gamble, Johnson & Johnson, Microsoft, and Cisco all made the top 25. Google didn't make the cut.

That was hardly a surprise. In 2014, after years of resistance, the company began voluntarily publishing its annual diversity employment numbers. Although not shocking by Valley standards, they showed a clear disconnect between the increasingly heterogeneous markets and customers the company needs to reach and the people making the products to reach them.

Those results haven't changed much—yet. According to the 2016 numbers, some 71% of the company's roughly 46,000 U.S. employees are male, 57% of the company's U.S. employees are white, and the vast majority of technology jobs and leadership positions are held by men. While Asian Googlers are one-third of the workforce, everyone else barely registers. Just over 5% of employees identified as Latino, 2.4% as black, 1.8% as mixed race, and fewer than 1% as "other."

The mere act of releasing the information had a profound ripple effect, though: Other technology companies, such as Apple, Yahoo, and Salesforce, quickly ponied up their own numbers—with similar ratios to those at Google—and began making their own diversity commitments (see the box "Facebook: Iterating Diversity"). As is often the case in tech, where Google goes, others attempt to follow.

While cautioning patience, Google executives are confident that the organization's embrace of diversity will begin to show up in its workforce soon. The company recently offered *Fortune* an inside look at its efforts—including interviews with employees in different parts of the company, both techies and non-techies, and at various levels of seniority. Everyone I spoke with agreed that progress is slow but real.

One glaring observation about the campaign: It's not your standard, top-down, CEO-driven initiative. Google has focused on pushing resources into four areas—hiring, inclusion, education, and communities—where it believes it can have impact. But there is no overarching mandate from the C-suite, like linking compensation to diversity goals, that would indicate to outsiders that diversity is an urgent priority. CEO and cofounder Larry Page didn't issue a memo. Rather, it's more of a crowdsourced effort inside Google, with a host of different Googlers leading in various ways.

That leaves an opening for skeptics who wonder about the seriousness of the effort. "There's nothing like a 'moonshot,'" says Freda Kapor Klein, a cofounder of Project Include, referring to the long-term, wildly ambitious and well-funded projects that Alphabet takes on, like Google Glass and self-driving cars. "If these initiatives are not given the resources to make it a priority, then tweaking how they recruit, releasing numbers, and giving money to a bunch of nonprofits is not going to get them the results that they want."

David Drummond welcomes that type of critique, even if he rejects the premise. Alphabet's senior vice president of corporate development and chief legal officer, Drummond, who is African-American, is the de facto leader of the diversity movement inside the company. He believes real progress is being made, but he's happy to have outside pressure. Drummond, 53, says it's more powerful than a moonshot declaration in some ways, because the world is watching the company struggle in real time. "You're not going to make any progress on a problem if you're not honest about what a problem is," he

O David Drummond, Alphabet's chief legal officer and a board member, is helping lead the diversity movement inside the company.

▲ PHOTOGRAPH BY WINNI WINTERMEYER

Bonita Stewart, Google's VP of global partnerships, presses white allies in the company to sponsor talent of color. "They're not used to being asked," she says.

says. "We're putting ourselves under scrutiny and that's super important."

DRUMMOND REMEMBERS well the day that race consciousness finally came crashing into the Googleplex. He helped lead the parade.

It was a Thursday in July 2014, the week that a jury found Florida neighborhood-watch volunteer George Zimmerman not guilty of murder and manslaughter in the shooting death of Trayvon Martin, an unarmed, hoodie-wearing teenager. The case inspired a heated national debate on racial profiling and criminal justice—as well as the hashtag #BlackLivesMatter—and the decision left plenty of Googlers of color deeply unsettled, Drummond among them.

There was a spontaneous "hoodie march" around campus, and Drummond joined in. Wearing a Google hoodie, he addressed the crowd of about 100 through a bullhorn before leading them along Mountain View's Charleston Road and into Google's weekly all-hands meeting, at which top executives publicly field questions from employees with no topic off limits. Cofounders Page and Sergey Brin were onstage when the group arrived, and Drummond, still holding a bullhorn, asked his two bosses to stand down while he spoke. "It was sort of in an old-school civil rights way," says Drummond, who has been with the company since 2002. "We felt we needed to come together as a company, and we did."

Drummond sits on the executive steering committee on diversity, and diversity in human resources was in his direct area of responsibility as a senior executive for the past 15 years. "I've always felt very strongly about it and have pushed us to do more," he says.

He is also deeply involved with the various non-search businesses that since 2015 have been separated from Google under the umbrella of the Alphabet holding company. They include wagers on, for instance, smart homes (Nest), technology to enhance health (Verily), faster Internet access to homes (Google Fiber), and self-driving cars (part of X). "It's really a collection of startups, so there's an opportunity to look at diversity and inclusion from the beginning," he says. In his role at Alphabet, he asks the questions early on. "We take a lot of the lessons we've learned about diversity inclusion from other organizations and encourage them to get on these things earlier."

Google's diversity measures are a hybrid. They cut across all lines of business, giving people a new language for speaking about diversity—not unlike a design language. Some 30,000 Googlers have already taken part in antibias training and hiring, and promoting practices, say many employees, have been transformed. Increasingly, recruiters are willing to look beyond a sliver of particular majors at a handful of elite colleges when identifying job candidates.

Bonita Stewart is a perfect example of why new markets need fresh faces. Ten and a half years ago, she was recruited by Google out of Detroit—where she ran communications for Daimler Chrysler—to help lure automotive advertisers into

▲ PHOTOGRAPH BY BRAD OGBONNA

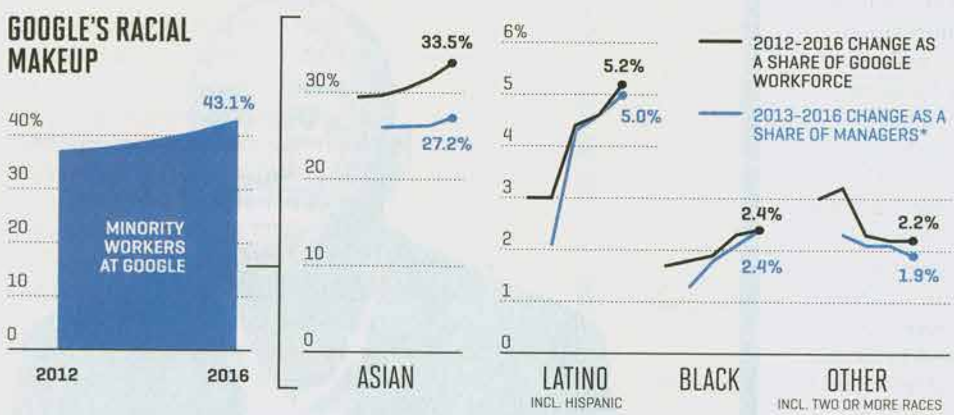
the Digital Age from Google's New York office. Today, as vice president of global partnerships, she makes sure that publishers are figuring out how to make money across the growing array of Google assets. But back in the day, she was a trailblazer. "In many ways I feel like the diversity revolution started with me, honestly."

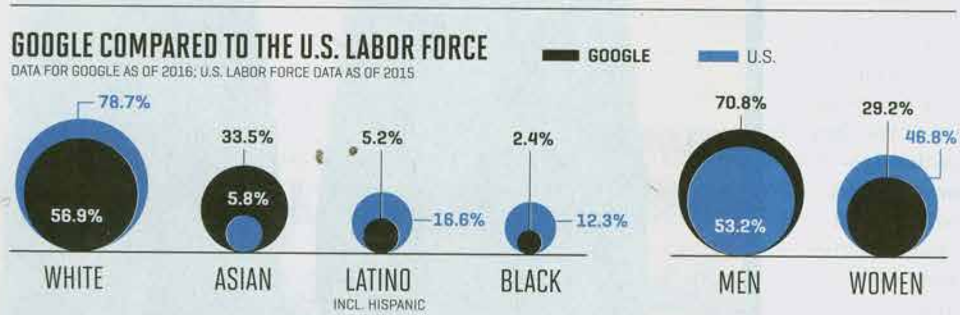
As a leader, she has been focusing on casting a wide net for open positions and is committed to sponsoring other women of color with leadership potential. "I don't want to be the sole sister in this chair," she says. She now presses white allies into service sponsoring talent of color. Says Stewart: "You have to ask them. They're not used to being asked."

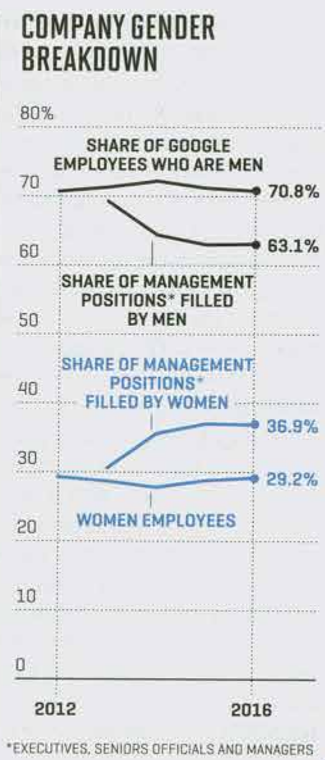
There are a multitude of vibrant employee groups, large and small, working to make inclusive practices a new normal inside the company. Taken together—there are groups for black, Latinx (the gender inclusive form of "Latino"), Asian, and disabled employees, and older "Greyglers," to name a few—they represent a formidable movement. "Google is in this for the long haul," says Anna Patterson, one of Google's engineers on the search product and co-chair of Women at Google, a growing 9,000-person organization. "Diversity makes all tech better, and our products better. We need to become even more thoughtful about how we understand each other, including our user base."

For his part, Drummond says that some of the best, most innovative ideas are probably outside Alphabet—a radical notion on its own. And he bristles at criticism that supporting community projects, such as STEM (science, technology, engineering, and math) programs in Harlem or Oakland, is just checking boxes. "We do it because it's a good thing to do, but we also want to learn from what other people are doing," Drummond says.

He expects that Googlers who spend more time understanding underserved communities will naturally understand the power of diversity. "This is about being 'proximate,'" he says, citing his friend Bryan Stevenson, the founder of the Equal Justice Initiative and author of *Just Mercy*, about racism in the criminal justice system. "This is about understanding what's happening on the ground, being next to the problems, and building on what's working to get more and different people into tech."







SOURCES: GOOGLE'S EEO FILINGS (U.S. EMPLOYEES); BUREAU OF LABOR STATISTICS.

IT'S ONE THING to talk about diversity. It is quite another to be confronted by the fact that your core product, which was designed to be based on "the collective intelligence of the web," has dredged up the web's collective bigotry instead.

That's exactly what happened to the company in a pair of recent incidents. In 2015 a new Google photo-search application began tagging images of black people as gorillas, causing public outrage and internal embarrassment. And just this past December, a writer for *The Guardian* discovered while searching for information about the Holocaust that Google's algorithm returned white supremacist Holocaust-denial propaganda in its top spot. To make matters worse, the writer fixed the issue by buying ads to promote the correct information.

Events like these, say some skeptics, make it easy to look askance at Google's lack of progress with its workforce numbers. But defenders say that the traumatic episodes are part of a learning process. "The intentions are good," says Anil Dash, a writer, an activist, an inclusion advocate, and the CEO of Fog Creek Software, based in New York. "The people doing the work are very smart and thoughtful." Dash was a panelist recently at Decoding Race, the fourth installation of Google's new Race@ series. The program is supposed to provide honest dialogue around race and racial justice both within the company and in the world.

Bradley Horowitz, who led Google Photos at the time of the gorilla incident, told the company at the Race@ event that if the team had been more diverse, it would have noticed the problems earlier in the process. "To the degree that the data is sexist or racist, you're going to have the algorithm imitating those behaviors," Horowitz said, as reported by TechCrunch. It's the world we all live in, but it's Google's job to put its finger on the scale to make it level. "What data should we be feeding it, how should we be correcting that."

But part of what makes the lesson stick, says Dash, is that it gets attention: "The public pressure is working 100%, and these things like the [gorilla] photos, or Holocaust deniers being featured are very visible."

TALK TO ENOUGH Googlers, and you start to accumulate examples of how outside perspectives are enriching the company's business.

Exhibit A is Adriana Jara, 33, who started at the company in 2013. Jara grew up in Costa Rica surrounded by coffee plantations; one of her first jobs was fetching the morning milk from a neighbor's cow. But she eventually found her way into engineering school in Costa Rica's forward-thinking educa-

○ Michael Gardner, a 26-year-old Googler in Ann Arbor, got his start through an internship program that targets non-technical students of color.

tion system, then into a series of good jobs in her country's growing tech industry.

When she got to Google, "it was culture shock in every way imaginable," she says. Her first assignment didn't take. "My team was very homogenous, and they were all about the same, and I was the weird person, so I ended up switching." Having a native Spanish speaker as a mentor, a manager, or an HR contact, she says, would have helped.

Now Jara works on Google's shopping product, on a core team of six, where nearly everyone has a different background, including engineers from China and Korea. "Everyone is different from each other, which is much easier," she says.

There are two important areas where Jara has been able to influence the company, and she's got a third in her sights. First, the shopping product itself. Turns out, shoppers focus on different things in Latin American economies, hers included. "In the U.S., how fast you can get it is super important," she says. "But in places like Costa Rica, you have such bad infrastructure that we're used to waiting for things." She made the case that price comparisons are more important than shipping options in certain markets, a search tweak that was welcomed by her team.

But she is also proud of her work as an ambassador inside and outside Google, a role that is encouraged and acknowledged by her manager. She was tapped when a Google recruiter visited her university in Costa Rica—a trip she has now made several times herself looking for candidates and helping future interns survive the ultra-challenging marathon interviews. She has visited a camp for girls in Peru and has made lasting relationships with people in the international development community, all on Google's dime.

With success under her belt, Jara sees a third act for herself, citing Google's long-standing deficit in social media and research that shows the Latino market's rapid adoption of both social and mobile technologies in the U.S. and around the world. "People have always said that Google is not good at social stuff—and one of my dreams is to figure out how Google can be good at that," she says. "Latinas are touchy-feely, and we hang together in bunches, and blah, blah, but actually, real social components are very important to me."

FACEBOOK: ITERATING DIVERSITY?

Like Google, Facebook gets scrutinized and criticized for the hue and gender of its workers. The social network is applying the same spirit of experimentation to its employment imbalances that it does to its products, says Maxine Williams, Facebook's global director of diversity. The company tracks the results of a series of pilot programs, revises accordingly, and then either expands or kills the program. "Because we're so data driven," she says, "doing pilots makes a huge difference."

The fate of one initiative shows how tricky the obstacles can be. In recent months, the *Wall Street Journal* and Bloomberg have reported on a Facebook system in which its recruiters receive twice as many points for hiring a black, Hispanic, or female engineer as for whites, males, or Asians. Bloomberg's article reported that hiring managers sometimes rebuff diverse candidates offered by the recruiters. During interviews, according to Bloomberg, the managers often inquired where the applicant went to college, the sort of "old boys" question the program seeks to avoid.

Williams declines to comment on the points system or even confirm that it exists. Either way, though, change has been slow at Facebook. As of July, 1% of the social network's U.S. tech team is black and 3% is Hispanic, numbers that have stayed flat since 2015. Globally, 17% of its tech employees are women, an increase of one percentage point over the previous year.

Still, Williams says some Facebook programs, such as the three below, are showing promise:

▶ **The Diverse Slate Approach:** Based on the NFL's Rooney rule, it requires that hiring managers interview at least one member of an underrepresented group for each open role.

▶ **Facebook University:** The company has been running a summer training program for undergrads from underrepresented groups. The hope is that these trainees will join the company after graduation as engineers and business and data analysts [some already have]. The program has expanded from 30 engineering students in 2013 to a class of 170 engineers and analysts-to-be.

▶ **Managing Unconscious Bias:** In 2015, Facebook publicly launched an online training course to help its employees identify and address unconscious biases. The course is a series of videos in which Facebook executives explain commonly held stereotypes. The clip on performance bias, for example, explains why some people are perceived as naturally talented, while others as having "gotten lucky."

—Valentina Zarya

Another nontraditional Googler who has become a passionate advocate for the company is Michael Gardner, who is based in Ann Arbor. The 26-year-old works as an account manager for nonprofits and religious organizations, an area he loves because he spends his time amplifying the impact of their work. "The culture is why I fell in love," says Gardner.

▲ PHOTOGRAPH BY **MARVIN SHAOUNI**

Gardner came to Google through the BOLD program, which recruits nontechnical interns of color, in the summer of 2011, and felt so welcome that he snapped up an offer the following year. He's proud of the work he has done, including modifications he recommended to an automated lead-generation system for salespeople targeting small-business owners. But he is just as proud of the ways he has contributed to improving relationships among 400 employees in the Michigan office.

In the fall he spearheaded something he called Inclusion Week, which happened to coincide with the presidential election. It's his own personal moonshot. "There are a lot of people who are well-intentioned about inclusion but don't know exactly how to get involved," he says. There were presentations and focused conversations leading to a series of lightbulb moments that Gardner hopes will help the Michiganders think more deeply about creating an inclusive workplace and sharing those learnings across the company.

Jack Chen, 42, is yet another Googler who has made an impact. The computer scientist turned patent lawyer has been instrumental in transforming the way Google thinks about employees with disabilities. He frames it in a very Google way: "We decided to create an employee group around the goal of making Google the best place to work for people with disabilities," he says. Chen, who has been blind since he was a teenager, had to take the lead when he joined the New York office in 2010, modifying both his office and his personal technology to make it work for him.

Since then, he has worked closely with other Googlers with disabilities to create a clear set of aspirational goals for a community that is diverse in its needs and challenges. He ticks through a list: blindness, autism, stuttering, people who need wheelchairs, the hearing impaired. "There are vast differences in experiences as well as the solutions that help those people," he says. "The common thread is empathy."

THE REAL TRUTH is that for a long time now Google's meritocracy in a bubble has worked splendidly—vastly enriching Googlers and shareholders alike. The search product is an astonishing achievement enabled by constant refinement and a technical skill that routinely reaches the level of magic. And if it was built and maintained by a homogenous collection of Stanford engineers, well, it's hard to argue with success.

But narrow inclusion has had its opportunity costs as well. Drummond, as do others at the company, gets this from both a product and talent perspective. "There's a long list of people who were turned away from Google who went on to do great things—I don't need to name names," he says, laughing.

But I will. One famous example is Kevin Systrom, a Google employee who was turned away from the company's associate product manager program because he had the wrong degree from Stanford—management science, not computer science. So he wandered off to found Instagram, which he sold to Facebook for $1 billion in 2012. The photo-sharing social media platform is now worth multiples of that purchase price.

> "GOOGLE IS IN THIS FOR THE LONG HAUL," SAYS A VETERAN ENGINEER AT THE COMPANY. "DIVERSITY MAKES ALL TECH BETTER, AND OUR PRODUCTS BETTER."

A lesser known but perhaps even more impressive technologist, Laura Mather, might have helped transform Google in other ways. Mather was an early cybersecurity expert, a rare breed who started at the NSA and then migrated to Silicon Valley, where she became an integral part of eBay's first antifraud team in 2003. She applied for and won a position at Google in 2006. But then, says Mather, her recruiter shared a message from Larry Page: that he was offering her the job, but he didn't think she was going to be successful because her school wasn't good enough. She had gotten her Ph.D. 12 years earlier from the University of Colorado. "It broke my heart; it was so irrelevant," she says. (Page declined to comment.) She was equally put off by the interviews: "All they wanted to do was prove they were smarter than me." She says she decided she didn't want to work for a company that wanted to tear her down.

Mather went on to cofound the antifraud startup Silver Tail Systems, which uses pattern-recognition algorithms to identify online fraud in real time. It was bought by EMC/RSA for $250 million in 2012. She then founded a software platform called Unitive, that, wait for it... helps companies eliminate bias in recruiting by helping hiring teams identify candidates based on skills and values rather than on what school they went to. Or, as she says with a laugh, "whether or not they played water polo." Who knows? Maybe Google will make her an offer. ■

TIM RYAN'S AWAKENING

PwC's U.S. chairman has responded to national racial traumas with a rare willingness to address uncomfortable issues—and to rally his firm and others. Can he really spark change?

BY ELLEN MCGIRT

Ryan talks about diversity with new PwC interns at a welcoming event in Washington, D.C.

▲ PHOTOGRAPHS BY **REBECCA GREENFIELD**

TIM RYAN, THE NEWLY MINTED U.S. CHAIRMAN OF accounting titan PwC, was set to have a great first week. "Like most new leaders, I had a 100-day plan," he says, smiling. "I was going to bring my new leadership team together. We'd bond, set big goals, do all that stuff." That was July 1, 2016.

Then on July 5, a black man named Alton Sterling, a CD seller, was shot by two white police officers in Baton Rouge. The incident was captured on two videos, which sparked immediate protests. The next day, a black cafeteria worker named Philando Castile was fatally shot by an officer during a traffic stop near St. Paul. His girlfriend, whose 4-year-old daughter was in the backseat, streamed his death live on Facebook. Then, on July 7, a disturbed veteran killed five officers in Dallas during a protest over police shootings. The world watched in horror on live TV as the terrified crowd scrambled to take cover. The shooter told investigators, before he was killed by a police robot, that he had been infuriated by the deaths of black citizens at the hands of police.

With those searing events, Tim Ryan's 100-day plan went into the dustbin. "I got the team together and asked what they thought we should say or do about what was happening," he says. "I knew it had to be something."

That "something" started as a series of emotional, companywide conversations about race that continue to this day and have transformed PwC leadership and emboldened employees. It has also changed the way the firm thinks about leadership development for PwC and the world. PwC plans to make its antibias training, already mandatory for new employees and those who are being promoted, available to the public for free. (PwC also sponsors *Fortune's RaceAhead* newsletter.)

Since July, Ryan, 51, has been thinking about other ways to share what the company has learned, including with clients and competitors. At first blush, his pitch sounds ridiculously naive: "Wouldn't it be great if all the CEOs of the *Fortune* 500, who employ millions of people in the United States, came together and acknowledged that, notwithstanding everything we've tried, we can do even more about race?"

Naive, at least, until you consider PwC's reach. The firm, which consists of audit, tax, and advisory businesses, brought in $35.9 billion in gross revenue last year. PwC claims 96% of *Fortune* 500 banking and capital market firms as clients in some capacity, 97% of automotive firms, and 100% of entertainment firms.

PwC is everywhere, giving Ryan a powerful platform to broadcast his message. "I sometimes meet with 20 to 50 executives a day," he says. "Now I bring up diversity in every meeting." For Ryan, the cause has become more than just moving the needle on corporate America's collectively dismal diversity numbers—PwC is faring no better than the typical big company, and that concerns him. It's about how to make people throughout the country better equipped to talk to, and not past, one another.

If you asked a 1950s schoolkid to draw a picture of a businessman, the sketch might resemble Tim Ryan: a trim white guy in a suit with a friendly smile, never a hair out of place, just the right amount of handsome—a guy you'd trust with the corporate coffers. Yet he's playing against type, surprising even himself. "If you had told me on July 1 that I'd be spending most of my time talking about race and thinking about how to solve these big problems," he says, "I wouldn't have believed you."

RYAN ACTUALLY KNOWS A LITTLE BIT about what it's like to be an outsider. He still remembers how he felt on his first day at Babson College, outside Boston: He was the first person in his blue-collar family to continue his education past high school, and he arrived with his possessions crammed in his uncle's old Army duffel bag. His dad—a lineman at the Boston Edison utility "in his jeans, work boots, and T-shirt on his lunch break"—dropped him off. He didn't dress like the mostly affluent parents saying goodbye to their sons and daughters. Ryan recalls himself as the "poor kid in the land of plenty," but he made friends and left with a degree in accounting.

From top: Ryan with Sanjay Subramanian, who leads PwC's diversity efforts in Washington; Ryan speaking at a PwC town hall; pressing the flesh at an event for the firm's D.C. partners.

Ryan felt equally out of place on his first day at PwC, in its Boston office, on a sweltering June day in 1988. "My mom had taken me shopping at Sears Roebuck for suits and such," he says, and they had bought two white dress shirts, both short sleeved. He realized their mistake during his first hours of training, as other rookies started taking their jackets off and rolling up their long, businessman sleeves. "I kept mine on as long as I could, but I was melting." He finally took off his jacket, and everybody stared. "Then I really melted," he says. "They were like, 'Who is this kid?'" The instructor took Ryan to Filene's Basement on their lunch break and bought him the kind of shirts that executives wear. "That meant a lot to me," Ryan says. "I thought, Okay, they're looking out for me. I'm going to make it."

Those are the kinds of stories Ryan likes to tell—he has a trove of them—that help him explain why he thinks the way he does, usually because he's about to ask the nearly impossible of you. He has collected life lessons—and the people who have delivered them—voraciously since he was a kid.

Ryan is earnest and direct, with a few traces of a workingman's Boston accent, all of which make him refreshingly accessible for a corporate executive. He's devoted to his six kids (he's divorced) and unrelentingly nice. What might come across as trite slogans when uttered by another executive sound authentic and profound when spoken by Ryan: *Listen more. Be kind. Change your mind when it's warranted. Care about people who are different from you.*

"My job is to get 100% out of everybody," Ryan says, "and everybody's 100% is different." He gleaned that wisdom in a dressing down he received as a teen working at a grocery store. Ryan and a buddy were caught mocking a special-needs coworker who wasn't as fast as they were at wrangling lettuce. "He's giving me his 100%," his manager told them. "Are you giving me yours?" Says Ryan, "I never forgot that." He never forgets any of it.

Ryan grew up in a working-class part of Boston for his first few years. Like his father, his mother also worked, as a cashier (in the same market as her son). "There were three things that mattered," he says. "One was working hard, the second was being honest, and the third was treating people with respect." Academics, he says, were not emphasized.

Race was a palpable presence in Ryan's early life. It was the early 1970s, and forced integration was coming to Boston's schools and his white neighborhood. "Suddenly everything was about black and white," he remembers. Listening to worried chatter in his family's double-decker home, he wondered what was going to happen and what they should do.

His father took a second job so the family could afford to move. In 1972 the Ryans relocated just past the Boston city limits to Dedham. "The neighborhood was a little rough," Ryan recalls. The schools weren't necessarily better. "My teacher tied me to a chair and put tape over my mouth on my first day," he says. "Today they might call what I had something else, but back then they just said I had too much energy." Two years later, the Boston public schools began integrating under a court order, triggering protests and race riots that made national news. Says Ryan, "The race talk, the emotions—it all made an impression on me."

Ryan took the "hard work" rule seriously, and like his brother and two sisters, he got busy making himself useful. Of all the jobs he had growing up, the one that meant the most to him was at Roche Bros., a small, family-owned grocery store chain that still employs his brother, brother-in-law, and dearest friends. From age 14 through his first couple of years at PwC (then called Price Waterhouse), he worked at every job imaginable, from cashiering and stocking to the produce department. "It was a high-end supermarket, we wore ties, and we were proud," he says. "That's where I learned that the customer is always right," he says.

Well, maybe not *always* right. Ryan advanced at PwC, focusing on financial clients. He had a disarming ability to be honest and persistent. In early 2008, Ryan pushed AIG to declare a "material weakness" in its financial results relating to the insurer's credit default swaps. It was a highly sensitive step to take given that the insurer was one of PwC's largest clients—and it put added pressure on AIG in the short term. (Ryan declined to comment on the episode.) The swaps, of course, turned out to be key culprits in AIG's near-collapse later that year. Ryan was vindicated and his actions earned him a reputation as a man of principle.

TIM RYAN REACHED THE TOP spot at PwC just as the nation was reaching a pinnacle of its own. The previous four years had seen an alarming number of lifeless black bodies filling national news feeds, most dead at the hands of the police. Starting with the death of Trayvon Martin in Sanford, Fla., in 2012, then with the shooting death of Michael Brown in Ferguson,

PwC's U.S. Workforce by the Numbers

5.5% ELECTED NOT TO ANSWER

SOURCE: PWC

Mo., in 2014, the incidents seem to multiply day by day, most of them captured in some form by photo, audio, or video. Black Lives Matter, which began as a hashtag after Martin's killer, George Zimmerman, was acquitted, had evolved into an increasingly visible movement trying to address, among other things, racism in the criminal-justice system. But for many white people, the BLM protests and online commentary were a confusing and frightening new element in a conversation about race that they didn't want to have in the first place. "This was the world that all of us, including our employees, were living in," said Ryan. "We had to understand what it meant to them."

Most corporate leaders struggled with what to say or do that week in July, and PwC was no exception. Ryan's newly formed team settled on a thoughtful letter to employees, no easy task in itself. They sent the letter on Friday, July 8.

Over the weekend, Ryan's in-box was flooded with emails from employees thanking him for saying something. "The big theme in the responses was that all this stuff was happening and the silence around it was deafening," he said. "If I'm coming to work—the place I spend more time than anyplace else, practically—and I'm not sure my son is safe, or I don't know what to say to a black person, then people can't realize their full potential."

Ryan announced that he wanted to get employees together to talk about race. A mild panic ensued. The response both inside and outside the firm was "'Oh, my God,'" says Ryan. "They worried that it would all go off the rails and turn into a fight about right and wrong and the police," he says.

The meetings, called ColorBrave: A Conversation About Race, were set to take place on July 21 in offices across the country. They were to be informal with no agenda. To preserve privacy, the sessions were not filmed, and employees agreed to keep what was discussed in the room. But that was it. No rules, no protocol. Ryan and Elena Richards, from PwC's diversity office, teed up the conversation with a short video and then just let people talk.

A lot could have gone wrong, says PwC's chief commercial officer, Reggie Walker. He feared a social media debacle. "I didn't want to look like we were taking advantage of the situation either," he says. Later, Walker got a call from Ryan. "He said, 'I think you're scared,' and he was right. I was. He called me out on it, in a good way."

PwC aims to increase its diversity. From top [left to right in each row], its new crop of Washington interns: Nick Dalcortivo, Qian Wang, Matt Kim, Cassidy Brown, Francisca DaSouza, Javier Perez Navarrete [an associate], Merab Shackleton, Basim Ainahar, Michael Burks, Oliva Butler, and Bilal Asad.

The Atlanta meeting was "uncomfortable at times," says Marvin Washington, a partner who attended it. People shared stories about being afraid for themselves or their sons at the hands of police, of navigating the pressures of mixed-race families, and about feeling invisible at work. Several PwC'ers told me there were more tears shed that day than on any other day in the firm's 160-year history. "What really got me was the response from the [white] leadership," says Washington. "They're like, 'Wow, I had no idea people felt this way, that they were going through these things.'"

Washington was recruited to the firm 13 years ago to fill a competencies gap; the firm had sold its consulting arm and needed people with experience with the federal government, which he had. Now Washington expects PwC to bring in more outsiders. "Most of the people at PwC grew up here, like Tim," he says. That's part of the diversity problem. If PwC is going to continue to grow, it will need to attract professionals with an increasingly modern set of skills. "And our clients expect diverse teams," he says.

Ryan has asked that all of PwC's units meet regularly to continue the ColorBrave conversations. Washington has found the gatherings eye-opening. He says he was the only black partner in the room at one such meeting, and he spoke up. "Oftentimes you feel like you're always auditioning to be accepted," he told the group. "And it feels like it will never end." The white partners had no idea he felt that way. "There are so many emotions bottled up in all of us, and it can be surprising to some people," Washington says. "But we've got a lot of momentum now." He says he now talks routinely with people in his network about race and their lives.

Many didn't know what to expect. Javier Perez Navarrete, a third-year associate on a banking and capital markets team in D.C., worries that his English doesn't quite measure up (he's from Puerto Rico). He found himself confessing his lack of self-confidence at a ColorBrave event. The message—be comfortable with the uncomfortable—hit home. PwC's antibias training also impressed him. "I used to think I should treat people the way I wanted to be treated," he says. "But really, I need to treat people the way *they* want to be treated." That's a subtle shift, one that requires a willingness to listen. "It's good," he says. "I'm growing."

RYAN IS "THE RIGHT BALANCE OF A BIG DREAMER AND AN ACTION-ORIENTED EXECUTIVE TO ACTUALLY GET THIS THING DONE," SAYS NEW YORK LIFE CEO TED MATHAS, WHO HAS JOINED HIS INITIATIVE.

C**ORPORATE DIVERSITY EFFORTS ARE** where, all too often, good intentions go to be slowly suffocated by a slew of committees, meetings, and initiatives. Ryan is trying to combat that by moving fast—though the process inevitably requires committees, meetings, and initiatives.

After the success of the July events, followed by the firm's commitment to continue the work in local markets, Ryan began making calls—lots of them. His dream was to get all the *Fortune* 500 CEOs together to change the world. Soon a short list of his counterparts at major companies emerged, including at competitor firms, who had similar ambitions and were open to working together on the thornier issues of race. So far, two dozen giant enterprises have agreed to work with him.

New York Life, a longtime PwC client, signed on right away. "I love Tim," says the insurer's CEO, Ted Mathas. "He's a big thinker. He's the right balance of a big dreamer and an action-oriented executive to actually get this thing done." Mathas continues, "He works closely with our audit committee to ensure the integrity of the books. Great. But doing a really good job as our audit firm is just table stakes. We spend *a lot* of time together. Tim's thing is always, What else can we do together? This is a perfect example of that, and Tim's exactly the kind of person who can invent something important for the business that has nothing to do with our books."

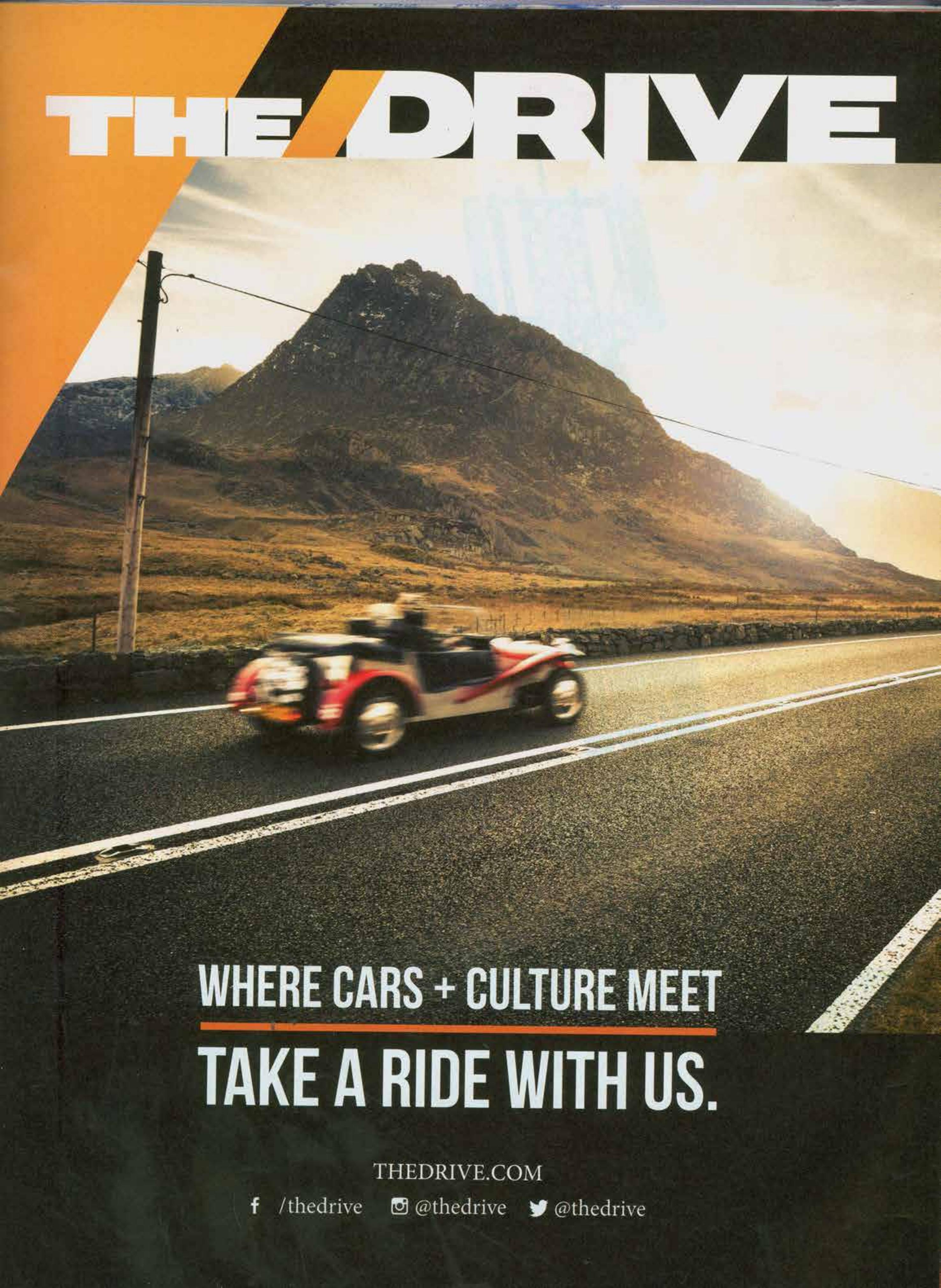
What is still emerging is how Ryan's new, largely leaderless alliance can put a shape to a conversation about race that improves the lives of companies and communities. Ryan, working hard to recruit other participants, says he is loath to discuss specifics until he has more companies onboard.

Ron Parker, CEO of the Executive Leadership Committee, an organization of black executives dedicated to corporate diversity and inclusion, has been watching Ryan's work unfold. "They're a longtime sponsor of our events, so we've worked closely with them over the years," Parker says. He is thrilled but not surprised by Ryan's quest. "Tim has a lot of courage on this but also credibility in the marketplace. He can garner a level of support to make this a very extensive conversation."

Parker was particularly struck that Ryan started by bringing competitors onboard. "Tim reached out to industry peers, like Accenture and Deloitte and E&Y, and they aligned with him right away," Parker says. Then the hard work was to figure out what they wanted the larger *Fortune* 500 cohort to sign up for. One of Parker's roles has been to help frame the issue. "We needed to add the sense of urgency as to why this needs to happen now," he says.

What happens next is still unfolding. "Every *Fortune* 500 CEO is going to be briefed on what is going to take place, and they will make the decision on whether or how far or how deep they're going to play on this topic," says Parker. Expect a commitment to implicit bias training and sharing best practices, with some bold-faced names taking the lead. "When you have enlightened leaders like Julie Sweet at Accenture, Indra Nooyi at PepsiCo, and Brian Cornell at Target, you have to take advantage of that kind of leadership," he says. "This is their point in time to step forward on the topics and issues that we've all been silent on."

Will all that be enough to make a difference? Diversity and race are, after all, notoriously intransigent challenges. Still, mustering a large coterie of leaders who account for a discernible chunk of our economy can only help. ■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IS THE WORLD ENOUGH FOR HUAWEI?

After climbing to the top of the smartphone market in its home country, the Chinese giant is taking off in Europe. But to challenge Apple and Samsung, the world's No. 3 phonemaker needs to figure out how to reach American consumers—or how to live without them.

★ BY SCOTT CENDROWSKI

▲ ILLUSTRATION BY BENEDETTO CRISTOFANI

WAY UP AMONG THE FORESTS, fens, and tundra of Finland, 5,000 miles from its headquarters in the balmy south of China, Huawei is disrupting the world's smartphone oligopoly.

As Nokia's home country, Finland was once the center of the cell phone universe; later (along with most of the rest of the world) it became Apple and Samsung territory. But over the past 18 months, Huawei's smartphone market share there has climbed from almost nothing to the summit. In the first quarter of 2016, Huawei sold 10 times as many phones as Apple in Finland, according to research firm IDC. And in October it soared ahead of Samsung for the market-share lead.

Today you can't stride through Helsinki without encountering a Huawei billboard. You can't watch Jokerit, one of the country's top hockey teams, without seeing Huawei's flower-in-bloom logo. And you can't find an electronics store where Huawei's phones don't outnumber Samsung's and Apple's. "It was remarkable," says IDC researcher Francisco Jeronimo, who flew from London this winter to see for himself. "Their devices were everywhere."

Like many tech professionals, Jeronimo once expected that Apple and Samsung's choke hold on high-end smartphones would last for many years to come. The companies have been No. 1 and No. 2 worldwide since 2011, and during that span they have never had a consistently strong third-place challenger. That gives the two more leverage to command outsize profit margins.

Enter Huawei—probably the most viable contender yet to loosen the giants' grip. It's a 170,000-employee company with $61 billion in sales, selling telecom equipment in 170 countries. Since 2014 it has been No. 1 globally in sales of the networking equipment that underpins telecommunication systems, taking the crown from Sweden's Ericsson. And now its goal is to dominate the market for the phones themselves. It has taken big strides toward doing just that in China and in growing swaths of Europe—helped in those Western countries by side deals with wireless carriers that have not previously been reported.

Huawei owes part of its success to a technical breadth that competitors can't match. It makes products along every point of wireless communications: It builds the telecom networks that transmit signals, the chipsets inside smartphones that interact with the networks, and the handsets themselves, which it manufactures mostly in the sprawling city of Shenzhen. It's as if General Motors had paved the Interstate Highway System, then started selling cars. Flush with cash from

YU: CHRISTOF STACHE—AFP/GETTY IMAGES; FINLAND: LI JIZHI—XINHUA/SIPA USA; ZHENGAI AND ZI: PA IMAGES—SIPA USA

its networking sales, Huawei spends more on research and development than its Chinese rivals do, helping it build handsets whose quality is close to that of iPhones and Galaxies.

The result: skyrocketing growth. In 2015, Huawei sold 108 million phones, ranking third worldwide. For 2016, it estimates that its shipments jumped 30%, to 140 million, and its phone revenue an estimated 40%, to 178 billion yuan ($26.5 billion), while the industry grew only by single digits globally. "It's really grown fast," says Gartner analyst CK Lu, who studies China's smartphone makers. "From a global perspective, Huawei is the most successful Chinese brand."

This surge was long in the making. Loans from China's government helped Huawei build a network business in Africa and Latin America; the experience it earned there helped it win networking-equipment deals with major carriers in Europe. Now Huawei is selling its newest devices for those same networks in Europe, where it doubled its smartphone market share in the first nine months of 2016, to 12.2%. Huawei is the top smartphone seller in Portugal and the Netherlands and the second biggest in Italy, Poland, Hungary, and Spain. Like Apple and Samsung, the company now unveils phones in splashy shows in Munich and London, inviting hundreds of journalists and paying for many to attend.

In China, the world's biggest country for smartphone sales, the fight for leadership resembles a game of king of the hill among closely matched domestic companies (see "China's Smartphone Big Four"). But even there, Huawei's ascendancy is striking. At the end of 2015, Huawei took the top spot for the first time, passing Apple and low-cost Xiaomi after boosting sales that year by more than 40%. The most recent market-share figures, depending on who's measuring, show Huawei as either No. 1 or within a couple percentage points of the top.

Immodestly, Huawei sees itself very soon passing Apple globally. "We are going to take [Apple] step by step, innovation by innovation," Huawei's consumer head, Richard Yu, told a reporter at a Munich product launch in November. He later told *Fortune* that Huawei would pass Apple in handsets sometime in 2018. That's an ambitious but not unattainable goal: In the third quarter of 2016, Huawei's 34 million smartphones shipped worldwide trailed Apple's 46 million (with both far behind Samsung's 73 million).

To close that gap, however, Huawei will need to replicate its conquest of Finland in many other, bigger markets—no easy feat. In much of Europe, *Fortune* has learned, carriers that use Huawei's networking equipment can get significant

GLOBAL REACH
Above, from left: Richard Yu, head of Huawei's consumer division, unveils the Mate 9 phone at a launch event in Munich in November; an engineer adjusts Huawei antennas at a base station in Finland, where Huawei is now the top-selling smartphone maker; founder Ren Zhengfei (right) gives Chinese President Xi Jinping a tour of Huawei's London offices.

CHINA'S SMARTPHONE BIG FOUR

Apple and Samsung dominate pricey smartphone sales, accounting for about a third of the market. But the next several names on the global bestseller list include four lower-cost Chinese competitors that collectively sell almost as many handsets as the big two. [Market share as of third quarter of 2016.]

Oppo: Oppo, owned by billionaire Duan Yong Ping, made its name selling cheaper phones in rural China [where it has 200,000 retail locations] and Southeast Asia. Its R9S looks like an exact copy of an iPhone 7—a winning formula in China.

Vivo: Marketing for Oppo's sister brand Vivo, also owned by Duan, focuses on its smartphones' camera, a major selling point in selfie-obsessed China. Celebrity endorsements and its sponsorship of the NBA in China have propelled the brand.

Huawei: The network-equipment giant sold an estimated $26.5 billion worth of phones in 2016. It's the only Chinese phonemaker whose devices are on par with Samsung's in quality—which helps explain its strong recent growth in Europe.

Xiaomi: Xiaomi's phones, all the rage in 2014, are falling out of favor almost as quickly as they became hits, hurt by mediocre reviews and a lack of retail distribution. The formerly online-sales-only company is making a big push to open retail stores.

discounts on its smartphones—side deals that have not previously been reported. That's a sales-boosting bonus other smartphone makers can't offer. But it's also a tactic Huawei can't use in the U.S. Geopolitical tensions have kept Huawei from selling network equipment in the States, which in turn has made the brand a stranger to American wireless carriers. Not coincidentally, Huawei smartphones are a virtual nonentity in the U.S., capturing less than 0.4% of the market.

Huawei founder Ren Zhengfei has talked about breaking into the U.S. time and again, former employees say. More $500-plus phones are sold here than anywhere else, making the country a gold mine of profits and prestige. But Huawei's efforts so far have come up empty—and even the company doesn't see that changing soon. So it finds itself at a crossroads: Can it really topple Apple or Samsung, or at least become their global peer, without making it big in America?

UNTIL FAIRLY RECENTLY, even most Chinese consumers asked, "What's Huawei?" For years the company was one of many manufacturers making cheap, low-quality phones, mostly "white label" products for telecom carriers that slapped their own logos on the back. Huawei didn't see a future making them: It even tried to sell the business in 2008, but it couldn't find a buyer. Huawei's own employees brought Samsung and Apple phones to work.

It was an embarrassment that founder Ren, who still holds the CEO title and directs strategy, almost certainly noticed. When Richard Yu, who had led Huawei's European networking division, took over the consumer business in 2011, he knew the company needed to move into higher-quality devices. But it couldn't happen overnight. "I remember the first year I took over the smartphone business, we sold less than 1 million," Yu said in a recent interview at Huawei headquarters. Changing that has taken its toll: Yu carries the paunch of someone who spends two weeks a month on the road. He has quit running marathons, he says: "I'm too heavy."

But Yu and his team were sprinters in using Huawei's networking expertise to their advantage. Most of the world's 1,000 smartphone manufacturers enjoy inexpensive access to what it takes to build a phone. Google provides Android software for the operating system; ARM, owned by Japan's Softbank, licenses its design for chipsets. But the intellectual property of cellular networks—how phones talk to the network towers—is not shared, and that's where Huawei focused.

When Yu took over, Qualcomm, Ericsson,

Nokia, and other Western and Japanese companies controlled 3G cellular network patents in the West, effectively keeping Huawei out of many markets. Huawei, however, was devoting its energy to patents and standards for the next generation: 4G phones, run on networks 10 times as fast as 3G and better suited to an always-updating app culture. "In the last three or four years, they've invested a lot in [intellectual property]," says Neil Shah of Counterpoint Research. "It's almost on par with what Samsung or Apple has done." That eventually allowed Huawei to sell phones in Western markets that Samsung and Apple had dominated, without cowering from IP litigation.

By 2014, Huawei was producing the first Chinese smartphones that could credibly claim quality as good as, and in some ways better than, Samsung's. Huawei's phones were the first to include modems that let Chinese users receive calls in basements and parking garages, where other brands' phones cut out. What they lacked in Apple-style cachet, Huawei phones made up for with strong reception, powerful cameras (Huawei's P9 brought dual-camera systems to consumers a few months before the iPhone 7 arrived), and slick designs. By the third quarter of 2016, 60% of Huawei's smartphone shipments were mid- and high-priced devices, a striking reversal of its past reliance on cheap handsets.

The cash generated by its \$35-billion-a-year network-equipment business gave Huawei the resources to market phones to almost every consumer in China. And the company proved to be a nimble adapter that can sell both high and low. When a competing Chinese brand, Oppo, won over female buyers, Huawei countermoved with a new product line called Nova. When Xiaomi grabbed the world's attention in 2014 with a business model of selling phones online, offering rock-bottom prices by eliminating retail overhead, Huawei reacted by building its own inexpensive online-only brand, called Honor. The lower-priced Honor made up 40% of Huawei's total shipments in 2015, helping sales volume skyrocket. But the company still recorded high revenue growth thanks to higher-priced, Huawei-branded phones.

Conquering China was a way for Huawei to grow powerful, but not necessarily rich. Neil Mawston of Strategy Analytics estimates Huawei generated \$200 million of smartphone operating profit in the third quarter; Apple's smartphone profit was \$8.5 billion. Huawei's opportunities in China are limited by a constantly replenishing pool of competitors willing to lose money to build market share. "Our consumer business is profitable, but the margin compared with Apple and Samsung is very low," Yu admits. Europe, where Huawei can sell higher-priced phones, is where the company sees an opportunity to grow it.

HUAWEI SMARTPHONE MARKET SHARE

SOURCE: IDC

HUAWEI MIGHT NOT have earned that opportunity abroad if it hadn't been considered a national champion at home. Ren Zhengfei, a former army engineer, founded the company in Shenzhen in 1987 to sell telecom switches. Officially, Huawei has kept China's government at arm's length. According to a story widely reported in Chinese media and sourced to a government planning official, former Premier Zhu Rongji approached Ren around 2000, when Huawei was expanding rapidly, and told Ren he could arrange a loan of 300 million yuan (\$35 million). Ren turned it down: He didn't want to be hooked too tightly to the government.

But a less direct form of state support has benefited Huawei. The China Development Bank, tasked with supporting Chinese companies' expansion abroad, is the world's largest, with \$1.8 trillion in assets (bigger than the controversial Export-Import Bank of the U.S. by a multiple of 64). Just after Christmas in 2004, CDB signed a \$10 billion agreement with Huawei to provide loans to its customers in Africa and Latin America; the credit level later rose to \$30 billion.

"If there had been no government policy to protect [national companies], Huawei would no longer exist," Ren has said. Huawei's revenue soared after the loan guarantees kicked in; overall, its sales nearly quintupled from \$3.8 billion in 2004 to \$18.3 billion in 2008. Huawei was undercutting competitors' prices by anywhere from 10% to 30%, and Huawei executives routinely traveled with Chinese government officials on dealmaking trips, according to Nathaniel Ahrens, who studied the company for the Center for Strategic International Studies in Washington, D.C.

The experience gained in Africa and Latin America and other emerging markets paved the way for Huawei's acceleration in Europe. Huawei rose to international prominence in 2005 when it struck a global equipment deal with U.K.-based multinational carrier Vodafone. By 2007 it had deals with all the major European carriers. And by 2015, Huawei's smartphone quality was up to the European carriers' quality standards—ready to be deployed on the very networks that Huawei equipment helped build.

That's where Huawei's breadth gives it a major edge in the smartphone market today, says Jeronimo, the IDC research director, who previously worked at Korean conglomerate LG selling its smartphones to Vodafone. Huawei offers carriers vouchers worth a percentage of their spending on network equipment, which they can use either for network services or smartphones from Huawei, Jeronimo has confirmed with at least one European wireless operator. "If you don't buy the Huawei network, you pay a certain price," Jeronimo says. "If you do buy a Huawei network, then you get a better price." If a carrier uses the discount on Huawei phones, the savings can be several percentage points of the total cost, or millions of dollars. "In the end it's a very strong incentive for carriers to buy Huawei devices," Jeronimo says. Since they make a bigger profit when they sell or lease them to consumers, and since Huawei's phone quality has improved, those phones get better marketing placement.

It's not an incentive the companies are eager to discuss: In a hot, competitive market, they tightly guard the financial details of their partnerships. Huawei told *Fortune* it wouldn't comment on "confidential business arrangements with customers." Huawei network customers Vodafone, T-Mobile (of Germany), and Orange (France) also declined to comment. A spokesman for Elisa, one of Finland's largest wireless providers, said its core relationship with Huawei has been built on devices, including USB Internet dongles and smartphones, but added, "We cannot go into commercial details regarding our cooperation."

Whatever the specifics may be, Huawei's success in Europe illustrates just how important strong relationships with wireless carriers have become to smartphone makers. And it also helps explain Huawei's biggest dilemma: its continued irrelevance in the U.S.

IN THE STATES, Huawei's smartphones don't crack the top 10, trailing even *who-dat?* companies like BLU and OnePlus. A direct-sales website, GetHuawei.com, has gotten nowhere. Shoppers can buy Huawei phones at Best Buy or on Walmart.com, but few do. Huawei sold just 153,000 handsets in the U.S. in the third quarter of 2016; Apple sold nearly 12 million.

Huawei's ties to the Chinese government and presumed ties to China's army have plagued its U.S. business for a decade. Its attempted acquisitions of U.S. network-server and switch companies have been blocked twice, in 2007 and 2010, by the White House Committee on Foreign Investment in the U.S., which can invoke national-security concerns to prevent such deals. In 2010, Republican senators thwarted Huawei's bid to sell networking equipment to Sprint Nextel. And a 2012 report from the House Committee on Intelligence raised concerns about Huawei's government ties. Despite being short on evidence, the committee's recommendation that U.S. companies avoid Huawei's equipment remains influential, and a Donald Trump administration appears unlikely to be more accommodating.

IN THE U.S., HUAWEI PHONES DON'T CRACK THE TOP 10 IN SALES. "THE U.S. REMAINS THEIR BOTTLENECK," SAYS AN ANALYST. "IT WILL TAKE TIME."

Unable to sell equipment to them, Huawei doesn't have the relationships with American wireless companies that it enjoys in Europe. None of the U.S. "big four"—Verizon, AT&T, T-Mobile, and Sprint—has cut a deal with Huawei. Since carriers account for 80% to 90% of smartphone sales in the U.S., Huawei isn't making an impression on consumers, and Americans can't find Huawei in the carrier-branded stores, kiosks, and websites where most buy their gear.

Yu, Huawei's consumer chief, recognizes that Huawei needs to build those relationships from scratch. "The past five years we were not taking the right strategy," Yu says. "We didn't have the right people." Huawei recently hired Michelle Xiong, a former Verizon wireless executive with experience negotiating with device makers, to help sell Huawei's smartphones. But a Huawei staffer cautions that any carrier agreement is at least a year away, pushing meaningful success in the U.S. at least three years down the road. (Verizon had no comment on its relationship with Huawei; AT&T did not respond to requests for comment.) "The U.S. remains their bottleneck," says Shah, the Counterpoint analyst. "It will take time."

The bottleneck hasn't choked Huawei's ambitions. "We want to grow into top two [in] market share, and, in the future, top one by 2021," Yu says matter-of-factly at the end of an interview.

Minus big American sales, Huawei may get a boost from a technological breakthrough—in 5G wireless service. Today, 5G is more imagined than real (standards won't be finalized until 2020), but the technology promises speeds of 60 times that of current 4G networks. Even more important is the number of connected devices it can support—an estimated 1,000 times the connections of a 4G network, which would make 5G the architecture for a pending rush of Internet-connected cars, homes, businesses, and smart cities. Analysts see Huawei, along with Sweden's Ericsson, as an early leader in building that network.

In Finland in November, the carrier Elisa claimed a world record: It sent data through its network at 1.9 gigabits per second, a speed capable of supporting virtual reality without glitches or the fastest movie streaming users could imagine. The speed was reached on a test network—built by Huawei. It was a glimpse of the next information superhighway. And with success in the U.S. a distant possibility at best, it may also be a glimpse of the fast-lane innovations Huawei will need if it's ever going to catch Samsung and Apple. ■

▲ PHOTOGRAPHS BY **THE VOORHES**

The Brazilian investors who control Kraft Heinz are applying their proven formula to construct a new global food colossus. What will they buy next?

BY GEOFF COLVIN

In

EXTREME MAKEOVER

3G CAPITAL, the Brazilian private equity group that runs Kraft Heinz, has rapidly cut costs [and boosted market expectations] since merging Kraft with Heinz in 2015.

	BEFORE...	...AND AFTER
EMPLOYEES	46,600	41,000
OVERHEAD	**18.1%**	**11.1%**
REVENUE	$29.1 billion	$26.8 billion
MARKET VALUE	$63 billion	$105 billion

IN MADISON, they still struggle to accept that it's really happening. On a not-yet-specified day before the end of March, a Kraft Heinz employee will turn off the lights in the sprawling Oscar Mayer plant, and for the first time in 98 years, no one will be coming back to work.

The facility was once the city's largest employer, with over 4,000 workers transforming hogs, 900 an hour, into Oscar Mayer hot dogs, bacon, sliced ham, and more. Employment was down to about 1,000 when Kraft Heinz announced in 2015 that it would close the plant, and recently the workers had dwindled to about 400; the products still being made include an item called liver cheese, which few consumers under age 80 are clamoring for. No one knows what happens after March. Because the 50-acre site will need environmental remediation, its "value" is estimated at negative $10 million to negative $20 million. The city is scrambling to drum up interest in the site but was caught flat-footed; planners never imagined that Oscar Mayer would leave. Redeveloping so many acres won't be easy. Madison Mayor Paul Soglin told a local publication, "It's possible that given its size, it will take a decade or more to develop."

So what happened? Why is a plant that provided good jobs to 1,000 people just 15 months ago being shut down? (Other than the liver cheese.) The answer explains a lot more than the fate of a Midwestern processed-meat factory. It also illustrates Kraft Heinz's iconoclastic strategy under the hard-driving management of 3G Capital, the private equity firm overseen by Brazil's richest man, 77-year-old Jorge Paulo Lemann. The answer even hints at the future of the U.S. food industry—and perhaps has global implications—because all evidence suggests that 3G is just getting started in an effort to transform this whole vast sector. But evidence also suggests that the 3G playbook, which has worked spectacularly well over

○ SOURCE: SEC FILINGS. "BEFORE" COMBINES DATA FOR KRAFT AND HEINZ AS OF DEC. 28, 2014; MERGER WAS COMPLETED JULY 2015. "AFTER" IS MOST RECENT DATA FOR KRAFT HEINZ.

the past 30 years, may not prove so effective this time.

YOU CAN BE forgiven if you're not up to speed on the intertwined corporate marriages and divorces in the world of Big Food. Kraft Heinz came into being 18 months ago when Heinz bought Kraft Foods Group, a mostly U.S. grocery manufacturer that in 2012 had separated itself from a collection of mostly non-U.S. snack businesses now known as Mondelez International, an independent, publicly traded company that could reenter this saga before long. Heinz had been bought and taken private in 2013 by 3G Capital, with considerable financing from Warren Buffett. When it then bought Kraft and merged it with Heinz in 2015, 3G took the combined business public as Kraft Heinz. Buffett's Berkshire Hathaway owns about 27% of the stock; 3G, about 24%.

Got that? While Buffett is the largest shareholder by a slight margin and has three seats on the board of directors, including one for himself, he's happy to let 3G run the show. Back before they bought Kraft, he said, "I'm not embarrassed to admit that Heinz is run far better under [3G] than would be the case if I were in charge."

The 3G management model that Buffett so admires is worth a close look because it's on track to eat the food industry. At its heart is meritocracy, broadly defined. Every employee must justify his existence every day. That's great news for the very best performers; they are promoted with speed that's unheard-of in lumbering old food companies. Kraft Heinz CEO Bernardo Hees, for example, first became a CEO in 2005 at a company called All America Latina Logistica, owned by a 3G predecessor. He was then made CEO of Burger King, a 3G holding since 2010. He moved up to be CEO of Heinz in 2013 and now of Kraft Heinz. He's only 46.

Underperformers get fired with the same alacrity. Budgeted costs also are evaluated unsparingly every year, or more often, and are eliminated if they're no longer judged worth incurring. After all, Hees (pronounced "Hess") and other top executives are 3G partners. Their own money is tied up in each venture, and they can't afford to be sentimental about it.

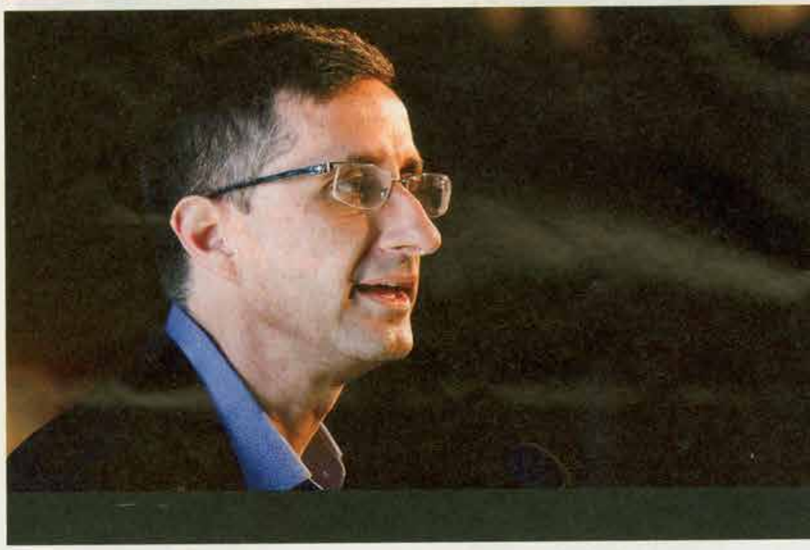
Which brings us back to the Oscar Mayer plant in Madison. The truth is, that plant should have been closed long ago, and everybody knew it. "The Madison plant was a terrible plant," says John Ruff, a retired Kraft executive who spent much of his career in food-processing plants worldwide. "It had good people, but it was an old plant that had been added to over the years. It was never meant to be run as it was being run. Closing it was probably the right thing to do." So why hadn't Kraft closed it long before 3G came along? The reason is a classic problem for big, old businesses: People loved that plant. It was a treasured part of the company's history. But not to 3G. "[Kraft] had trouble making tough choices," says Credit Suisse analyst Robert Moskow. "3G has forced them to make tough choices, like closing the Oscar Mayer facility. It was very emotional." Ruff agrees: "3G got rid of a lot of remaining emotional ties."

Now project that philosophy across a $26 billion company. Step 1 in the 3G management model is a wholesale replacement of the top team and a blitzkrieg of cost cutting. At Heinz, 3G cashiered 11 of the top 12 executives in one day (as this publication chronicled in a 2013 story headlined "Squeezing Heinz"). When Heinz bought Kraft, 10 top executives were quickly dismissed. Of Kraft Heinz's top 10 leaders today, eight are Brazilians from 3G who know the playbook. "If you don't speak Portuguese, you're at a bit of a disadvantage," says a former Heinz director.

As with every 3G takeover, cost-cutting measures were imposed immediately after the takeover of Kraft. Office refrigerators long stocked with free Kraft products (cheese, Jell-O) were wheeled out within days of the merger's closing. Corporate aircraft were ditched, and everyone from the CEO down was made to fly coach. And today employees on the road are sometimes required to double up in hotel rooms. More important than the actual savings is the message. "We think and act like owners of our business, treating every dollar as if it were our own," the company tells prospective employees.

The real savings take longer to implement. Kraft Heinz's new leaders wasted little time announcing they would close seven plants in North America and consolidate production in other locations, eliminating some 2,600 jobs. (One of the seven, a plant in Fullerton, Calif., was recently given a reprieve due to strong demand for Lunchables.) Additional savings come from a second-order effect: States, cities, and labor unions, desperate not to lose their local facility, start offering incentives to the company to keep it open. In December, for example, Boone County, Mo., granted Kraft Heinz large tax abatements to keep operating its hot dog plant, with 40% fewer workers, even though it had not been scheduled to close. The company is closing a 71-year-old plant in Davenport, Iowa, but building a new one nearby—and getting $4.75 million in incentives in a deal that requires the new plant to employ only one-third as many workers as the old one.

Predictably, 3G does not favor grand corporate digs. It moved Kraft out of its lush suburban Chicago campus into one-quarter the space, occupying five floors of a downtown skyscraper. The floor plan is mostly open—lots of desks, few offices.



WARREN BUFFETT'S BERKSHIRE HATHAWAY OWNS 27% OF KRAFT HEINZ, BUT HE LEAVES THE MANAGING TO HIS BRAZILIAN PARTNERS FROM 3G CAPITAL. KRAFT HEINZ CEO BERNARDO HEES [BOTTOM] PREVIOUSLY RAN BURGER KING FOR 3G.

BUFFETT: KEVIN LAMARQUE—REUTERS; HEES: KEITH SRAKOCIC—AP

SO FAR THIS sounds like a typical private equity strategy of slashing costs at a portfolio company and preparing for an exit in five years or so. But 3G is far from typical. To understand its unique MO and what it might portend for Kraft

KRAFT HEINZ'S SHOPPING LIST

WALL STREET IS BETTING that Kraft Heinz will make a major acquisition soon—it's already priced into the stock—and the big question is what. Though the company is mum, it clearly needs more sales outside the U.S., and the ideal target would carry some fat to be cut. Kraft Heinz is presumed to favor friendly deals, not hostile ones, and a target must be available at a reasonable price. Here's how the top contenders stack up.

	MONDELEZ	GENERAL MILLS	CAMPBELL SOUP	KELLOGG	MEAD JOHNSON
COMPANY SUMMARY	Split off from Kraft five years ago, the snack giant could be headed for a reunion with its ex.	The Minnesota maker of Wheaties and Betty Crocker has valuable brands but is growing slowly.	Led by CEO Denise Morrison, Campbell has recently made a big push into fresher and healthier food.	Much of the stock of the cereal maker is held by two trusts, either of which may fight a merger.	The Indiana infant-formula manufacturer offers limited upside because of its robust Ebitda margins.
MARKET CAP	$69.6 billion	$35.7 billion	$18.6 billion	$25.7 billion	$13.2 billion
CORE OVERHEAD	**17%**	**13%**	**13%**	**16%**	**26%**
INTERNATIONAL SALES IF MERGED WITH KRAFT HEINZ	48%	25%	20%	27%	29%

Heinz and the food industry, consider its highest-profile investment, AB InBev.

Lemann and his two partners, Carlos Alberto Sicupira and Marcel Herrmann Telles, bought a Brazilian brewer called Brahma in 1989. Then Brahma bought a big competitor, Antarctica, in 1999, and merged it with the giant Belgian brewer Interbrew in 2004, creating InBev. Its brands included Bass, Beck's, Labatt, Skol, Stella Artois, and many others. Then, in an act of breathtaking ambition, InBev bought the world's biggest brewer, Anheuser-Busch, in 2008 for $52 billion. And *then*, even more remarkably, AB InBev bought the world's No. 2 brewer, SAB Miller, in the third-largest corporate acquisition in business history, paying over $100 billion. The deal closed last fall and gives AB InBev some 200 brands, including three that are marketed globally: Budweiser, Corona, and Stella Artois. The company brews almost one-third of all the world's beer.

Note a few key elements of how this was done:

• Unlike other PE firms, which have an exit in mind from the day they buy a company, Lemann and partners have stuck with their beer venture for 28 years and counting.

• While the mergers with Interbrew and Anheuser-Busch required the partners to dilute their stake, they still dominate the board, with four of the 15 directors.

• The pattern is buy, squeeze, repeat. The 3G managers developed extraordinary operating skills and greatly increased the value of every company they bought, but they were not great innovators. They achieved growth through acquisitions—not organically.

And there's the rub: A central feature of this model is that it can't work forever. It builds value only by buying more compa-

FROM LEFT: ALAMY STOCK PHOTO; COURTESY OF GENERAL MILLS; ALAMY STOCK PHOTO; COURTESY OF KELLOGG; COURTESY OF MEAD JOHNSON

SOURCES: **CREDIT SUISSE; STIFEL. COST-CUTTING OPPORTUNITY—CORE OVERHEAD AS PERCENTAGE OF REVENUE.**

nies. "It's like the shark that can't stop swimming," says a director of another major foodmaker. But AB InBev can't apply the model further because it's so big that antitrust authorities would never let it buy another significant brewer. So what's next? Anyone who might know is not saying. Speculation in the industry is that since AB InBev can expand only outside its industry, its next target will be Coca-Cola.

THUS THE GREAT question: Is Kraft Heinz intended to be the AB InBev of food, dominating its industry so completely that the only remaining players are minor? 3G plays its cards very close to the vest—Hees declined to be interviewed for this article—and does not even offer earnings guidance to investors. But all signs say yes. The Brazil Journal blog reported in November that 3G is raising $8 billion to $10 billion to buy a global consumer goods company through Kraft Heinz. (3G won't comment on the report, naturally.) Regardless of whether the report is accurate, an acquisition fits the pattern. It's how 3G creates value. Plus, it's about time. The firm bought Kraft two years after buying Heinz, and now it has been almost two years since the Kraft acquisition.

Investors are so sure that Kraft Heinz will make a big acquisition that they've priced one into the stock. By looking at analysts' consensus forecast of profits, it's possible to calculate a stock price that fairly reflects the present value of that future profit stream. When the EVA Dimensions consulting firm ran that analysis for *Fortune* on the basis of economic profit (after-tax operating profit minus a capital charge), it got a stock price for Kraft Heinz of $59. Actual recent stock price: $87.

The only way Kraft Heinz is worth that much is if it generates far more economic profit than anyone expects the company, as constituted, to generate. That is, investors are already betting on another big 3G-style acquisition. EVA Dimensions CEO Bennett Stewart concludes, "Kraft Heinz needs to add another Kraft Heinz, and at the right price—and the sooner the better."

The whole U.S. food industry is speculating on who's next. The leading candidate, somewhat ironically, is Mondelez, which would be remarrying its ex, Kraft, after only five years. Activist investor Bill Ackman's Pershing Square hedge fund

END OF THE LINE

Kraft Heinz's decision to close its 40-year-old plant in Upper Macungie, Pa., put roughly 400 employees out of work. The good news? There are jobs to be found in the area. The bad news: They don't match up to the ones that just left.

© SARA HARLSON FOR FORTUNE VIDEO

BY ERIKA FRY

bought $5.6 billion of Mondelez stock just weeks after the Kraft Heinz merger closed, in what was widely regarded as a bet that Mondelez was 3G's likeliest next target. (Ackman and Mondelez declined to comment for this article.)

For 3G, Mondelez's attractions are several. Most important, it would help Kraft Heinz achieve one of its top priorities, expanding outside the slow-growing U.S. market. Kraft Heinz does only 30% of its business abroad; adding Mondelez would raise that number to 48% for the combined company. It would increase Kraft Heinz's business in the fastest-growing food markets, the emerging economies, from 12% to 26% of sales. Mondelez also offers an attractive opportunity for 3G to work its operational magic because its Ebitda (earnings before interest, taxes, depreciation, and amortization) margin is only 18.3%, the lowest of the main potential targets. (The others are Kellogg, Campbell Soup, General Mills, and infant formula maker Mead Johnson.) That leaves a lot of room for Kraft Heinz to raise the margin toward its own towering 30%. One more advantage: Mondelez seems unlikely to resist a deal at the right price. Its board includes activist investor Nelson Peltz and Carlyle Group managing director Patrick Siewert, both ardent value seekers.

It's easy to see why rumors of an imminent deal keep popping up, most recently in December (causing Mondelez's stock price to jump 5%). But a closer look reveals at least one significant challenge to a deal. Mondelez's widely dispersed global footprint could be a problem as well as an attraction. The 3G efficiency machine works best on big, coherent operations, not on far-flung operations in 165 countries. Dramatic improvements, which Kraft Heinz would need to produce, could be hard to achieve.

Other potential targets all pose problems as well. General Mills, which investors seem to consider the second-best bet for a deal, is slow

G

GREG REITENAUER still feels like the rug has been ripped out from under him. "You get so caught up in life," he says. "You never think that the day will come where you'll lose your job and have to find a new one."

For Reitenauer, 54, that day came last July when he was laid off from the Kraft Heinz plant in Upper Macungie Township, Pa., near Allentown, after 33 years of service. He was one of roughly 400 employees who found themselves out of work when the company decided to shutter the plant, which officially closed on Nov. 18. Most recently, the 40-year-old factory had produced A1 steak sauce, Grey Poupon mustard, and Tassimo and Keurig coffee products. Kraft invested $35 million in the facility in 2013. But that was before the merger with Heinz and the arrival of the new cost-cutting management team from 3G Capital, which moved the plant's production to other Kraft facilities in the U.S. (and a small portion to a plant in Canada).

Don Cunningham, president and CEO of the Lehigh Valley Economic Development Corp., says that while the closure of the Kraft plant is unfortunate, it's just "a small ripple" in the region's fast-growing economy. Jobs in the local manufacturing and industrial sectors are as plentiful as they've ever been in the 820,000-person region, says Cunningham. In fact, the Kraft property has already been sold and will be redeveloped for industrial use.

Just a couple of decades ago, the Lehigh Valley was reeling from the closure of Bethlehem Steel. Today, because of its central location, says Cunningham, it's a booming distribution and logistics hub for e-commerce operations like Amazon, Walmart, and Zulily and a favored production site for food and beverage companies like Ocean Spray and Nestlé Purina PetCare.

Those employers have already absorbed some of the laid-off Kraft Heinz workers, but the jobs aren't quite the same. At Kraft Heinz, they worked eight-hour shifts, had solid benefits, and made $22 to $30 an hour, or roughly double the wage that one gets in the area's e-commerce warehouses. While some companies, like Ocean Spray, offer comparable pay, available jobs often involve 12-hour shifts that are daunting to older workers.

"I don't want to go to a job that pays $10 an hour, and have to work every day of the week, 14 hours a day, just to live," says Joanne Nichol, a 53-year-old worker who joined Kraft three decades ago.

Reitenauer hopes to go back to school but says he's mired in the process of securing his benefits. "Everything in this country is a political game," he says. "I don't think anyone actually cares about the people who work."

growing and wouldn't noticeably increase Kraft Heinz's international exposure. Mead Johnson's Ebitda margin is already almost as high as Kraft Heinz's. Campbell Soup has a dominant shareholder, the Dorrance family, and much of Kellogg's stock is held by two trusts, any of which might fight a merger, even at a good price.

Another, larger factor could frustrate Kraft Heinz's search for a much-needed takeover target: The entire food industry is "3G-ing" itself before Kraft Heinz can do it to the companies. Ever since 3G bought Heinz, every major U.S. foodmaker has announced an initiative to reduce its overhead significantly. 3G embraces a demanding discipline called zero-based budgeting, in which every unit's budget is assumed to be zero at the beginning of each year, and every proposed expense must be justified anew. What do you know? Soon after the Heinz deal, Mondelez adopted zero-based budgeting, trumpeting the expected savings to Wall Street. When Kraft Heinz was closing down plants and laying off workers last summer, General Mills announced it would close five plants and eliminate 1,400 jobs.

Back when 3G was rolling up the beer business, it was taken less seriously—an out-of-nowhere striver. Now everyone in the food business sees it coming and adapts. With fewer excesses left to wring out of target companies, the 3G model might not be as profitable as it used to be.

Kraft Heinz can still find opportunities, mostly because competitors can't or won't run the 3G playbook as well as Kraft Heinz does. The unsentimental reasoning with which the company closes plants is applied more broadly. For example, virtually every big company has too many projects underway, and they're hard to pare back because each one has a constituency. Kraft Heinz trims them anyway under the mantra "fewer, bigger, better," concentrating resources where they're most effective; it's worth the price of disappointing some people.

Not many companies would put everyone including executives on a simple $50 per diem for food while traveling. But doing so not only saves money directly, it also frees managers from low-value hours of inspecting expense reports for rule violations. The company's extreme meritocracy is too intense for many corporate cultures, but it attracts exactly the people 3G wants—"fanatics," as they put it. Management guru Jim Collins, who has worked with 3G for over 20 years, believes fanatics are key to 3G's success. "Such obsessed people do not become the most popular people, as they often intimidate others," he writes, "but when fanatics come together with other fanatics, the multiplicative effect is unstoppable."

Combine those policies, relentlessly enforced, and the result is operational superiority. Major competitors are diminishing Kraft Heinz's lead, but it's still a big lead.

THE GREATER THREAT to Kraft Heinz becoming the AB InBev of food is its ability or inability to handle the long-term shift in consumer tastes. The growing preference for fresher, healthier products is a crisis for Big Food, and some players are taking risks to confront it aggressively. Campbell Soup under CEO Denise Morrison is betting heavily on fresh foods, though it has little expertise in that area. Hormel, famed for Spam, has performed extraordinarily well by creating such utterly un-Spam-like products as peanut butter snacks, a pea-based protein shake, and a food service burger made with chicken, quinoa, and kale.

But Kraft Heinz isn't going that way. Under the policy of "fewer, bigger, better," it's focusing innovation on a few "big bets" that are mostly tweaks of famous, old Big Food products: Jell-O (invented in 1897) reformulated without artificial flavors, dyes, or preservatives; shelf-stable mac and cheese (1937) made with better cheese; Velveeta (1918) cut into smaller blocks. Those products are performing well, but they seem a tepid response to the industry-shaking reality of growth shifting strongly from the center of the supermarket, where those products reside, to the perimeter, where the fresh foods live.

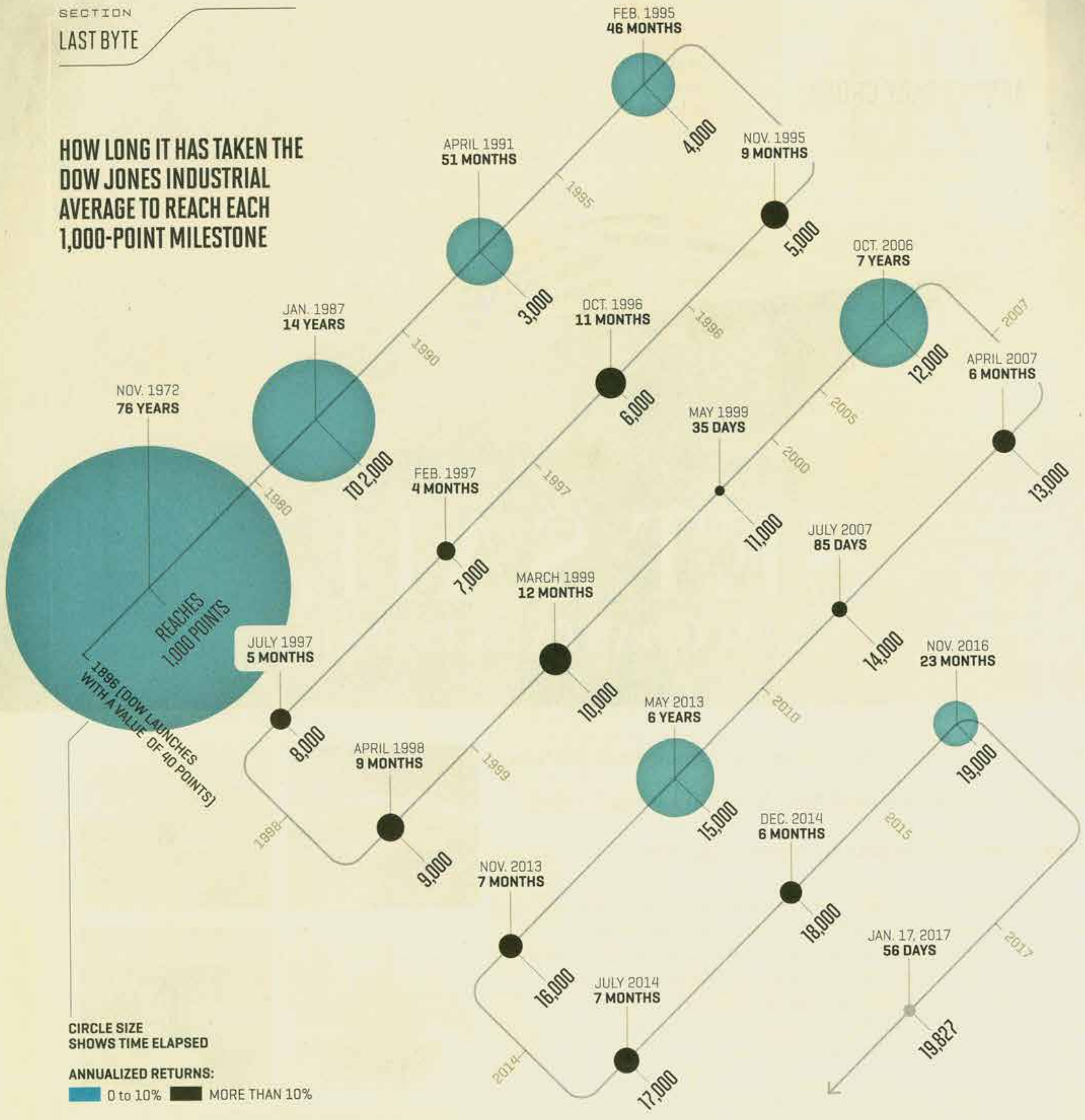
Weak innovation is one reason Kraft Heinz has been shrinking, not growing. Revenue in 2016 was likely about 3% less than in 2015, which was almost 6% less than combined Kraft and Heinz revenue in 2014. The company gave up some business willingly as it focused on the best uses of capital. But that process is mostly done, and analyst forecasts for this year and next show inflation-adjusted revenue as flat.

Kraft Heinz today illustrates the essential 3G: quite possibly the world's best at creating value by eliminating costs and focusing on the most promising opportunities, but not adept at growing the top line organically. In such a model, performance is front-loaded in the years right after an acquisition. Analysts expect Kraft Heinz profits to increase by smaller percentages each year.

That's why the shark must keep swimming. Even as the food industry changes—and as competitors learn how to make themselves slightly less appetizing prey—Kraft Heinz can probably find enough acquisition targets to keep its model going for years.

But what if Kraft Heinz fully becomes the AB InBev of food and someday finds nothing left to buy? For now, the unsentimental, analytical response is to note that such a risk is a long way off, and discounted to the present, it doesn't amount to much. ■

HOW LONG IT HAS TAKEN THE DOW JONES INDUSTRIAL AVERAGE TO REACH EACH 1,000-POINT MILESTONE



WATCHING THE DOW LEAP

IT'S A MOMENTOUS MILESTONE: Dow 20,000. And it was within reach as *Fortune* went to press. Thanks to a post-election stock rally, the Dow Jones industrial average has been flirting with the 20K mark since mid-December (getting as close as 19,999.63 on Jan. 6). The stock index—which tracks the value of 30 large U.S. companies—just crossed 19,000 for the first time in November. But investors should be careful about rooting for the new record: The last (and only) time the Dow jumped 1,000 points this fast, in 1999, it took 7½ years to level up again. —**JEN WIECZNER**

SOURCE: **S&P GLOBAL MARKET INTELLIGENCE**

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