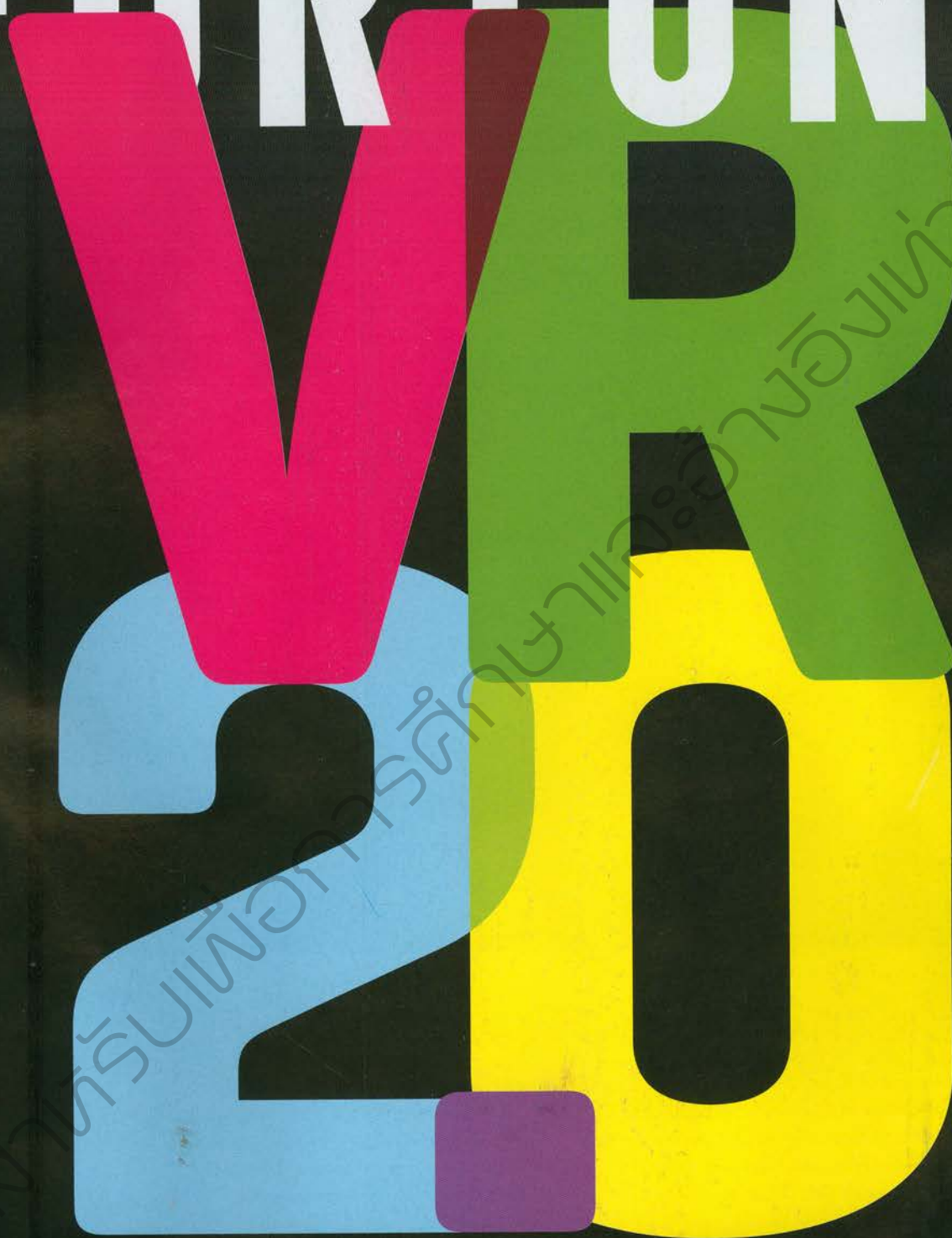


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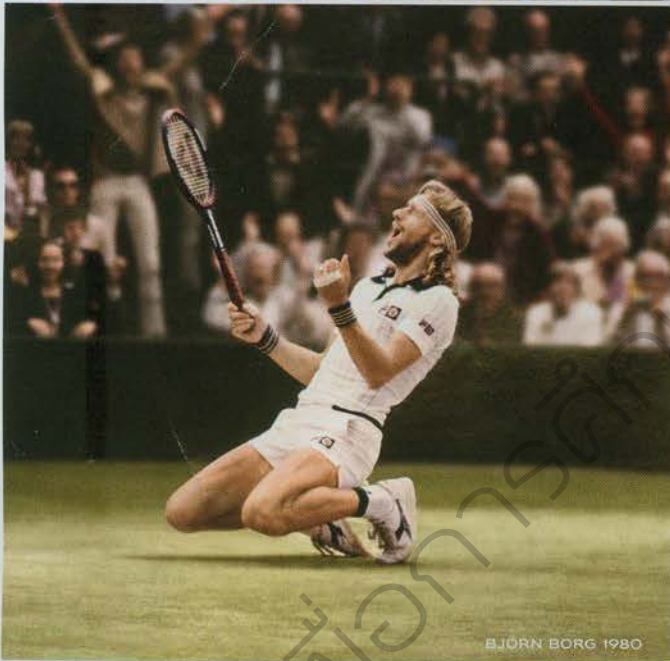


WHY SILICON VALLEY IS BETTING
ON **VIRTUAL REALITY** ... AGAIN

ASIA PACIFIC EDITION NUMBER 7



CENTRE COURT



BJÖRN BORG 1980



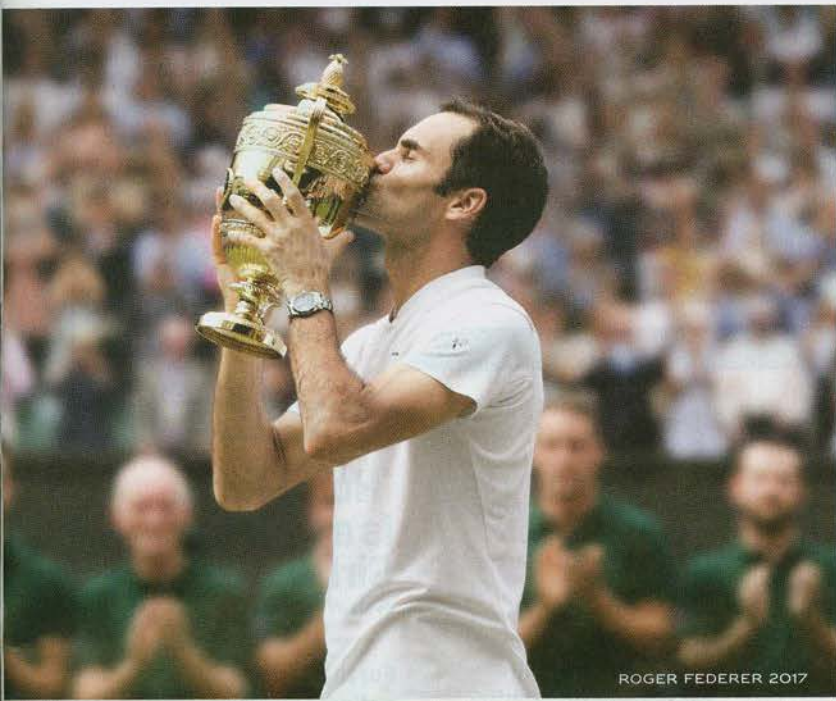
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SAMSUNG



One giant leap for reality

QLED 8K

THE
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BRIEFING



The Shifting Fortunes of Automation

Technology didn't depress wages—until it did. The hidden story in one macroeconomic indicator could explain why. **By Geoff Colvin**

MACRO

HERE'S A MYSTERY: Why is workers' share of total economic output declining? If you think that's been happening forever or that the answer is obvious, you'd be wrong. On the contrary, through most of the past two centuries of booms, busts, wars, and technological revolution, labor's share of GDP stayed remarkably constant (around 65% in the U.S.). That finding, when first unearthed decades ago, surprised everyone. British economist John Maynard Keynes called it "a bit of a miracle." Nonetheless, it looked like a fact of life—workers' pay grows with GDP.

BRIEFING

But then, of course, it didn't. Starting in the 1980s, around the world, labor's share began to fall slowly. In 2000, it began to fall quickly. Labor share is now 56% in the U.S., which translates into some \$11,000 less in annual income for the average household than with a 65% share. The decline has been even steeper in some countries, notably Germany, and has occurred also in developing economies, including China, India, and Mexico.

So what's going on? The leading suspect is technology, but the causal relationship isn't as obvious as it may seem. After all, the tech advances of the 19th century were revolutionary, and they improved living standards dramatically. What has changed in the past 30 years about the relationship between technology and wealth distribution?

Recent research

by Daron Acemoglu of MIT and Pascual Restrepo of Boston University outlines an eye-opening new way of analyzing technology's effects on workers. Automation always eliminates jobs, they note, and technology also creates new jobs; machinery displaced a lot of farmworkers in the 19th century but also created millions of new jobs in manufacturing, for example. That may be common knowledge, but comprehensive figures on tasks eliminated and created by technology were not readily available.

So the researchers did some heavy-duty number crunching and found them. "Look at the 40 years after World War II," says Acemoglu, referring to a period when the labor share was still holding steady. "There was quite a bit of automation [that eliminated tasks] but also quite a

bit of introducing new tasks—they were almost identical." (Think of all the new jobs in services as they became a much larger part of the U.S. economy in the 1950s and 1960s.) "Then the sea change in the last 30 years—automation gets a little faster, but the introduction of new tasks gets very, very slow. That's the big headline finding."

It's also the mystery. The significant implication of this research: For the first time in modern history, automation isn't necessarily good for workers overall. "Our evidence and conceptual approach" do not support "the presumption that technological change will always and everywhere be favorable to labor," Acemoglu and Restrepo write. "If the origin of productivity growth in the future continues to be automation, the relative standing of labor will decline."

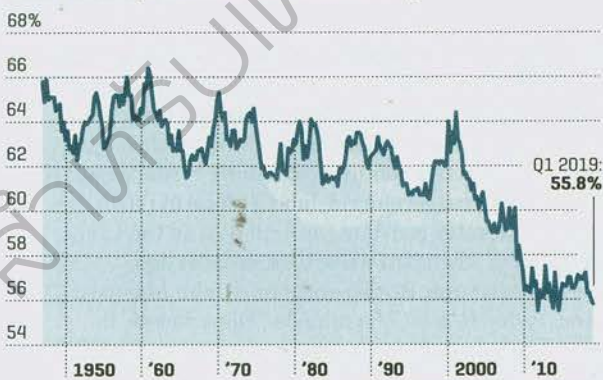
Again, why? For non-economists observing the world around us, it's hard not to conclude that the big-picture explanation involves technology's increasing power—a combination of Moore's law, advanced algorithms, and universal connectivity, all at ever-falling cost. Maybe tech has crossed some threshold relative to human capabilities. If so, capital wouldn't augment labor with

technology, as it has always done, but sometimes would have an incentive to fully substitute for it. The number of non-automatable jobs, existing or still unimagined, would dwindle. Daniel Susskind of Oxford University has proposed an economic model based on a new type of capital along these lines, "advanced capital," that is purely labor-displacing. His model leads to a scenario in which "wages decline to zero."

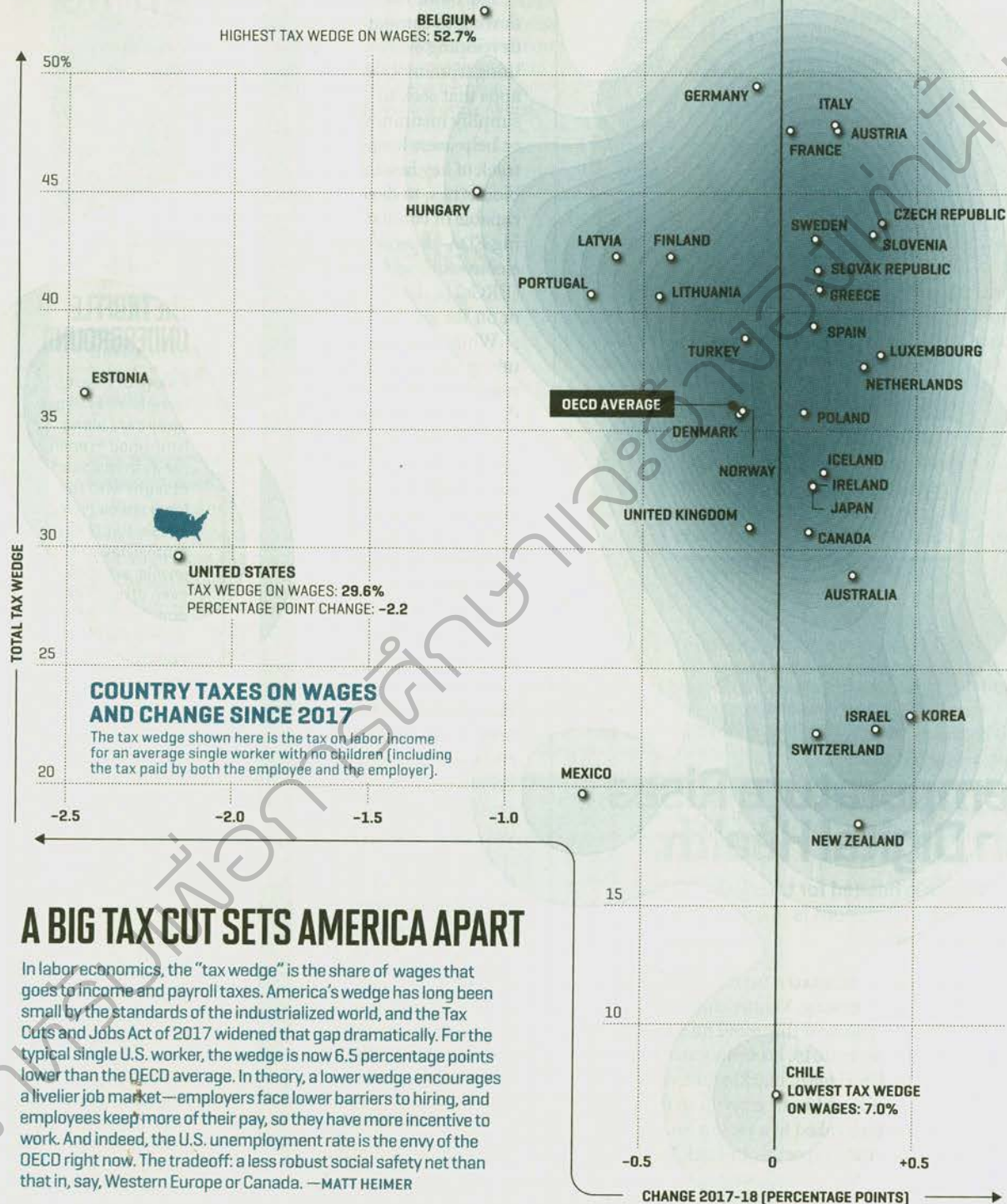
Virtually no other researcher is ready to go there. But the increasingly mainstream view—that technology can still make workers better off but doesn't necessarily—reflects a world-changing shift in the way automation affects labor. It requires new assumptions by business and government leaders, investors, and workers. It suggests that voters may demand public policy that controls technology's effect on workers, since tech can't be counted on to boost workers' well-being overall.

In a 2013 lecture, former Treasury Secretary Lawrence Summers said, "This set of developments is going to be the defining economic feature of our era." That's looking truer every day. A major societal realignment is in its early stages. Brace for the tumult.

LABOR SHARE (NONFARM BUSINESS SECTOR)



SOURCE: BUREAU OF LABOR STATISTICS



A BIG TAX CUT SETS AMERICA APART

In labor economics, the “tax wedge” is the share of wages that goes to income and payroll taxes. America’s wedge has long been small by the standards of the industrialized world, and the Tax Cuts and Jobs Act of 2017 widened that gap dramatically. For the typical single U.S. worker, the wedge is now 6.5 percentage points lower than the OECD average. In theory, a lower wedge encourages a livelier job market—employers face lower barriers to hiring, and employees keep more of their pay, so they have more incentive to work. And indeed, the U.S. unemployment rate is the envy of the OECD right now. The tradeoff: a less robust social safety net than that in, say, Western Europe or Canada. —MATT HEIMER



Withings' BPM Core and Move ECG are both FDA-pending as electrocardiograms.



AliveCor's KardiaMobile 6L goes far beyond the capabilities of wrist-based EKG devices.

Temperature Rises on Digital Health

Health care is headed for the cloud. Digital health tech investment is nearing the moon.

By Sy Mukherjee

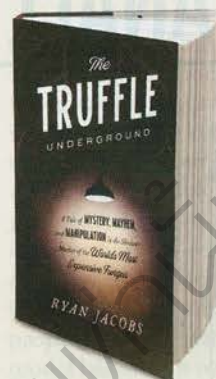
VENTURE THE DIGITAL HEALTH funding fever is far from breaking. Venture funding for digital health firms around the world hit an all-time high of \$14.6 billion in 2018, according to a new report from StartUp Health, marking the eighth consecutive year of investment growth. In the U.S. alone, health startups raked in a record \$8.1 billion, according to a separate report from Rock Health.

That number was just \$1.1 billion in 2011.

The money is flowing to companies developing everything from mobile apps that seek to simplify insurance or help users keep track of key health biometrics, to devices capable of conducting FDA-approved electrocardiograms (EKGs) in the home or on the go.

While most start-ups in the space have remained private to date, the public will soon be able to get a piece of the action. A slew of digital health IPOs are expected in the second half of 2019 from diabetes management firm Livongo, health data firm Health Catalyst, and technology intermediary Change Healthcare. Not to mention the high-end exercise platform Peloton, which recently filed confidential IPO documents.

Even if some of these early tests of the public markets sputter, the general buzz in the space will almost certainly last. For technologists and their funders, solving the mysteries of the human body, and the U.S. health care system, remains an irresistible challenge.



REVIEW

THE TRUFFLE UNDERGROUND

A GANG of thieves speeds away in get-away cars along tree-lined French roads in the dead of night with the local police giving chase. But these crooks haven't stolen jewels, artwork, or even drugs. They've poached truffles. Who knew fungi could cause so much drama? As investigative reporter Ryan Jacobs unearths in *The Truffle Underground* (Clarkson Potter), the truffle supply chain is a dangerous, sometimes lethal business involving fraud, sabotage, and animal cruelty. Jacobs puts the reader in the foxhole with French investigators as they seek to pin down who is running the crime ring, making the book both a full-fledged mystery and an exposé about a luxury delicacy whose price is far higher than you ever imagined.

—RACHEL KING

HARD FACTS

CHINA'S INDUSTRIAL economy may be ailing, but it remains the cement capital of the world. From 2011 to 2013 China used more cement [6.6 gigatons] than the U.S. did in the entire 20th century [4.5 gigatons], as Bill Gates pointed out at the time in a famous blog post. Both consumption and production have fallen from that peak, and cheap imports from Vietnam are reshaping the market. Still, the 2.3 gigatons China produced in 2018 is enough to outpace any other nation.



Selling Seychelles for the Seashore

Innovative financial products like “blue bonds” could play a big part in saving the world’s oceans. By Erika Fry

ECO-FINANCE

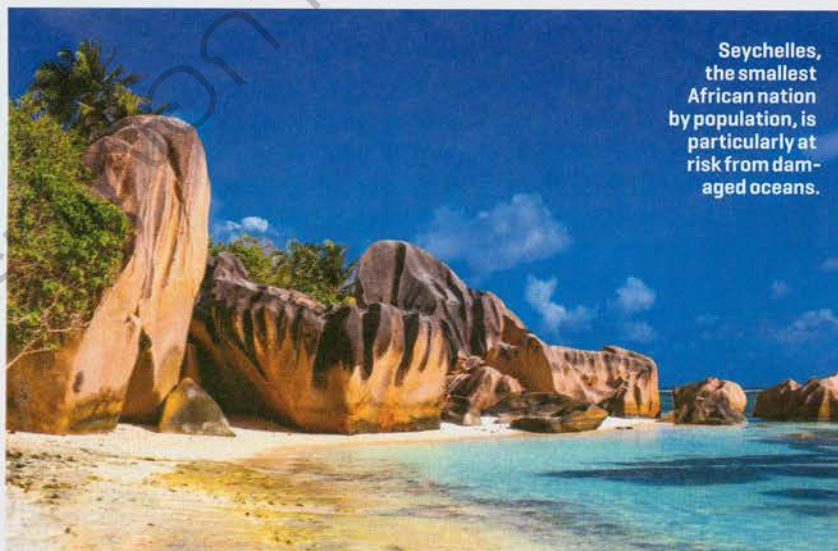
CAN WE FINANCIALLY engineer our way out of climate change and polluted oceans? Maybe not, but financial innovation is emerging as a popular tool to help in the race to protect the planet. Last year, the market for “green bonds,” a decade-old asset class that funds environmentally friendly projects, reached a record \$163.7 billion, up from \$36.6 billion issued in 2014, according to the Climate Bonds Initiative, an international not-for-profit.

Now there is a wave of novel financial instruments aimed at saving the oceans and alleviating

the world’s water crises. They include “blue bonds,” which, structured like their chromatic cousins, are being used to raise money to tackle issues from the ocean’s plastic waste problem (Morgan Stanley recently sold \$10 million worth) to wastewater management. Last year, Seychelles launched a multi-million-dollar blue bond, and the Nordic Investment Bank, on behalf of Baltic and Nordic countries, did so this year. “We’re

just scratching the surface,” says Navindu Katugampola, head of green, social, and sustainability bonds at Morgan Stanley.

Seychelles, whose economy—largely, tourism and fish—heavily depend on healthy oceans, also did a groundbreaking deal with the international nonprofit The Nature Conservancy (TNC). In exchange for TNC purchasing and refinancing a chunk of the nation’s debt, the government committed to using the newly raised capital to protect and manage marine resources. TNC, which structured the deal like previous (and successful) debt-for-nature swaps in Latin America, plans to work with dozens of other coastal and island nations on similar financing maneuvers. Done right, says TNC’s Robert Weary, the whole “blue economy”—livelihoods and the environment—should be better off.



Seychelles, the smallest African nation by population, is particularly at risk from damaged oceans.

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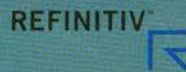
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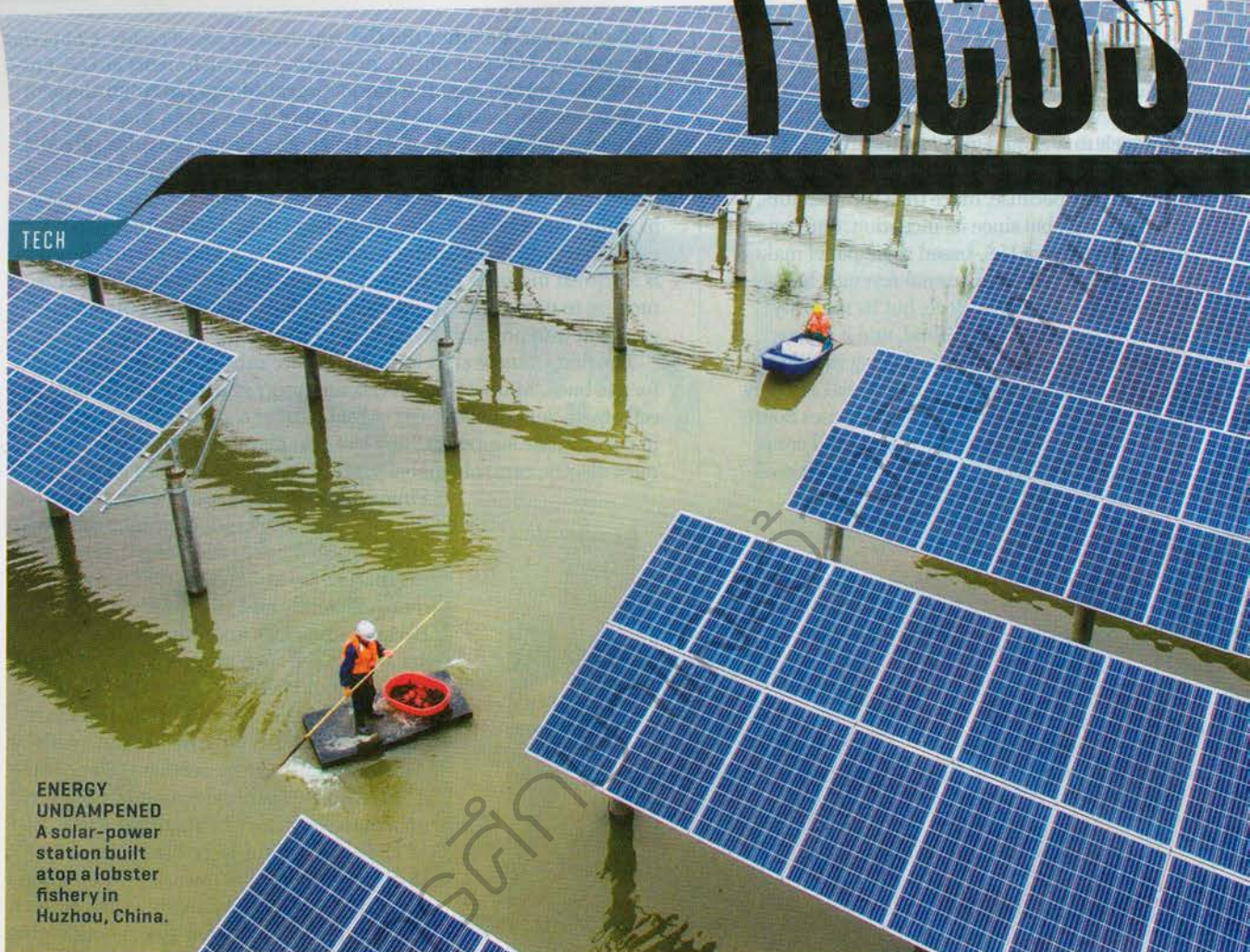


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UNDAMPENED**
A solar-power
station built
atop a lobster
fishery in
Huzhou, China.

THE DILEMMA OF 'GREEN CHINA INC.'

**U.S. businesses can profit from China's clean-energy boom—
if trade tensions don't disrupt their flow.** By Jeffrey Ball

SO MUCH FOR CLAIMS THAT THE U.S.-CHINA trade war is boosting American jobs, REC Silicon, a Norwegian firm that produces polysilicon at its plant in Moses Lake, Wash., announced in May that it planned to mothball the facility this summer “unless access to Chinese polysilicon markets is restored.”

REC has postponed a final decision, on the chance that a truce might emerge. But the facility's uncertain future hints at a broad, troubling trend. Polysilicon is a key raw material used to make solar panels; China is its top global consumer. Indeed, China, which has decreed green industries to be a strategic priority, has become the world's largest producer of clean-energy equipment and of clean energy itself. The U.S. has shown less sustained interest in those arenas—but plenty of interest in quashing the Chinese green giant.

That approach is hurting not just the planet but also America's bottom line. The trans-pacific tariff war is nowhere as intense as in the clean-energy sector, where it is backfiring and harming U.S. companies. Anti-China fever

is also blinding the U.S. to opportunities, as China's clean-energy sector modernizes in ways that offer savvy players chances to make money.

Green China Inc. is growing up. The U.S. approach to it should grow up too.

Protectionism is particularly problematic in clean energy because, more than most sectors, it has been global since its inception. SunPower, one of the biggest U.S.-based solar-panel makers, with \$1.7 billion in annual revenue, has its headquarters in San Jose, but its majority owner is French oil giant Total, and it makes many of its panels in Asia, including in China. General Motors has said it plans to sell as many as 20 electric-car models by 2023; it uses South Korea's LG as a supplier of batteries and components for the electric Chevy Bolt, and it sees

manufacturer. But after the U.S. imposed its panel tariffs, China did the same on U.S. polysilicon, prompting retrenchments at U.S. factories. REC began slashing production at Moses Lake months ago.

America has reasons to worry about Green China Inc.'s rise. With its command-and-control economy, China provides subsidies to "strategic" green industries and supports state-owned banks to finance the national mission. And American firms doing business in China face real obstacles, including spotty intellectual-property protection and government preferences for Chinese firms. But now is a critical moment for smart U.S. engagement because China is moving to modernize its green enterprise in two ways that should create new opportunities for U.S. capital.

The first Chinese shift is to restructure subsidies to get more bang for the buck. Many of China's clean-energy efforts remain economically inefficient. Electric-car subsidies offer a good example. Thanks in part to state support, China last year accounted for 60% of the pure-electric cars sold globally, according to Bloomberg New Energy Finance. But Chinese leaders are concerned the subsidies aren't inducing enough innovation. So they're redrawing them to steer the market toward models that use power more efficiently and go farther on a charge. Because some U.S. and European automakers already sell such models, Chinese policy changes could help those Western players. So could China's move, last year, to let foreign automakers build cars in China without local joint-venture partners. That was a big reason Tesla broke ground in January on a massive factory in Shanghai.

The second Chinese reform is an effort to direct more capital toward lower-carbon investments. China is dangling carrots, such as lower interest rates for "green bonds" that finance eco-friendly projects, and waving sticks, such as a mandate that publicly traded Chinese companies disclose their environmental liabilities. For Western financial giants ginning up green-finance businesses, China represents a surging market. Already, Ernst & Young is one of the biggest auditors of Chinese corporate green-bond projects, and JPMorgan Chase and other U.S. banks

are peddling services to help Chinese clients issue such bonds.

The planet needs China to clean up its act. But history suggests calls for climate comity are largely beside the point. Far more relevant is that a growing array of U.S. businesses need Green China Inc. to succeed for the good of their financial returns. ■

Jeffrey Ball is scholar-in-residence at Stanford University's Steyer-Taylor Center for Energy Policy and Finance and a nonresident senior fellow at the Brookings Institution. This essay is adapted from a Brookings paper he wrote.



China as a key electric-car market. Major U.S. sellers of clean-energy wares have Chinese suppliers, investors, customers, or all three.

The REC Silicon plant is one of the latest unintended casualties in the trade fight. More than five years ago, the U.S. imposed tariffs on Chinese solar panels, accusing China of "dumping" overly subsidized goods on the global market. The U.S. hoped tariffs would significantly boost its own solar-panel manufacturing workforce, but that hasn't happened. Between 2017 and 2018, U.S. solar employment fell 3.2%, to about 242,000 jobs, according to the nonprofit Solar Foundation; solar-manufacturing jobs shrank by nearly 9%. Polysilicon was one of the only solar markets in which the U.S. was a significant

WELCOMING COMMITTEE
Workers at the groundbreaking ceremony for Tesla's new factory in Shanghai.

TIKTOK IS ON A TEAR

The video-sharing app has gained a massive following of young users. The challenge will be to turn that popularity into a money-making business. **By Eamon Barrett**



TECH

DURING LUNCHTIME AT middle schools across the U.S., adolescents stare at 15- to 60-second clips of their friends lip-synching to Beyoncé on the video-sharing app TikTok. At home, it's more of the same: Tap on TjK Tok, scroll through a feed of clips featuring shtimmies to Shakira or skateboard stunts, and then pick one to watch.

Even in the annals of viral apps, TikTok is a standout. Since debuting two years ago, it has been downloaded 950 million times—mostly by teens seeking snippets of entertainment or

looking to share their own rapping, dancing, or magic skills with the world.

TikTok is so popular in fact that, by one measure, it ranks among a who's who of tech. During the first three months of this year, it was the third most downloaded app worldwide, ahead of Facebook and Instagram, and just behind WhatsApp and Facebook Messenger, according to app analytics firm Sensor Tower.

"TikTok's all about these scrappy viral videos shot with no budget and low production," says Randy Nelson, head of mobile insights at Sen-

sor Tower. “Unlike on Instagram or YouTube, which are far beyond their maturation point, TikTok’s a Wild West.”

Still, with the growth, TikTok is quickly morphing from its roots in amateurish lip-synching clips to a destination for more elaborate videos cut with increasingly sophisticated editing tools. Reenactments of movie comedy scenes and cooking tutorials are just some of what’s popular on the app.

But video apps are a particularly fickle business, as users inevitably flock to the next big thing. They’re also notoriously difficult to make money from—so much so that few, if any, have ever turned a profit.

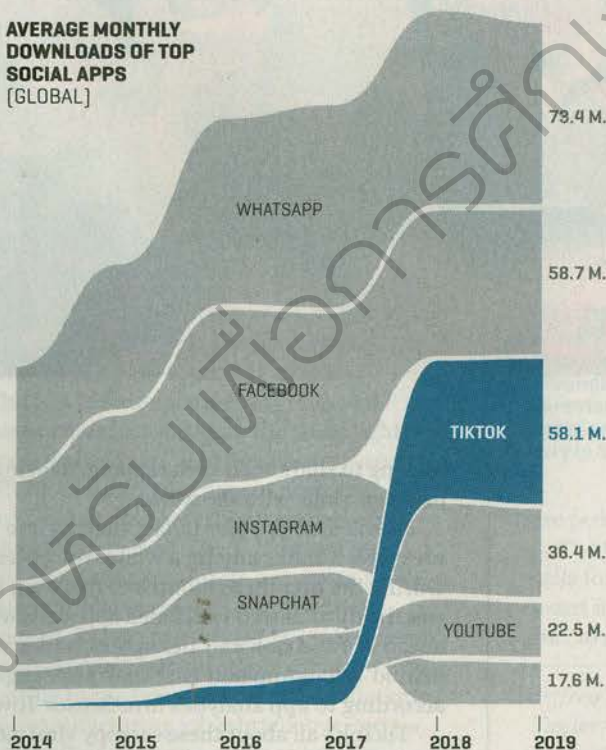
Twitter, for example, learned the hard way, after jumping on the video bandwagon in 2012 by paying \$30 million for Vine, a then-hot app that let users shoot and share six-second clips. For a short period of time, Vine flourished. But the fad quickly passed, prompting Twitter to shutter the service in 2016.

TikTok, which declined to comment for this article, is owned by ByteDance, a Chinese tech conglomerate founded in 2012 by former Microsoft engineer Zhang Yiming. The company’s first product provided users with a personalized list of news headlines. After a few more forays into news and entertainment, Zhang introduced Douyin, a video-sharing app

A VIDEO SUPERSTAR IS BORN

In just a few years, the number of people who have downloaded TikTok has soared. It now ranks among the most downloaded mobile apps, rivaling powerhouses like Facebook’s constellation of apps.

AVERAGE MONTHLY DOWNLOADS OF TOP SOCIAL APPS (GLOBAL)



TOP APP DOWNLOADS IN Q1, 2019 (GLOBAL)



NOTE: DATA INCLUDES DOWNLOADS OF MUSICAL.Y, WHICH WAS FOLDED INTO TIKTOK IN 2018.

SOURCE: SENSOR TOWER

for the Chinese market, in 2016. A year later, ByteDance created an equivalent video app for overseas users under the brand name TikTok.

It was hardly an overnight success. But then ByteDance paid nearly \$1 billion for Chinese-owned Musical.ly, which had gained impressive traction among U.S. teens who used it to share short videos of themselves lip-synching. Zhang soon folded it into TikTok, which then started to take off.

Facebook is clearly paying attention. Last year, it introduced its own rival video-sharing app, Lasso. But the wannabe-TikTok has been downloaded just 187,000 times as of June, according to Sensor Tower. Meanwhile, Facebook-owned Instagram is also adding TikTok-like features. Last year, for instance, Instagram incorporated music into Stories, its ephemeral feed of photos and videos, while in May it started letting users append song lyrics to their videos so viewers could sing along.

But none of that has slowed TikTok's rapid growth. In the first quarter, on Android phones alone, U.S. users spent 85 million hours in the app, nearly five times as many hours as were spent during the same period last year, according to analytics firm App Annie.

"ByteDance has hundreds of engineers in A.I. alone and is known for its algorithms, which are just really good at figuring out what you like and sharing with you other stuff it thinks you'll like," says Hans Tung, a managing partner at investment firm GGV Capital who was an early backer and board member of Musical.ly.

TikTok's rise has come with controversy. Twice this year, it ran afoul of regulators over its young users. In February, ByteDance paid \$5.7 million to settle allegations by the U.S. Federal Trade Commission that Musical.ly, before merging into TikTok, had illegally collected data about minors. Following the settlement, TikTok started purging users under 13, the minimum age for using the app in the U.S.

"It's our priority to create a safe and welcoming experience for all of our users," TikTok said in a statement at the time.

Then, in April, India's high court banned TikTok over concerns that it had helped spread pornography and put minors at risk. Judges lifted the ban two weeks later, after TikTok as-

VIDEO'S WILD RIDE

TikTok has many forerunners and current rivals—but few, if any, have turned a profit.



VIDDY
Launched 2011;
closed 2015



VINE
Launched 2013;
closed 2016



MUSICAL.LY
Launched
2014; acquired
by TikTok in 2017



DUBSMASH
Launched
2014



FUNIMATE
Launched
2016



CHEEZ
Launched
2017



TIKTOK
Launched
2017



LASSO (Facebook)
Launched
2018

sured the court it would address the issues.

ByteDance, which is privately owned, doesn't disclose financial details about TikTok. But because its business is still a work in progress, TikTok is almost certainly a money loser.

Like many other apps, TikTok sells ads. But it's also increasingly experimenting with other ways to generate revenue.

Companies can pay TikTok to run sponsored "hashtag challenges," in which users are encouraged to share videos using a hashtag affiliated with the advertiser. Guess Jeans was the first U.S. company to give it a try. The label asked users to shoot "rags to riches" videos showing people instantly changing—with the help of TikTok's editing tools—from scruffy sweats into dapper denim, and then to share the clips with an "InMyDenim" hashtag.

To date, videos with "#InMyDenim" have been viewed 37.7 million times.

Nevertheless, TikTok still has a lot of work to do if it wants to compete against the social media giants for ad dollars. Excluding China, TikTok has only 150 million monthly active users worldwide, according to App Annie, indicating that many people who have downloaded TikTok's app don't use it. Facebook, in contrast, has 2.4 billion monthly users across its family of apps, which includes Instagram and WhatsApp. And right now, TikTok has very limited advertising abilities, says John Lincoln, CEO of digital marketing firm Ignite Visibility.

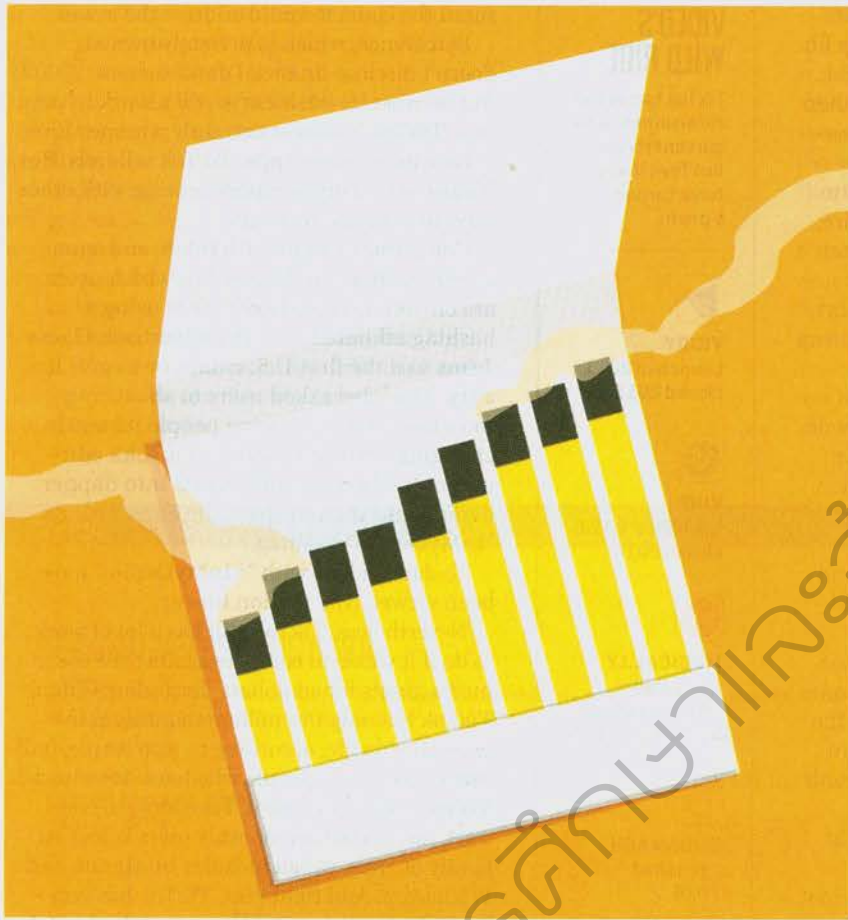
Unlike Facebook, TikTok can't target ads to particular users based on their interests. TikTok's users simply don't share as much personal information about themselves.

Increasingly, marketers are bypassing TikTok's sales team to cut deals directly with TikTok influencers. These social media tastemakers earn money by using the brand's products or sharing a particular hashtag—but TikTok doesn't share in the revenue.

Austin Sprinz, a 23-year-old from Tempe, Ariz., who has over 2.4 million followers on TikTok, says he and his brother have been approached for such deals. He declines to say how much money they've earned, but posting TikTok videos is their full-time job.

"We pretty much do it every day, from when we wake up to when we go to bed," says Sprinz.

In the end, their success depends on millions of flighty teens. And so does TikTok's. ■



THE BIGGEST BURNERS

Today's hot tech stocks may seem to have a lot in common with their now-huge forerunners. But those titans never burned cash like this. **By Shawn Tully**

INVEST

"YOU'VE GOT TO SPEND MONEY to make money" is one of the most widely accepted business adages of all time.

And nowhere is that belief more innate than in Silicon Valley, where companies like Tesla, Uber, Lyft, and Snap command dizzying valuations based on the belief that one day, they will indeed make money. Raising fresh billions to fund operations, boosters of these

companies would have us believe, is a regular rite of passage. After all, didn't giants like Amazon, Apple, Facebook, and Google also burn through tons of cash on their path to profitability?

Fortune decided to find out: How much money did Amazon, Apple, Facebook, and Google spend in their early years? And how does that compare with what today's hot names are spending? To get the numbers, we went back to each company's earliest published financial reports, starting with the offering statements for its IPO.

It turns out the assumption that successful tech companies burned lots of cash in their youth isn't merely wrong—it's staggeringly wrong. Look closely at the early days of the giants—the Fab Four, as we'll call Amazon, Apple, Facebook, and Google (now Alphabet), and you'll see that they were models of frugality compared with the new wave (which we'll dub the Breakneck Burners: Tesla, Uber, Lyft, and Snap).

It's true that in the dotcom frenzy of the early 2000s, many tech companies posted losses while devouring new funding. But

the ones that burned piles of cash were such failures as Webvan and eToys.com, not winners like Google. Today, says accounting expert Jack Ciesielski, "you've got these companies chewing through mountains of cash, and investors are comparing them not with the failures of the dotcom era but with the survivors."

For this analysis, the crucial measure isn't net profit but "free cash flow" (FCF), calculated by taking "cash generated by operating activities" minus capital expenditures (capex). In other words, business income minus money you spent to grow your business.

The differences are stark. Let's start with Google. Amazingly, the company appears never to have been significantly cash flow negative. Similarly, Apple never showed negative free cash flow starting with its first full year in business and weathered only short-lived

deficits as a mature player. Facebook showed just two years of negative FCF (in 2007 and 2008, when it burned \$143 million).

At Amazon, long the poster child for taking losses today to earn profits tomorrow, the numbers seem almost quaint. The new venture had negative FCF of \$10.6 million from 1994 to 1997, but that was just a fraction of total sales. The only major underwater span in its history came from 1999 to 2001, when negative FCF totaled \$813 million. But by 2002, Amazon's FCF turned positive. All told, the Fab Four had total negative free cash flow in their early years of almost exactly \$1 billion.

By contrast, the Burners have already torn through \$23.9 billion, encompassing 22 years of FCF deficits and outspending the Fab Four by around 20 to 1. At this pace, will they ever reward investors? Here's the outlook for each.

TESLA

CASH BURN (total negative FCF): \$10.9 billion over 12 years.

OUTLOOK: Negative FCF ballooned to \$4.1 billion in 2017 but narrowed the following year to a [comparatively] modest \$222 million. The reprieve was short-lived, as Tesla began to spend heavily to ramp up production of its mass-market Model 3. In the first quarter of this year, sales tumbled, and FCF fell to minus \$945 million, forcing Tesla to raise \$2.4 billion in equity and debt funding. Morgan Stanley's Adam Jonas shocked the markets by lowering his previous "bear case" for Tesla's stock price from \$97 to \$10, citing dangers of slowing sales in China. Jonas warned that declining overall demand is pushing back the

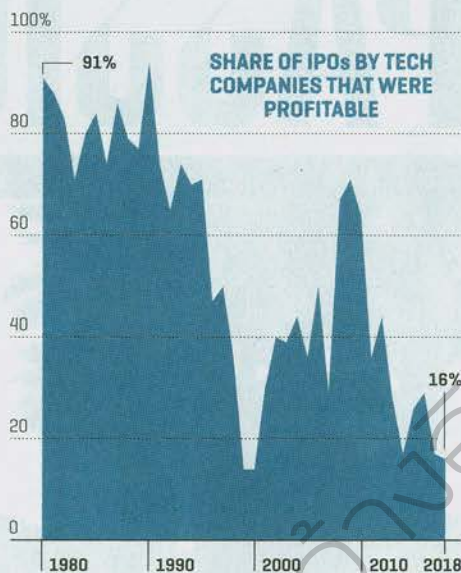
date when Tesla will be able to fund itself from operations.

Jonas's price target [all targets are for 12 months from now]: \$230
Current price: \$216

UBER

CASH BURN: \$8.9 billion over three years [not including losses from earliest years].

OUTLOOK: In the offering statement to its long-awaited IPO in May, Uber revealed FCF numbers from 2016 through 2018. In 2016, Uber posted negative cash from operations of \$2.9 billion and spent \$1.6 billion in capex, for a negative FCF of \$4.5 billion. Since then, the shortfalls have been shrinking, although they have remained substantial as the company has offered price promotions to customers and



NOTE: CALCULATED USING LAST 12 MONTHS OR LAST FISCAL YEAR BEFORE IPO. SOURCE: JAY R. RITTER, UNIVERSITY OF FLORIDA

spent heavily on the launch of its Uber Eats food-delivery service, raising sales and marketing expenses by 25% in 2018 and 54% in Q1 of 2019. Tom White of brokerage D.A. Davidson tells *Fortune*, "Uber has bought itself some time with good recent performance on revenue and bookings. But by the end of this year, investors will start thinking of 2020 as hopefully the year where meaningful progress is made toward profitability." If quarters keep slipping by without concrete progress, he adds, investors "will get discouraged or impatient."

White's price target: \$46
Current price: \$42.33

LYFT

CASH BURN: \$1.36 billion over three years and one quarter [not

including losses from earliest years, which were not specified in the IPO prospectus].
OUTLOOK: In 2016, Lyft burned \$496 million in FCF, and since then, the trajectory has improved only slightly. The shortfall shrank a bit to \$350 million in 2018, but in Q1 of this year, it stood at \$110 million. Lyft is asset-light, but it's still spending so heavily on such basics as driver pay, insurance, R&D, and marketing that operating losses have continued to mount. Dan Galves of Wolfe Research points out that Lyft depends on dense urban markets for nearly 60% of its business, despite those areas making up only 5% of U.S. households. And annual growth in those metro areas, he reckons, has slowed to 24%, half the rate

in early 2018. Galves also cites high driver costs that "are taking almost all the revenue" and doubts that Lyft will win broad appeal outside the big cities.
Galves's price target: \$52
Current price: \$58.32

SNAP

CASH BURN: \$2.72 billion over four years [not including losses from earliest years, which were not in IPO filings].

OUTLOOK: Snap is still burdened by big research expenses, equal to one-third of its total costs, and R&D needed to expand its photo-sharing platform is expected to jump to over \$900 million this year. Additionally, it's instructive to look at how much cash Snap is burning in relation to all the money it collects marketing its service. From the start of 2017 through Q1 of this year, Snap had \$2.33 billion in revenues and churned through 73% of that amount, \$1.71 billion in cash. Michael Pachter of Wedbush notes that although user and revenue growth is impressive, "the road to profitability appears to have gotten longer." He's concerned that big spending on infrastructure and R&D has pushed back the date when Snap will show positive Ebitda to at least Q4 of 2020.

Pachter's price target: \$12.25
Current price: \$13.62

PASSIONS

TIME
WELL SPENT

AUTO

The Rolls-Royce Cullinan: Equally at home in Malibu and Manitoba.



A DIAMOND TAKES THE ROUGH

The Rolls-Royce of yesteryear was built to sparkle on the circular driveways of great estates, chauffeur at the ready. The marque's new SUV is built to change that. By Jaclyn Trop

"IT'S THE FIRST ROLLS-ROYCE that looks better dirty," says the brand's CEO, Torsten Müller-Ötvös, as he overlooks a small fleet of the marque's first SUV model, dubbed Cullinan—the three vehicles suitably caked in mud and dust from a daylong romp around Grand Teton National Park in Wyoming. "It's a remarkable departure for the brand."

Cullinan, named for the largest gem-quality rough diamond ever found, nominally starts at \$325,000, but no Rolls-Royce is delivered in its base form: One can add tens if not hundreds of thousands of dollars to the price



in bespoke paint, leather, woodwork, or custom cabinetry.

That's all in the service of distinguishing it from luxury SUV segment leader Range Rover, whose offerings have grown increasingly grand in recent years but can't touch the opulence of its rival from Goodwood. If anyone was going to be the "Rolls-Royce of SUVs," it was going to be Rolls-Royce.

While Cullinan will no doubt find its way into the valet lots of Beverly Hills and Bahrain, it's built for much more.

"For the first time, Rolls-Royce is using words like practical, functional, and versatile," Müller-Ötvös says. "You can put the family in, take your dogs, go fly-fishing—whatever you want. It can be even dirty for a couple of days—no problem."

Cullinan's performance credentials are bolstered by its 563-horsepower, twin-turbo V12 engine from parent company BMW and an "off-road" button that helps the car glide over rough terrain as the suspension works double time beneath.

Rolls-Royce is a latecomer to the highly profitable luxury SUV market. One by one, manufacturers that specialized for the better part of a century in premium sports cars and chauffeured saloons have bowed to recent pressure to keep customers who want taller vehicles from defecting to rival brands.

Their efforts have been rewarded. The Bentley Bentayga, Lamborghini Urus, and Maserati Levante have vaulted to bestseller status within their respective brands. Aston Martin expects its DBX crossover to help double the brand's global sales once it arrives later this year. Consumer interest is unlikely to flag. Tall cars have long since graduated from the new normal to the norm.

Rolls-Royce, which sells just 4,000 cars each year, is expecting similar results. Still, the stakes for introducing an SUV are high, says spokesman Richard Carter. "If you sell

Sure you want to call shotgun? Whether you're driving or a passenger, there's no inferior seat in Cullinan.

4,000 cars per year, and you get it wrong, you can very quickly sell 1,000 a year."

For his part, Müller-Ötvös says he is not interested in sales volume. "The last thing I want to talk about is volume," he notes. "Volume is the contradiction of luxury. It's the last thing customers want to hear. I don't want to see a Rolls-Royce on every street corner."

He does not like to discuss the competition, either, asserting instead that there is plenty of room in the market. "It's not so much that our competition is with other cars," he says, adding that customers are likelier to weigh the purchase of a new Rolls-Royce against that of a boat or a piece of art. "If they want both, they buy both."

When creating Cullinan, the Rolls-Royce design team asked themselves: Is there any history whatsoever that would allow us to make an SUV? They soon realized they could draw inspiration from the high running boards of the WWI-era Silver Ghost and the designer wardrobe trunks strapped to the rear of 1920s Phantoms.

They emerged with a boxy, angular design featuring short overhangs that hint at off-road robustness and a commanding perch. Unfussy enough for an owner to flip down the rear seats to toss in a riding tack or shotgun cases, yet with the precision in craftsmanship expected of a Rolls.

Already, Rolls-Royce is seeing the car resonate with customers new to the brand, including women and millennials. And while orders are rising in Rolls-Royce's biggest North American markets—California and Florida—the ruggedness and four-wheel drive is prompting an uptick in orders from Canada, New England, and the Rockies. Says Müller-Ötvös: "It is opening new garages for us." ■



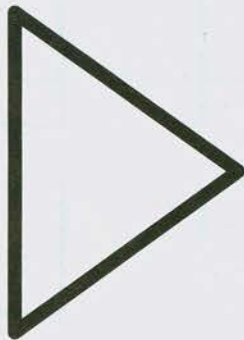
Guests suit up to explore another dimension at the Santa Monica outpost of The Void—the most expansive in a burgeoning collection of “location-based” VR companies, with 11 sites worldwide.



T H E
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BY _____
ARIC
JENKINS

Virtual reality has been the next new thing for five years and counting. Clunky headsets, a dearth of content, and lack of consumer interest have caused VR to stall. Can this much-hyped technology finally get real?



PAUL MCCARTNEY MADE HIS MODEST CONTRIBUTION to the future of virtual reality with a little help from a bike mechanic.

The unlikely union of the Beatles great, a bike-shop employee in Palo Alto, and a promising if underachieving technology is the accomplishment of Scott Broock, once an enterprising executive with a fledgling camera company called Jaunt VR. In 2014, Broock offered to pay the mechanic \$50 to ride around a skate park on a BMX bike while being filmed with a specialized camera rig that could shoot video and record sound in 360 degrees—all around and up and down. Broock hoped the bike's chain clanging around the fishbowl would be ideal for something called ambisonic audio, surround sound hearable above, below, and around the listener.

A few months later, Broock managed to show a clip of the video to McCartney, who was so impressed that he invited Jaunt to film his concert the very next night at San Francisco's historic Candlestick Park, the same venue where the Fab Four had performed their final show 48 years earlier. The startup company quickly mobilized and recorded one of the first videos of its kind, an immersive stadium concert film that would give a viewer the sensation of being among the pulsating crowd. Broock left Jaunt in 2016 and subsequently served a yearlong stint as a "global VR evangelist" for YouTube. But he still looks back at the concert video as a breakthrough achievement. "There's a moment recorded in time of Paul McCartney playing in front of people captured in a way that, maybe 100 years from now, seems like black-and-white films"—primitive but pioneering. "That's a powerful thing."

The vintage film comparison—think: grainy footage of silent passersby shuffling around in top hats among horse-drawn carriages and Model T-esque cars—is standard fare for virtual reality's boosters. Just as movies showed viewers places they'd never go, VR would transport them directly into those same filmed

environments. That was the promise that led Facebook to pay \$3 billion for headset maker Oculus VR in 2014, and every year since, evangelists have proclaimed virtual reality the next new thing. Consumer tech players including Google, HTC, Samsung, and Sony joined Facebook in a race to bring consumer-ready headsets to market. Venture capitalists poured billions into content development and hardware applications. *Time* magazine put the then-22-year-old founder of Oculus, Palmer Luckey, on its cover and announced the technology was "about to change the world." Mark Zuckerberg in 2017 famously said he wanted a billion people to be using Oculus headsets—though he conspicuously didn't say by when.

That omission is understandable. Because for all the hype-filled promises, virtual reality remains, well, virtually absent from everyday American life. Oculus in 2018, for example, shipped just 354,000 units of its flagship VR headset, the Oculus Rift, according to estimates from SuperData, a gaming-focused research unit of Nielsen. Contrast that with the more than 17 million PlayStation 4 game consoles Sony moved in the same period or global smartphone sales that year of 1.4 billion, according to IDC. Consumers are finding that VR is typically too expensive, too clunky, or too uncomfortable, and lacking in content that is worth trying more than once or twice. Skeptics compare the experience to the short-lived 3D-TV fad of the early 2010s.

The sluggish adoption has claimed multiple victims. Cinema operator IMAX, which used \$50 million in venture capital

ATTENTION DEFICIT: Despite \$100 million in funding, Jaunt abandoned VR, shifting its focus to augmented reality. "It just wasn't making sense for our company," says CEO Mitzi Reaugh.

funding to open virtual reality arcades in cities from New York to Bangkok, shuttered all the locations after just two years. Google's in-house VR film studio, Spotlight Stories, folded earlier this year. And CCP Games, a popular Icelandic video game developer, laid off 100 people and closed its VR operation in 2017. "We saw in our own data that this is gonna take a

1987

THE YEAR
VR PIONEER
JARON
LANIER IS
SAID TO
HAVE COINED
THE TERM
"VIRTUAL
REALITY"

while to get to the place it needs to be," says CEO Hilmar Veigar Pétursson, adding that the wait will be "years, not months." Even Jaunt, despite the boost from McCartney and more than \$100 million of funding, including from Disney, couldn't make a go of VR. Last year it shifted its attention to a related technology, augmented reality, which adds visual cues to real-life settings rather than trying to immerse users in distinct worlds. "We were focused on driving consumer adoption and understanding what consumers want to watch in VR," says CEO Mitzi Reaugh, who oversaw a mass layoff at the Silicon Valley company. "It just wasn't moving on the timeline that made sense for our company."

It is tempting to write off virtual reality as yet another overhyped fad. Yet that would ignore the technology industry's long history of fallen pioneers paving



the way for someone else's breakthroughs. The Apple Newton and the Polaroid Polavision died, after all, so that the iPad and camcorder might live. It took a decade for smartphones to become ubiquitous. Early VR headsets themselves date back to the 1960s, while Nintendo and Sega in the 1990s forayed into the consumer market with the ill-fated Virtual Boy and Sega VR systems, respectively. And even if VR has been a disappointment for the entertainment industry—the McCartney VR concert video will never go platinum—the technology is proving useful in sensible business applications, like workforce training, and yet new entertainment concepts. After all, when a technology is so exceedingly cool that it attracts a legion of true believers, it is extremely difficult to kill.

▷ **INSIDE A BUILDING** on Facebook's sprawling Menlo Park, Calif., campus, past a literal Facebook wall scribbled with employees' handwriting and motivational quotes like "If you never try, you'll never know," a spacious gray room is set up to demonstrate the highly anticipated Oculus Quest. This is the device VR

ALTERNATE-REALITY CREATORS: Below: Facebook director of VR product management Sean Liu and executive producer Yelena Rachitsky aim to execute Mark Zuckerberg's VR strategy. At right: Assembling an Oculus Quest optical eyecup module.

enthusiasts believe can change everything. Released in May, the Quest is Oculus's first all-in-one headset built for high-powered gaming. It requires no wires or connection to a PC and can operate with a full six degrees of freedom that allows users to look around and walk in all directions, unlike last year's similarly wireless but less immersive Oculus Go. At a starting price of \$399, it's on par with mainstream consoles like Sony's PS4 and Microsoft's Xbox One.

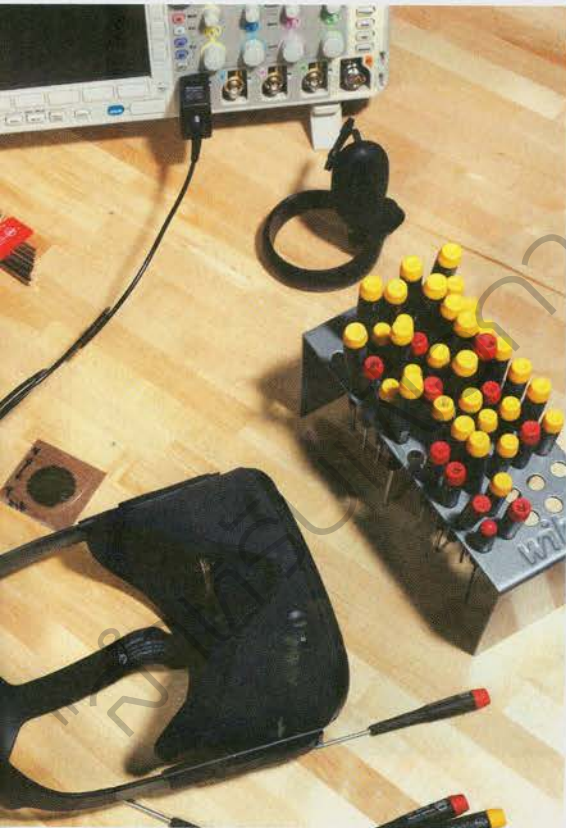
Being placed into a VR device by another person is an awkward experience. Once the headset snugly fits over your face, the person who was just assisting you could be giving you the middle finger for all you know because you are now staring at, yes, another reality. In my case, it's a very satisfying one, in which my Oculus Home, or the home screen, looks as if it were designed by Frank Lloyd Wright, complete with a maple wood interior and a domed glass roof peering up at the Northern Lights.

But the Quest is not about architecture; it's about games. More than 50 of them



launched with the device, none more popular than the colorful rhythmic sensation *Beat Saber*, developed and published by indie Czech studio Beat Games. Best described as *Dance Dance Revolution* meets *Star Wars*, *Beat Saber* in March became the first VR game to claim to surpass 1 million copies sold, and it shows no signs of slowing down. That's thanks to an active fan community on YouTube, generating millions of hits from videos showcasing standout players. In April, it was featured on a *Tonight Show* segment with the host Jimmy Fallon and actress Brie Larson each playing the game on national television. VR enthusiasts nearly hyperventilated in their praise. "This is huge!" tweeted popular VR YouTuber Nathaniël "Nathie" de Jong. "True killer marketing for the entire VR industry."

After 15 minutes of playing the game, I am sweating. You're "exercising without knowing you are," says Beat Games CEO Jaroslav Beck. "You are feeling the music in the most powerful way because you are physically experiencing it." People across the industry, from developers to investors to company executives, say that this



"I THINK THERE IS JUST A REALITY THAT A LOT OF THE CREATIVITY DOESN'T HAPPEN IN A BIG CORPORATION."

YELENA RACHITSKY, OCULUS EXECUTIVE PRODUCER

is, right now, the closest thing VR has to a "killer app"—a piece of content so good that it's possible consumers will buy VR headsets just to play the game. It's exactly the kind of outcome Facebook hoped for when it started Oculus Studios, a division that gives funding and technical advice to third-party game developers like Beat Games.

Facebook's initial vision for VR was far grander than games. It thought cinematic virtual reality would be a breakthrough application and that Facebook itself, rather than third-party developers, would create the masterpieces. Facebook established the Oculus Story Studio in 2015 as an in-house film department dedicated to making movies for virtual reality. Yet despite winning an Emmy for its animated short "Henry," Facebook shuttered the studio in 2017. Yelena Rachitsky, a Facebook executive producer who'd been with the defunct studio, says Facebook realized its clout was better deployed encouraging an ecosystem approach. "I think there is just a reality that a lot of the creativ-

ity doesn't necessarily happen within a big corporation," she explains. "It's the creators out there who aren't limited or confined by specific corporate structures [who] I think have the innovative and creative thoughts that are going to continue to push the boundaries in VR."

Hollywood also figured prominently in Facebook's VR dreams. Edward Saatchi, whose father, Maurice, cofounded the ad agency Saatchi & Saatchi, was a founding member of the Oculus Story Studio. He says the goal was to create VR content that could "inspire an industry." Five or so years ago, Hollywood directors approached then Oculus CEO Brendan Iribe, intrigued by the technology's prospects, says Saatchi, who now heads a "virtual beings" company called Fable. "They were super excited and said, 'Let's make a VR movie.' But he was like, 'I have no idea how to do that.'" The Story Studio was Oculus's attempt to find out how. "Our goal was to get film schools teaching VR movies, to have film festivals accepting VR movies, to have famous directors do VR movies," Saatchi explains, noting that director Alejandro González Iñárritu, whose *Birdman* won an Academy Award for Best Picture in 2014, took home another Oscar for his 2017 VR

short, *Carne y Arena*. "So, in that sense, we succeeded. Except it didn't become a mainstream thing. There just isn't any evidence that anyone is willing to pay for narrative VR content outside of a theme park."

In retrospect, Mark Zuckerberg was so enamored with the theoretical potential of VR that it appears he spent billions without having thought through how to make a business of it. "It was a platform play," says Blake Harris, author of the optimistically titled *The History of the Future: Oculus, Facebook, and the Revolution That Swept Virtual Reality*. "He had a popular app. But in his mind there's always going to be this problem of living on other people's platforms. You're beholden to Microsoft, Google, and Apple."

Indeed, Zuckerberg and his minions have described VR as the logical next step in the social experience Facebook itself created for billions of people. Just as it digitized the analog behavior of keeping up with one's friends, now Facebook wants people

inside a virtual reality to "span geographical boundaries," as Facebook director of VR product management Sean Liu says. "We're really thinking and pushing the notion of how we bring you and your avatar into VR. How do we allow you to emote and have social expression to really connect together and do different activities?"

In the reality we live in today, VR isn't a prevalent tool of communication. But that hasn't dampened Facebook's enthusiasm for it. "I don't know exactly when it's going to be a big deal," Zuckerberg said in a call with investors last year. "When we started talking about this, I said that I thought that this is going to be a 10-year journey before this was really a very mainstream and major platform." Just about halfway down the road, the futuristic technology is nowhere near realizing Zuckerberg's vision.

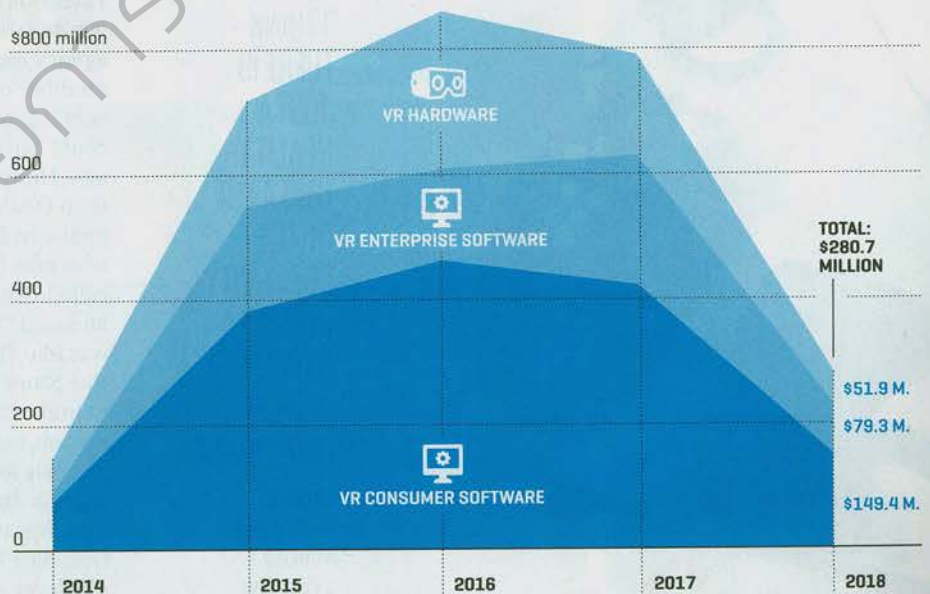


THE MASKED ROBBER points a gun in my face and shuffles me and a sobbing woman into a back room. "Take this fucking bag, pick it up, and fill it up!" he screams. "Everything!" Now he's motioning

DIM VIEW: VENTURE INVESTMENT IN VR TRENDS DOWNWARD.

In 2016, VR's peak venture year, VCs pumped \$857 million into VR startups. But in 2018, VR funding was down to \$280 million, ceding ground to promising related technologies, augmented and mixed reality.

VENTURE INVESTMENTS IN VR

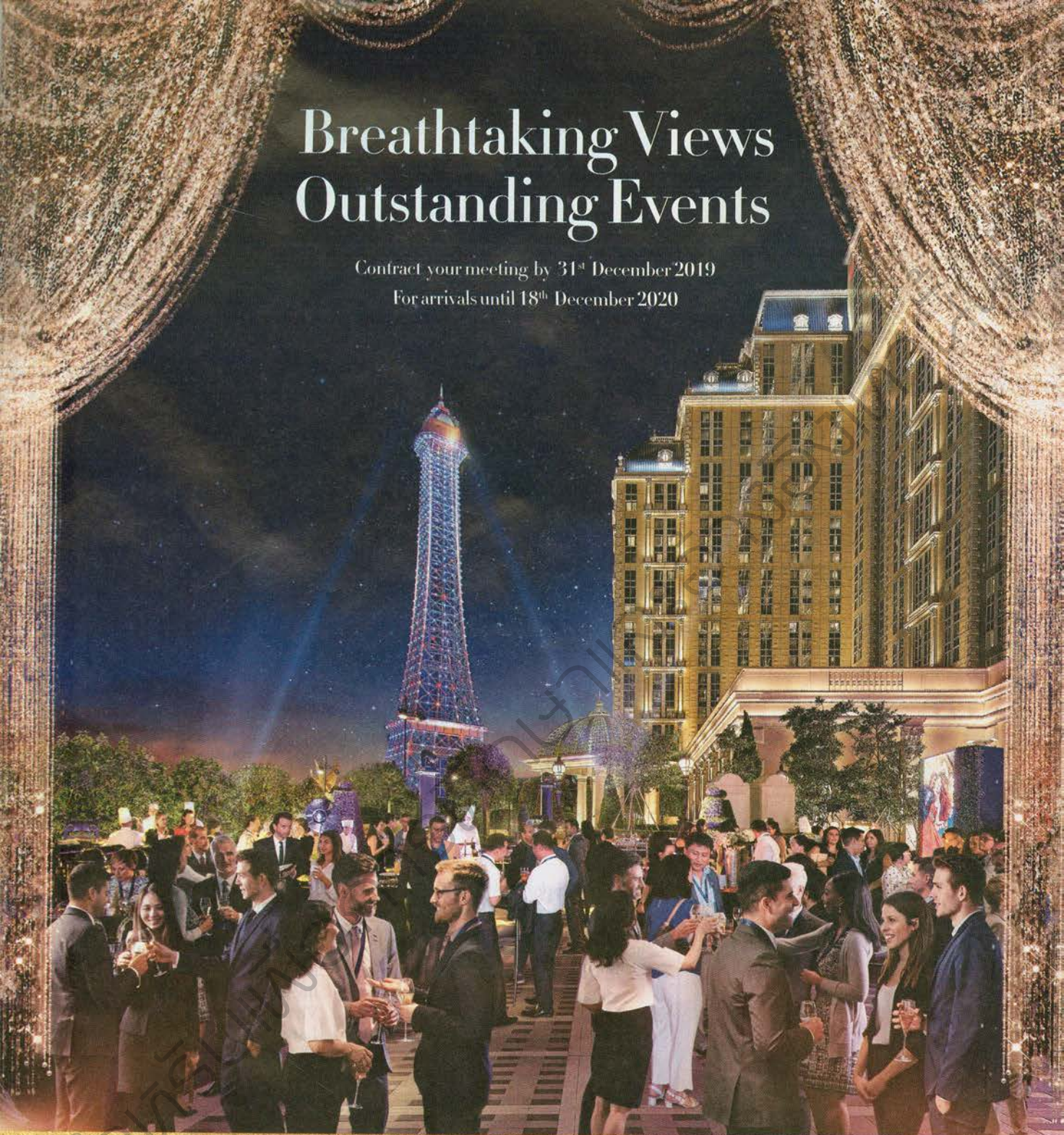


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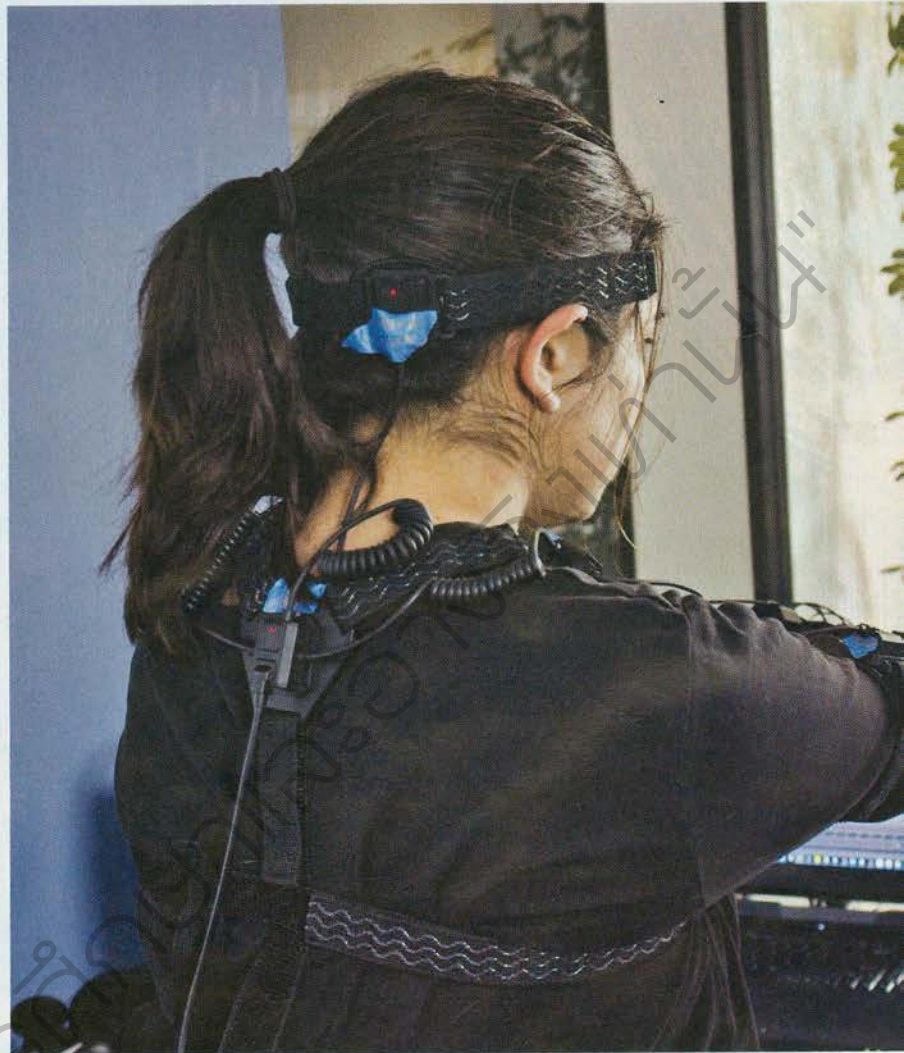
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SHOULDN'T THE WORKPLACE BE A BETTER PLACE?



READY, AIM, VISUALIZE: A Strivr employee shows how to capture accurate body movements using biomechanical input.

toward a white wall lined with packaged phones and accessories. Before we can react, a flash, a whirring noise, and then time cuts forward. The woman is now stuffing electronics into the bag, panicked. "Hurry the fuck up!" the robber's accomplice shouts. "Let's go!" And then black.

As I remove my Oculus Go headset, all is bright and

peaceful in an empty classroom inside an unassuming office building in Manhattan's Flatiron District. Jeremy Bailenson, a Stanford professor and founding director of the university's Virtual Human Interaction Lab, stands beside me. He begins explaining what I have just witnessed: a VR training module for Verizon store employees to learn how to deal with armed robberies. "If you work at a Verizon store, there's so much expensive material that's right near the door," he says. "They have dozens of robberies at gunpoint each year. They want to train their employees to be

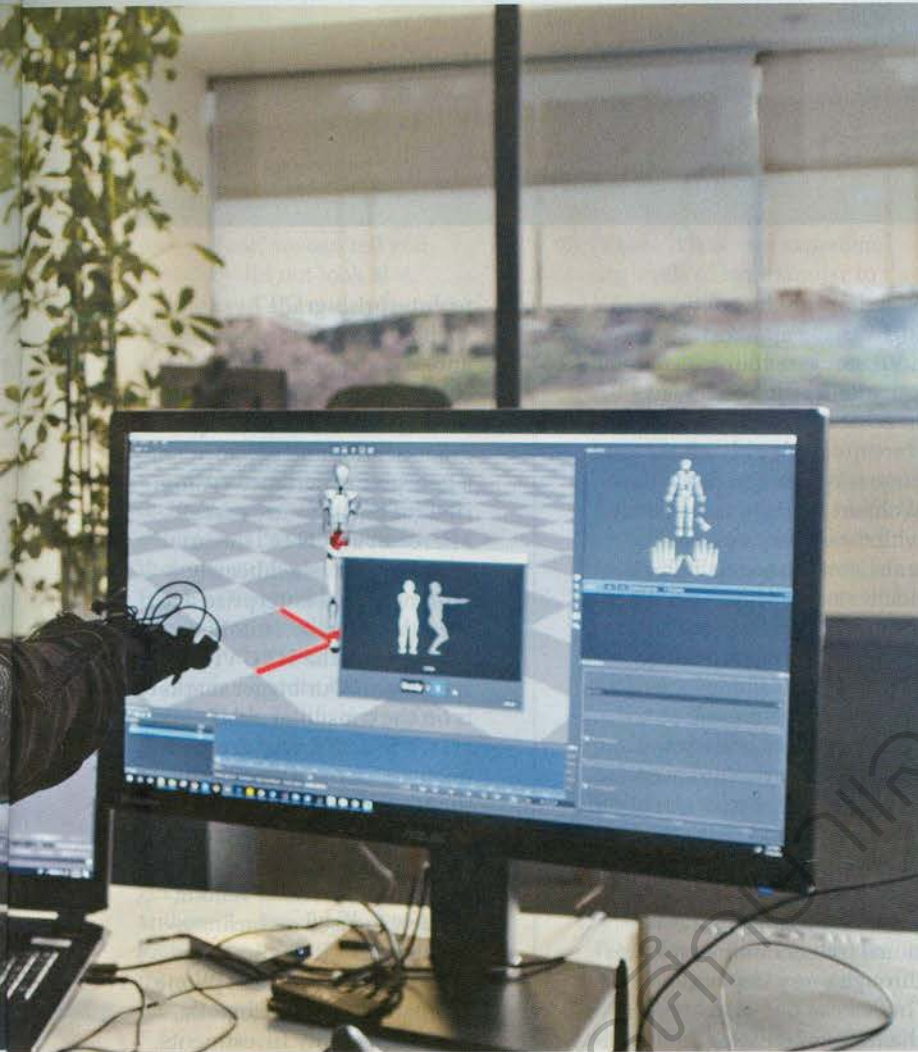
FORTUNE

RACEAHEAD

Every company is tackling diversity and inclusion in different ways. Ellen McGirt's newsletter follows their progress and those who hold them accountable.

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SMART ROBOTS ARE NOT GOING TO STEAL OUR JOBS. YET.

354,000

NUMBER OF
OCULUS RIFT
HEADSETS
SHIPPED IN 2018

[SOURCE: SUPERDATA, A NIELSEN COMPANY]

safe.” Verizon had been offering traditional training procedures for years, utilizing classroom instruction and hiring actors to simulate robberies. But the company found it minimally effective. “Despite having been trained, [our employees] weren’t necessarily equipped to manage through the robbery,” says Lou Tedrick, Verizon’s vice president of global learning. “We thought VR would be a good use case because it would help the muscle memory of what it had felt like to be robbed. You want to be able to feel it in a safe environment and be able to talk about it.”

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BRAINSTORM TECH

VIRTUAL REALITY

To improve its safety training, Verizon approached Strivr, a VR software training company Bailenson cofounded in 2015. Impressed by the startup's work with other large corporate partners like Walmart, Verizon tasked Strivr with developing modules to train store managers in high-fidelity heist scenarios. Since late 2018, roughly 1,500 of these managers have undergone Strivr's training experiences. When surveyed, 95% said they better understood the factors they would need to consider during an actual burglary attempt. Asked about the ethical concerns of purposefully traumatizing employees, Tedrick says that professional trainers walk employees through every step of the way. "In fact, we had many people thank us for creating an incredibly realistic experience versus trying to sanitize the experience," she adds. Verizon now plans to have store managers at all its retail locations trained in these VR simulations.

It turns out that while VR movies or virtual hangouts may not be ready for prime time, the technology is ideal for certain practical applications. VR is gaining traction in fields like surgical training, STEM education, industrial design, architecture, real estate, and more. At Facebook's F8 developer conference in April, Oculus announced an expanded Oculus for Business program slated to begin in the fall. It includes access

to enterprise-grade headsets, such as the new Oculus Quest, and "a dedicated software suite offering device setup and management tools, enterprise-grade service and support, and a new user experience customized for business use cases." Microsoft and HTC, meanwhile, have pushed heavily into industrial enterprise with the mixed-reality HoloLens headset and the HTC Vive, respectively. "Our bigger market is on the consumer side," says HTC's Dan O'Brien, general manager of the Americas for the Vive product line. "But our more aggressive growth area is enterprise."

Strivr, the Verizon vendor, is solely focused on business-to-business VR applications. In addition to the giant phone company, it counts Chipotle, Jet Blue, Fidelity Investments, and Tyson Foods as clients. It has distributed 17,000 Oculus Go headsets embedded with Strivr's software in Walmart

**\$34.5
BILLION**
ESTIMATED WORLDWIDE
VR TOTAL MARKET
FORECAST BY 2023

(SOURCE: GREENLIGHT INSIGHTS)

superstores and smaller stores across the country, all for internal use. From there, the startup says it can provide analytics that track performance and eye movement. "When a company tells us, 'I need to know that the trainee looked at that bucket on the floor,' we can tell you that they did not look at it," says Strivr CEO and cofounder Derek Belch, a former graduate student of Bailenson's. "That means they're not going to look at it in the real world. Like, unequivocally."

It isn't unusual for business technology applications to find commercial success before their consumer versions do. Belch of Strivr says he doesn't own a headset at home. One of Strivr's backers, Zaw Thet of Signia Venture Partners in Menlo Park, Calif., is clearly pleased with his firm's bet on an enterprise application. "There isn't a killer app here on the consumer side," he says. "Yeah, in 10 minutes you can get scared in a zombie house, and my 4-year-old likes to go look at the solar system for five minutes. But it's not something he's in every day."

▷ **WHY DON'T MORE** people use virtual reality—besides the issues of price, discomfort, and lack of good content? Because VR requires you to completely abandon reality. And, honestly, who has time for that? "You're inside of a walled garden, you're inside of a headset where you don't have access to the real world," says Jacob Mullins, a partner at Shasta Ventures, an early backer of the technology.

In fact, where VR has found limited success is by tweaking its approach, especially with augmented reality. AR shares similar properties with VR, but rather than completely immers-

ing a viewer in another reality, it adds digital elements to the real world, typically through a smartphone. Think of *Pokémon Go* or the Ikea app that enables users to place and visualize new furniture within their homes. As confidence in virtual reality falters, AR is now experiencing levels of hype similar to the VR wave of five years ago, with startups like Magic Leap raising close to \$2.5 billion to develop AR glasses and related content. Even Facebook is hedging its bets. Earlier this year, it moved hundreds of employees from its Facebook Reality Labs research division to a team dedicated to AR hardware projects. "In the future, our AR glasses will merge the physical and digital worlds, blending what's real with what's possible, resulting in the next mainstream, must-have, wearable consumer technology," promises a Facebook Research web page.

The thought for some is that perhaps it's more compelling to enhance our world than to replace it or create a new one. While stand-alone consumer AR glasses are still a ways away because the technology is less developed than VR, AR is already widely available on smartphones, thanks to Apple's release of a set of software development tools enabling easy-to-use applications. The tech has proved popular with retailers, for example, including Target, Walmart, and Bed Bath & Beyond, each of which has incorporated AR features into its iPhone app to help shoppers visualize purchases.

The pivot from VR to AR is particularly noticeable in venture capital trends. "I'm equally interested in both, but as an investor, I'm forced to have to pay attention to where the customer and market opportunity and demand is," Mullins says. "Two years ago, VR appeared

THE BUSINESS OF TECHNOLOGY DOESN'T BLINK.

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to have more excitement and scale behind it. But then Apple essentially enabled 300 million-plus devices and growing.” Indeed, in 2016, VR’s peak venture year, VCs pumped \$857 million into VR startups, according to SuperData; AR and MR, or mixed reality—which allows virtual imagery to actually interact with the real world—received just \$455 million combined. But in 2018, the equation had flipped: VR funding was down to \$280 million, while AR/MR jumped to \$859 million.

Another burgeoning approach has found its way back to the original promise of VR: entertainment. This compelling commercial application is called “location-based entertainment,” or LBE. A crop of companies are operating what is essentially a cross between an arcade and a movie theater, with a dash of theme park. These are brick-and-mortar venues where participants use virtual reality in custom-designed spaces, freely moving alongside a small group of fellow participants who appear to each other as avatars when wearing VR headsets manufactured by Oculus, HTC, and others. Some of these experiences play out more like games, with participants wielding plastic-model guns. Others are more like a narrative film that viewers interact with. LBE experiences offer another advantage over headset-bound, individual VR uses. They further immerse users by having them strap on haptic equipment that vibrates. Some venues even feature fans, sprinklers, and heaters to simulate conditions such as wind, water, or heat.

Dreamscape Immersive is a Los Angeles-based LBE “exhibitor” that’s raised \$36 million from the likes of 21st Century Fox, Warner Bros., and AMC. It hopes to entice customers with immersive narratives, a kind of interactive moviegoing experience, says Hollywood veteran Walter Parkes, a Dreamscape cochairman. Parkes says he finds LBE more compelling than typical in-home VR—in other words, a single user wearing a headset—because users are an “actual character in a real, rendered world with other people able to be in touch with all of [their] senses.”

The hope among VR adherents is that concepts like LBE will act as a gateway to overall VR (and AR and MR) adoption, in the same way cinemas begot additional ways to watch movies. Dreamscape charges \$20 for its experiences, not too far off the average price of a movie ticket, though

its run times are much shorter, at around 20 minutes. The Void, the most expansive of a burgeoning collection of LBE companies, with 11 locations in four countries including the U.S. and Canada, charges about \$35 for its 30-minute *Secrets of the Empire* experience, in which you get to infiltrate an Imperial base and shoot Stormtroopers on a molten-lava planet. (The firm has rights to *Star Wars* and other blockbuster Disney intellectual property.) Businesses like The Void also move VR forward because they make it possible for consumers to experience the technology without spending serious money. “It takes down that investment barrier to entry,” says Tuong Nguyen, an analyst at Gartner research.

▶ **I HAVE TRIED** many virtual reality products by now. Oculus’s and HTC’s and Google’s and films and video games and job-training simulations. Someone was always there to strap me into the headsets, to prepare me for the experience. And then they were always gone when it started. And I was always alone, even if I saw other people, or things, inside the new reality, even if I could still hear people outside in the old reality.

When I enter the Alien Zoo at Dreamscape, inside a Westfield mall in Los Angeles, I’m thinking about how people typically describe their VR experiences. They fly over the Manhattan skyline or dive into the Pacific or head for outer space. And they always use the word “I.” I, too, am now in space. But there’s a significant difference: It’s not “I,” it’s “we.” Moments ago, my partners and I strapped blue-lit haptic sensors around our hands and feet and slung computer-stuffed backpacks around our shoulders. We stepped into a dark, bare room; slid the headsets over our faces; and watched one another’s bodies transform into human avatars. Our Dreamscape minder instructed us to shake hands to confirm this astonishing mix of the physical and fake, and then we set off for a safari on a vibrant planet occupied by brontosaurus-giraffes and gigantic praying mantises that make Jurassic Park seem positively Neanderthal. It’s a mind-blowing experience—and absolutely worth paying for. Now all virtual reality needs to do is to persuade hundreds of millions of people to arrive at the same conclusion. ■

“LOCATION-BASED VR IS COMPELLING: YOU’RE A CHARACTER IN A RENDERED WORLD, IN TOUCH WITH ALL OF YOUR SENSES.”

**WALTER PARKES,
DREAMSCAPE
COCHAIRMAN**



WE ALL HAVE

THE POWER



Pearl, childhood cancer survivor; and Arnold, leukemia survivor.

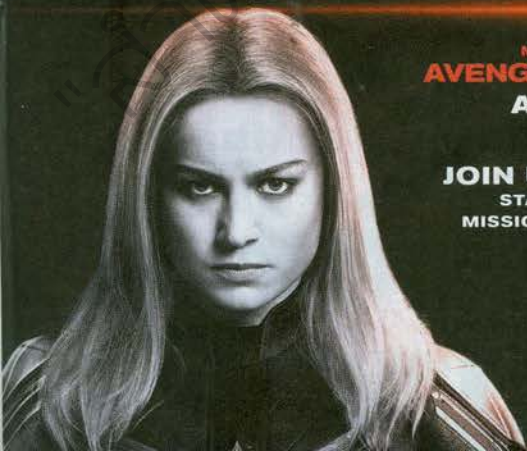
TO STAND UP



TO CANCER



Lori, breast cancer survivor.



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Pictured: Heroes from Marvel Studios' Avengers: Endgame. Survivor photos by Kevin Lynch.



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A M E R I C A . I . L L A N

BRAINSTORM TECH _____

Data science helped Sean Dobson make a fortune in the housing crash. Now he's deploying A.I. to build an empire of single-family houses—and profiting from properties that most investors wouldn't touch.

BY _____
SHAWN
TULLY

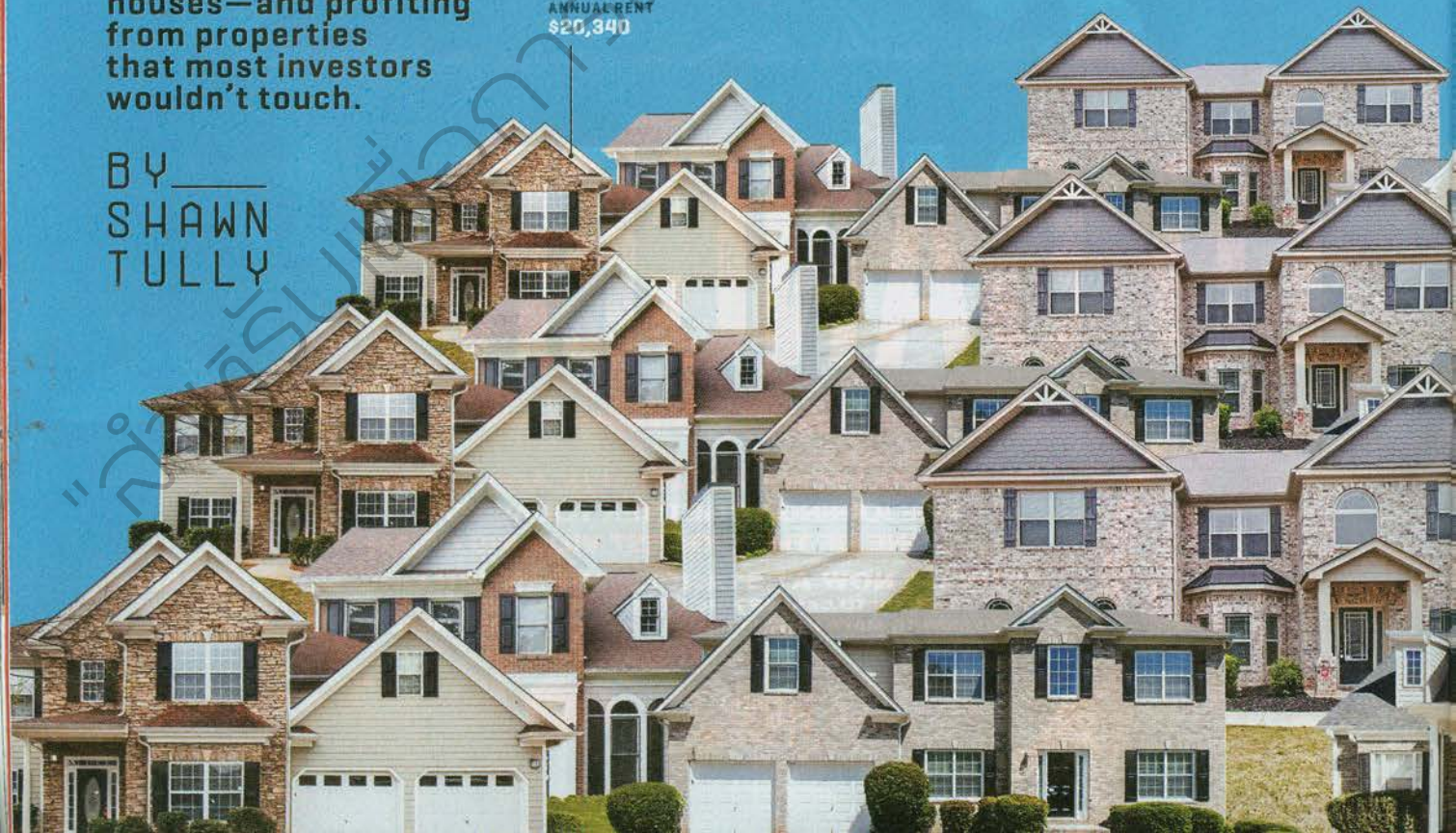
ATLANTA
DOUGLASVILLE

2905 Hollow Trace Way
3,100 square feet

PRICE
\$157,800

RENOVATIONS
\$32,000

ANNUAL RENT
\$20,340



A'S D L O R D



ERIN BURRUS HAS ENDURED SOME MISFORTUNE IN RECENT YEARS: After a cancer diagnosis, she lost her home to foreclosure. Today she's healthy again, and a stable job in sales has helped her mend her finances. "I'm climbing my way back up," says Burrus. One symbol of her stability is the two-bedroom home she shares with her husband and their children in Greenwood, a solidly middle-class suburb of Indianapolis. The family rents the place rather than owning their home. But it was important to Burrus that they not be in an apartment. "I wanted to get a house with a yard for the kids, for that family atmosphere," she says. • Burrus's landlord is a company called Main Street Renewal; she found out about it from her mother, who rents a nearby home from the same outfit (and runs a thriving dress-alteration business

ATLANTA DOUGLASVILLE

2672 Blowing Wind Circle
2,800 square feet

PRICE
\$188,000

RENOVATIONS
\$44,000

ANNUAL RENT
\$23,940

CHARLOTTE BRADFIELD FARMS

9825 Coriander Court
1,874 square feet

PRICE
\$199,069

RENOVATIONS
\$25,238

ANNUAL RENT
\$19,140



with Burrus). And each is now playing a small part in an ambitious experiment.

Main Street Renewal is an arm of Amherst Holdings, a real estate investing firm with \$20 billion under management. It owns or manages some 16,000 single-family homes, scattered across the Midwest and the Sunbelt. That portfolio makes Amherst one of the biggest, fastest-growing players in institutionally owned rental homes, a \$45 billion subsector of the real estate industry that barely existed before the Great Recession.

Sean Dobson, Amherst's CEO, is an imposing Texan data savant who dropped out of college to get into mortgage trading. A decade ago, he made a killing shorting shaky debt during the housing crash. Today he's adding 1,000 homes a month to his empire with the help of artificial intelligence, using data modeling to make dozens of offers a day on potentially profitable houses. The Main Street homes are a \$3.2 billion investment that generates around \$300 million in annual rental income, but Dobson harbors far bigger ambitions: "We want to get to 1 million homes in the next 15 years or so," he says. While that figure reflects as much bravado as realism—it's more than 60 times the number of homes Amherst owns today—the fact that it's conceivable shows how much the housing market has changed, and how technology is helping investors profit from those changes.

The rise of the single-family-rental industry reflects profound shifts in the finances and attitudes of America's families. Homeownership, long a bedrock of financial stability, has become unattainable or undesirable for many middle-income workers—for reasons including tighter lending standards, large college-debt loads, and lagging wage growth and savings. According to Yardeni Research, slightly more than one in three households that would have been buying first homes before the financial crisis is now either renting or still living with their parents.

These trends translate into roughly 5 million households that are renting single-family homes rather than taking out

mortgages and building equity, and that's Amherst's target market. Its specialty is grabbing run-down properties in nice, middle-class subdivisions—guided by algorithms that help it avoid bidding wars and money pits—which it then spruces up for the new rental generation. Amherst's typical customers are couples in their early forties with one or two kids and household incomes around \$60,000. They're paying an average rent of \$1,450 a month. "That's almost exactly what they'd pay on a mortgage and other expenses if they owned the house," says Dobson. "We're catering to a whole new class of Americans—the former buyers who are now either forced renters or renters by choice." And Dobson is betting that this new class is a permanent one.

▷ **SINGLE-FAMILY-HOME** rentals have long been dominated by local entrepreneurs—mom-and-pop investors or groups of businesspeople who own and manage no more than a couple of dozen properties (and often as few as one). Historically, when bigger fish, such as hedge funds and real estate investment trusts (REITs), invested in rental housing, they focused on apartment buildings—larger assets whose bunched-together density made them more cost-effective to manage.

The housing crash of the 2000s changed the math. As hard-pressed households gave up on ownership, and demand for rentals increased, investors realized single-family houses could be a more stable income source than apartments. An empty unit is a money loser, and houses were empty less often. Tom Barrack, head of real estate investment firm Colony Capital, explains that in single-family homes, "families stayed for two or three years, versus six months to a year in apartments." Demand has stayed high, he adds, in part because consumers who used to see homes as investments are no longer confident that prices will rise.

TRACT-HOUSE EMPIRE BUILDER

Dobson says aging baby boomers will provide a steady stream of new properties for him and his investors to buy: "We want to get to 1 million homes in the next 15 years or so."



The business remains highly fragmented: Institutional investors own only about 2% of America's 15 million single-family rental homes. But over the past seven years, those investors have amassed a substantial portfolio—some 300,000 houses in all. The biggest players include Invitation Homes, a REIT that's the product of a merger of rental divisions of several investment firms, including Blackstone, Starwood Capital, and Colony Capital; American Homes 4 Rent; and Amherst. All these landlords use automated house-hunting to fuel their growth. But Amherst differs from its rivals in focusing its computer models—and its business model—on affordable suburbs in the solid middle of the U.S. housing sector.

Dobson spent his childhood far from those burbs, in a trailer in an East Texas state park where his family owned a campground concession. "My mom and dad rented cabins and sold gas," recalls Dobson. "Then oil prices spiked, people couldn't afford vacations, and that was the end of the redneck paradise."

The family moved to Houston when Sean was starting high school, and his father bought him the toy that would change his life, a TRS-80 computer from Radio Shack. The device generated so much static, Dobson says, that the family's TV picture dissolved when the computer was running. But he became an expert programmer, and the summer after his high school graduation in 1987, he got an IT job on a mortgage-trading desk. He became a pioneer in building sophisticated models to price home loans—and in using those models to find instances when investors were mispricing mortgage-backed securities (MBSs) based on faulty projections of their risks.

In 1994, Dobson founded the forerunner to Amherst, and by the early 2000s, Amherst was selling \$25 billion a year in MBSs to pension funds and insurers. The seeds of his big score were planted during the housing bubble, when his models predicted a disaster in "Alt-A securities," packages of loans granted to homeowners who had often refinanced multiple times. "The market was predicting a default rate of 5%, and our models showed it would be 30% [even] if home prices didn't fall at all," Dobson recalls. He recruited a group of investors that took short positions in Alt-A, reaping a \$10 billion profit—10 times the investment, according to Dob-

son—when home prices tumbled.

Dobson's front-row seat at the housing collapse helped him recognize the opportunity in rentals. By 2011 he had begun a campaign to persuade investors to finance a new venture—a fund to buy and rent out single-family homes on an industrial scale. Some of his former partners saw the potential. "Single-family rentals are basically a big information game," says Curtis Arledge, head of Mariner Investment Group. "You collect all kinds of information if you buy at scale. That data gives him a competitive advantage."

Most were far more skeptical. To bolster his campaign, Dobson had purchased 215 houses in Phoenix and Dallas. "The portfolio wasn't ideal," he concedes. "We had graffiti-scarred houses in the inner city and houses in the suburbs six miles from the nearest house [we owned]. Did I mention that at least one dwelling was a former bordello?" Many investors saw the motley collection as epitomizing everything wrong with being a landlord—the deterioration of the properties, the hassles of maintaining a far-flung portfolio. "They said I was nuts, that this was an impossible business that would suffer 'death by a thousand cuts,'" Dobson says.

It took a year of hard selling for Dobson to raise \$200 million. But that seed money was enough to prove his concept. His first properties yielded enough profit to persuade investors to finance future rounds. Since 2011, Amherst has raised eight rental-housing funds totaling \$5 billion. In most cases, it has partnered with a single big investor—among them, private equity giants like TPG. The funds have produced average annual percentage returns in the mid-teens on their cash stakes, according to investors, including income from rent and price appreciation. (Amherst occasionally sells packages of homes when prices rise sharply, including to other investors.) And those returns are bigger than they would otherwise be, thanks to the firm's digitally driven bargain hunting.



ON A DRIVE THROUGH ARLINGTON and DeSoto, two Dallas suburbs, Amherst managing director Joe Negri is quick to point out the fixer-uppers. About one house in five qualifies. Negri shows me the classic signs: bedsheets stuffed in the windows, rusting AC units

in the side yards. On the inside, he says, we are likely to find glued-down vinyl tiles peeling off the concrete floors.

Finding shabby abodes like these and making them respectable is the load-bearing wall of Amherst's strategy. Amherst depends on humans to find cities, towns, and neighborhoods where fixer-uppers can become profitable, then relies on automation to pick individual homes. Negri, 31, heads the human team. He spends 150 days a year on the road overseeing Main Street Renewal's operations from Atlanta to Denver, searching for "sweet spot" neighborhoods that combine affordable rents with a strong middle-income employment base.

Around 70% of Amherst's 16,000 homes are in Sunbelt cities: Atlanta and Dallas, combined, account for about 5,300; Houston, Charlotte, and Jacksonville are also big markets. Amherst also favors Rust Belt "metros" with a sturdy foundation of jobs, including Indianapolis, Louisville, and St. Louis. These markets are all shaped by forces that keep housing costs in check. In Sunbelt cities, new construction plays that role; in the Rust Belt, relatively modest economic and workforce growth keep housing cheap. Each is an antithesis to coastal markets such as Los Angeles and

Boston, where a dearth of new building and superheated local economies inflate prices. Focusing on fixer-uppers in modestly priced markets helps keep Amherst's all-in costs for each home, including repairs, remarkably low, ranging from an average of \$140,000 in Memphis to \$208,000 in Dallas. (The median existing-home price nationwide is \$267,300.) They're almost always priced below the average in those markets too.

Making sure low prices aren't a sign of economic zombiehood is Negri's job. "The No. 1 criteria is diversity of employment," he says, especially in blue-collar and middle-class jobs. Before Amherst chooses a new metro, Negri explores its neighborhoods firsthand. "I'll live in a hotel for a month straight, driving around with an iPad," he says. "I was driving the Florissant area of St. Louis early in the morning, and one out of every two or three people are dressed in Boeing uniforms. That gave me a lot of confidence." A dealbreaker: cars sitting in the driveway in mid-morning, a sign that a lot of residents aren't getting paychecks.

Based on research like Negri's, Amherst now targets around 1,000 zip codes in 30 metro areas. Choosing homes there is the job of Amherst's highly automated purchasing system. In its 19th-floor office on New York City's Madison Avenue, a dozen

buying specialists screen leads on their workstations, delivered by a proprietary program called Explorer, an offshoot of the software Dobson developed to price mortgages. Each morning, the team gets alerts on newly listed homes that meet its price range and geographic criteria—around 1,400 listings a day.

For each "first cut" listing, Explorer estimates the costs of renovation. This is machine learning at work: The estimate is based on Amherst's experience with homes of similar age and size in the same or nearby neighborhoods. In an older home, this might include replacing the HVAC system; for one whose listing photos suggest wear and tear, it might include a new roof. (Team members help the software make that call.) Explorer has become so precise, Negri says, that the actual renovation costs average within 5% of the estimates.

Explorer also runs a separate calculation, finding three homes being rented within a two-mile radius that are close in age, size, and bed-and-bath specs to the newly listed home. Machine learning helps the software estimate what each house would rent for based on these "comps." Explorer then churns out an estimated "rental yield"—the net rent after such expenses as taxes and maintenance, divided by all-in cost.

MORE BUILDING, MORE BARGAINS

AMHERST CAPITAL MAIN MARKETS

	PORTLAND	SEATTLE	LOS ANGELES	NASHVILLE	RALEIGH	DALLAS
MEDIAN HOME PRICE	\$379,000	\$450,000	\$632,000	\$256,000	\$278,000	\$277,000
NEW CONSTRUCTION (AS A % OF ENTRY-LEVEL SALES)	7%	4%	3%	13%	19%	17%
EMPLOYMENT GROWTH SINCE 1990	60%	50%	10%	76%	114%	77%

In the Sunbelt and Rust Belt markets where Amherst Capital operates, looser zoning rules encourage new construction. That helps make single-family homes relatively affordable, even when the economy is growing fast.

SOURCE:
AMERICAN
ENTERPRISE
INSTITUTE
HOUSING
CENTER



If that yield meets Amherst's target (which *Fortune* estimates is between 5% and 6%), the team will make an offer. About 20% of each day's listings qualify; Amherst bids on those candidates no more than 12 hours after they're first listed, making all-cash offers. Around 10% of its offers—on roughly 30 homes a day—get accepted and go to contract. Amherst dispatches inspectors to assess each home's condition during the grace period. Unless they find fatal surprises—such as a cracked foundation—the houses pass muster and join the Main Street Renewal portfolio.

▷ **ONCE YOU OWN A FIXER-UPPER**, of course, you need to fix 'er up. Amherst spends an average \$28,000 per home, roughly 20% of the purchase price, on renovations. Many of the middle-class families in Amherst's customer base could amass the down payment to buy the same low-priced homes, but few would have the savings to also fund big improvements.

Touring a dozen Main Street Renewal houses in Dallas and Atlanta, I was impressed by how closely the homes, especially the interiors, resembled new construction. The houses all had different floor plans, but within each varied box, Amherst installed the same features: the kinds of fixtures and brands you'd find in a new middle-to-higher-end subdivision. In a six-year-old, 3,100-square-foot home in Douglasville, a suburb of Atlanta, Amherst had installed four gleaming new GE appliances: stove, dishwasher, fridge, and microwave. The countertops were thick quartz; the downstairs floors were sturdy ceramic tile; Hampton Bay ceiling fans whirred in the living room and master bedroom. The rent: \$1,850 a month.

In nearby Austell, a smaller, cheaper, and older Main Street home—1,850 square feet, built in 1997—was undergoing a gut renovation. The carpeting was ripped and stained, and the vinyl ceiling in the kitchen sagged. But workers were installing the same appliances, flooring, and other features as in the Douglasville house. The Austell renovations would eventually cost twice what the Douglasville ones did. But that house would rent for \$1,695—enough to reap the yield Amherst seeks.

Economies of scale help these renovations pay off. The improvements that

cost Amherst \$28,000 would, by the company's estimates, cost a regular buyer at least \$44,000. Because Amherst purchases in such high volumes, it can buy fixtures on heavily discounted national contracts. Its cost for the four GE appliances combined, for example, is \$1,850 per home; a do-it-yourselfer would pay around \$3,000 at Home Depot. The renovations are handled by outside contractors, but many rely on Amherst for most of their business, so costs are predictable and overruns are rare.

Amherst's tenants also benefit from a time-honored privilege of renting: not being on the hook for repairs. In-house crews in each market handle most of that. In Dallas and its suburbs, a crew of 28 maintenance workers pilots a fleet of 10 white repair vans, each bearing the Main Street Renewal logo and each stocked with spare tiles, trendy "moth gray" paint, and ceiling fans.

▷ **AMHERST HAS FIGURED OUT HOW** to serve a fast-growing new cohort of renters. The question facing Dobson is whether that cohort will keep growing.

Some experts think the downturn in ownership is temporary and that more millennials and families are on the verge of buying. That might not doom Amherst's business model, but it would put the brakes on investor enthusiasm, says Ed Pinto, an economist at the American Enterprise Institute and former chief credit officer of mortgage agency Fannie Mae. "That Wall Street money is hot, not patient money," Pinto says. "They will head for the exits or cut back on acquisitions."

Dobson acknowledges that a surge in demand could trip up his strategy. If prices spike in the Bargain Belts, Amherst's acquisition costs would go up. And since single-family rents tend to track home prices, its customers might choose to rent apartments rather than homes. "If home prices outpace income growth, we can't get the rents to be profitable and grow our portfolios," he says.

Still, Dobson doesn't see such threats on the horizon, and he thinks most trends are breaking in his favor. If the economy slows, Amherst could benefit in two ways: Home prices would slacken, creating buying opportunities for investors, and rental demand would rise. Whatever the economy does, he argues, his industry will benefit as it scales up. He's convinced that the pool of homes available to Amherst will grow by millions, as aging landlords whose kids have no interest in fixing toilets and dunning for rents opt to sell to the big guys. "I have \$5 billion to \$6 billion from outside investors knocking on the door," says Dobson. "In the end, we'll get to 1 million houses."

However big the empire becomes, it's unlikely to ever include Dobson's own home. He and his wife and two kids share a baronial brick manse of more than 7,500 square feet, complete with wine cellar, in trendy Austin. It may not be huge by Texas standards, but it's the kind of home that would never clear Amherst's algorithms, in the kind of market Dobson the landlord wouldn't touch. ■

"SINGLE-FAMILY RENTALS ARE A BIG INFORMATION GAME. YOU COLLECT ALL KINDS OF INFORMATION IF YOU BUY AT SCALE."

**CURTIS ARLEDGE,
CEO, MARINER
INVESTMENT GROUP**



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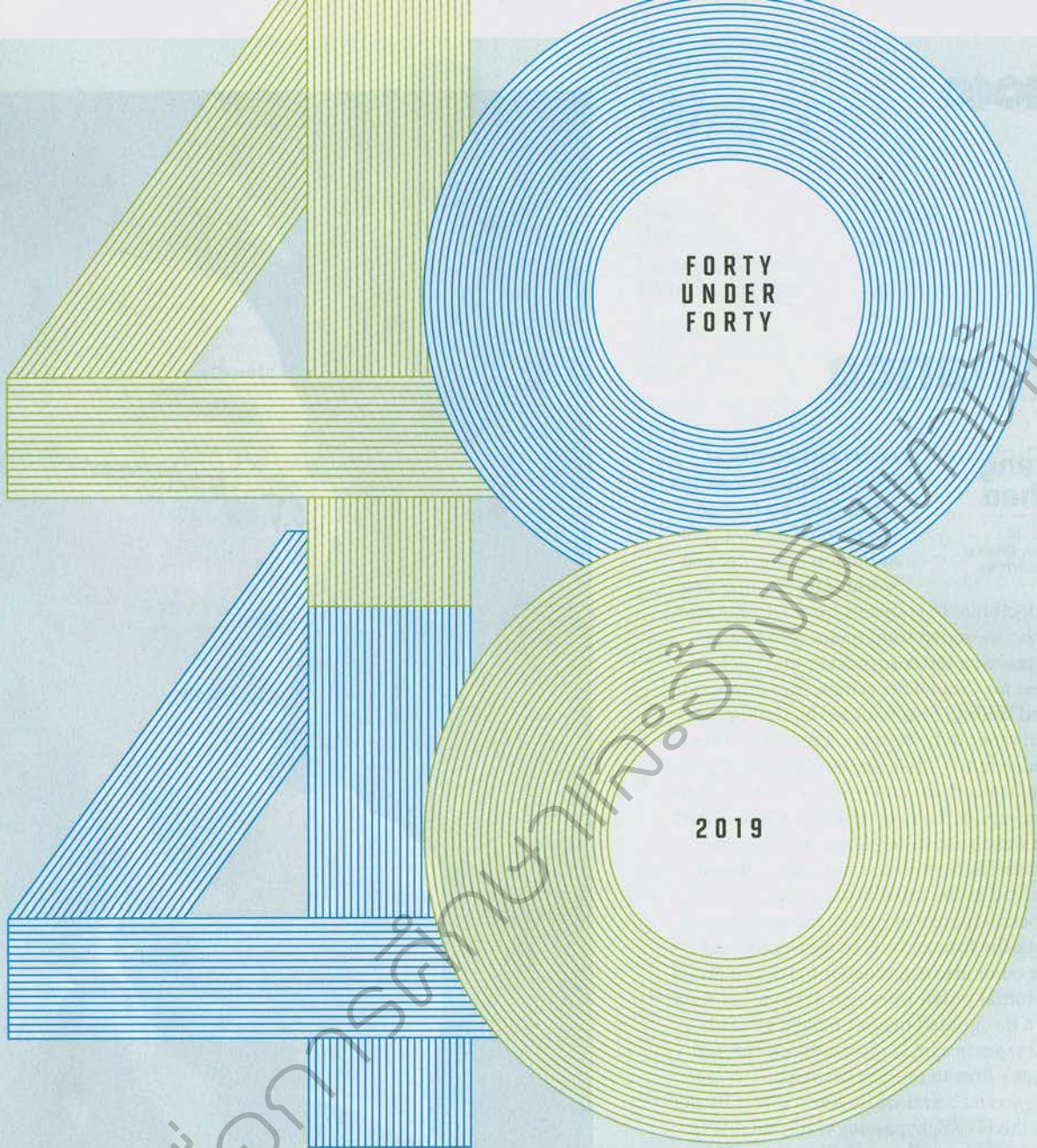
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THERE'S AN OLD SAYING THAT YOUTH is wasted on the young. That may be so, but apparently not everyone got the message. This year's list of the most influential young people in business features data scientists who are transforming how you work, gene wizards who are fighting disease, and brilliant minds who are altering how you exercise and what you eat. The one thing the list doesn't include? Repeats from *Fortune's* past 40 Under 40 lists. Turn the page to explore how these fascinating individuals are already changing the world of business—and perhaps even the world.

Contributors

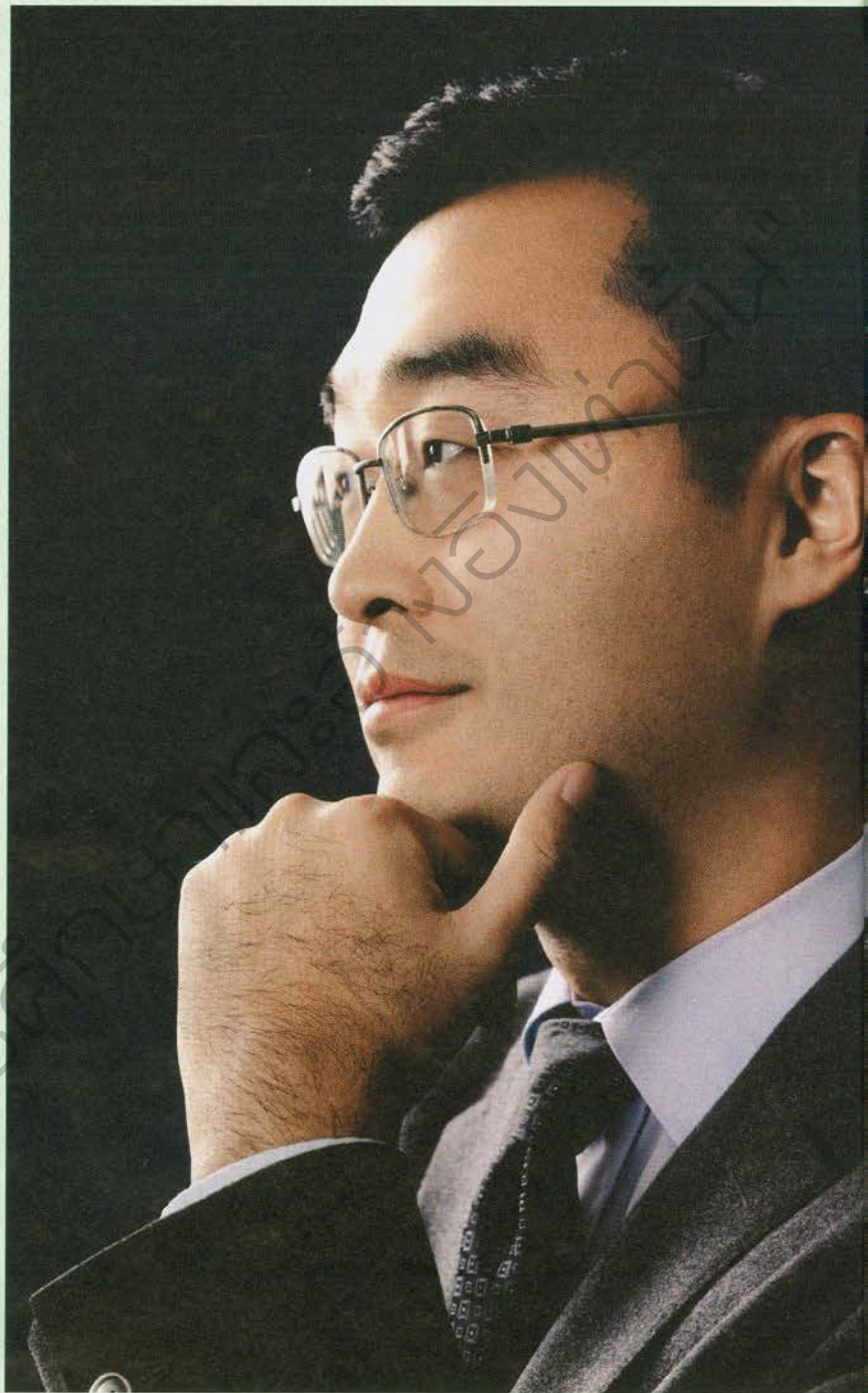
Megan Arnold, Eamon Barrett, Shannon Fitzgerald, Kate Flaim, Robert Hackett, Beth Kowitz, Rey Mashayekhi, Ellen McGirt, Sy Mukherjee, Aaron Pressman, Natallie Rocha, Lisa Marie Segarra, Lucinda Shen, Jonathan Vanian, Jen Wiczner, Claire Zillman

Finance

Peng Zhao

AGE 36
CEO, Citadel
Securities

HE MAY HAVE STARTED as Ken Griffin's protégé, but the Beijing-born Zhao has earned his own spot at the top of the finance world. After completing a doctorate in statistics from UC-Berkeley, Zhao ascended from quant research to overseeing the core market-making business for Citadel Securities, the computerized trading firm founded by Griffin (but run separately from his \$30 billion Citadel hedge fund). Zhao proved so good at growing its products and revenue that when the firm decided it needed a new CEO in 2017, he was the obvious choice. Under Zhao, Citadel Securities has not only widened its lead as the top market maker in U.S. stocks—thanks in part to the petabytes of data the firm collects to inform its trading—but also expanded into the hot arena of initial public offerings. It began to serve as a designated market maker for IPOs a few years ago; last year, Spotify picked Zhao's firm to oversee the music streaming service's first-of-its-kind "direct listing" on the NYSE, bypassing traditional IPO underwriters. Zhao, who became a U.S. citizen in 2016, has since turned Citadel Securities into the go-to firm for the pioneering practice: It managed Slack's highly anticipated direct listing in June, after serving in the same role for Uber's traditional IPO this spring.



ENTERTAINMENT



PELOTON

TOM CORTESE
COO AND COFOUNDER AGE 39

On June 5, Peloton confidentially filed for an IPO, which caps off an 18-month period that saw the launch of its treadmill and a bevy of content hires. The luxury exercise bike, which allows users to stream a constant supply of fitness classes, retails for more than \$2,000 and has made enough of a

cultural statement to have its own parody Twitter account. Cortese, as COO and cofounder, has his hands in everything from product design to the supply chain to customer satisfaction. Just remember: It's not about the bike. It's about an at-home boutique fitness experience, a dynamic community of riders and coaches, and a well of content. Okay—and the bike.

Henrique Dubugras

AGE 23
Co-CEO and cofounder,
Brex

Dubugras and his cofounder, Pedro Franceschi, carved out a lucrative niche providing interest-free credit cards to well-funded startups that lack the revenue to get approved by bigger banks. That's a problem the Brazilian natives and Stanford dropouts experienced firsthand, along with many of their Y Combinator peers. Brex is now valued at \$2.6 billion.

Karen Karniol-Tambour

AGE 34
Head of investment
research, Bridgewater

Karniol-Tambour joined Bridgewater straight out of college in 2006; 13 years later, she's reportedly one of the few people fully in the know when it comes to founder Ray Dalio's thinking at the world's largest hedge fund. Her mentor, Bridgewater co-CIO Bob Prince, has said he expects her to succeed him one day.

Omer Ismail

AGE 39
Head of U.S. consumer
business,
Goldman Sachs

When Goldman went to Main Street, it tapped Dartmouth and HBS grad Ismail to lead the effort. Today, as a partner, Ismail oversees the entire U.S. consumer



business. That includes personal-banking arm Marcus by Goldman Sachs, which now has more than 3 million customers, as well as the Apple Card—Goldman's headline-grabbing collaboration with Apple.

Ryan Williams

AGE 31
CEO and cofounder,
Cadre

While at Harvard, this Baton Rouge native started buying fore-closed houses and flipping them. Goldman hired him as a tech analyst; then Blackstone poached him to do real estate deals. He left to found Cadre, which aims to disrupt the REIT [real estate investment trust] world.

Kristo Käärmann

AGE 38
CEO and cofounder,
TransferWise

Käärmann cofounded TransferWise with fellow Estonian émigré Taavet Hinrikus, the first employee at Skype, after seeing how much firms were making on cross-border money transfers. At a \$3.5 billion valuation, the firm is now the highest valued private fintech startup in Europe. The operation has 5 million customers and moves \$5 billion every month.

Work

Audrey Gelman, Lauren Kassan, Diedra Nelson

AGES 32, 31, 38
CEO and cofounder;
COO and cofounder;
CFO, The Wing

The millennial-pink walls and tonal upholstery at The Wing's women-centric co-working spaces/social clubs may be dismissed by some as just aesthetics, but every detail was chosen to make women comfortable. The all-female leadership team oversees an empire that is expanding faster than WeWork or SoulCycle at this stage in its history. The original location opened in October 2016; by this fall, it will have 10 outposts, including in London.

Jessie Wisdom

AGE 37
CEO and cofounder,
Humu

Can work work better? Wisdom and her Humu cofounder [ex-Googleer Laszlo Bock] think so. Their behavioral "nudge engine" platform helps companies boost productivity, innovation, and retention in the workplace. But unlike the hoodie-wearing keyboard jockeys of older venture cycles, Wisdom's philosophy is rooted in empathy.

Alysia Montaño, Phoebe Wright, Allyson Felix

AGES 33, 30, 33
Professional runners

They risked their reputations and legal action by revealing the ugly truth about women and sports: If you get pregnant, your sponsors are legally allowed to stop paying you. The outcry when they went public forced Nike to announce it would end financial penalties for pregnant athletes—a victory for parents everywhere.

Kate Gulliver

AGE 37
Global head of talent,
Wayfair

Talent helped e-tailer Wayfair post record revenue and make the *Fortune* 500 this year. Gulliver has achieved a level of inclusion far beyond anything in Silicon Valley: Half of Wayfair's full-time employees are women, and she's boosting people who are non-white and nonmale into leadership roles.



ISMAIL: COURTESY OF MARCUS BY GOLDMAN SACHS; GULLIVER: COURTESY OF DOUGLAS LEVY PHOTOGRAPHY



SAM RAPOPORT
SENIOR DIRECTOR OF FOOTBALL DEVELOPMENT AGE 38

Her mission? To "normalize women in football." Rapoport has overseen a winning streak of inclusion that has turned NFL owners, coaches, and executives into gender advocates. Thanks to her "matching" program, some 42 women—59% of them women of color—are thriving in coaching, scouting, and football operations jobs.

NFL



JOHANNA FARIES
COMMISSIONER OF CALL OF DUTY E-SPORTS LEAGUE AGE 37

Just a game? Faries oversees *Call of Duty's* e-sports league, which according to the company generated more revenue as of January than the Marvel Cinematic Universe at the box office, and double that of the cumulative box office of *Star Wars*. Before joining Activision, Faries headed business and fan development at the NFL.

ACTIVISION
BLIZZARD

Health

Keller Rinaudo

AGE 32
CEO and cofounder,
Zipline

IT'S A 21ST-CENTURY SOLUTION to health care's "last mile" problem: delivering essential medical products via drone in some of the world's poorest nations. Rinaudo told the audience at *Fortune's* recent Brainstorm Health conference that Rwanda is now delivering 60% of its national blood supply outside the capital city of Kigali with Zipline drones—and many beneficiaries are new mothers suffering from hemorrhages. What's more, Zipline's technology is precise enough to literally drop off medical supplies to individual mailboxes with no need to land, take off, or traverse precipitous terrain. Zipline recently raised \$190 million at a reported \$1.2 billion valuation.



Alyson Friedensohn & Erica Johnson

AGES 29, 32
Cofounders,
Modern Health

These Y Combinator alums, with an all-female executive team, have found a niche helping big companies break the stigma around mental health and offer health and wellness tools. Kleiner Perkins just led the firm's Series A round to raise \$9 million.

Mei Mei Hu

AGE 36
CEO and cofounder,
United
Neuroscience

This former McKinsey consultant got a JD then caught the drug development bug (her mother is a renowned biotech entrepreneur). But Hu's outsider sensibilities may prove a major asset, as her company, United Neuroscience, seeks to stop Alzheimer's disease through prevention rather than post hoc treatment. Hu's radical notion? That vaccines are just as effective for chronic diseases as they are for infectious ones.

Trevor Martin

AGE 30
CEO and cofounder,
Mammoth Biosciences

Mammoth has drawn investments from luminaries like Tim Cook, who are betting that Martin's plan to leverage gene-editing technology to improve diagnostics and early disease detection could radically impact health care.

Mike Gorenstein

AGE 33
CEO, Cronos Group

This Canadian cannabis company has returned some 9,800% under Gorenstein's leadership, and a \$1.8 billion investment from Altria gives it a foothold in the U.S.

RETAIL



ALLBIRDS

TIM BROWN & JOEY ZWILLINGER
COFOUNDERS BOTH AGE 38

Allbirds founders Brown, a professional soccer player, and Zwillinger, a clean-tech engineer, want to change the world's carbon footprint one cushiony pair of shoes at a time. The duo emphasize the sustainability of the product, constructed from natural materials like merino

wool and eucalyptus fiber. And they hope the larger shoe industry, with its polluting and wasteful manufacturing processes, will follow suit. Allbirds was profitable in its first year, and three years later, it has an estimated value of \$1.4 billion. Its most recent \$50 million round of funding paves the way for more retail locations and a launch in China.



Tech

Ankiti Bose

AGE 27
CEO and
cofounder,
Zilingo

JUST 10% OF THE WORLD'S VENTURE CAPITAL-backed startups worth \$1 billion had a female founder as of last year. Bose, the 27-year-old cofounder of fashion and lifestyle marketplace Zilingo, is set to join that too-exclusive club. Along with onetime neighbor and current CTO Dhruv Kapoor, she launched the four-year-old Singapore-based startup after visiting Bangkok's Chatuchak market and realizing its merchants had no easy way to sell their goods online. What started as an aggregator of small fashion

retailers has since expanded into business-to-business offerings, such as supply-chain tools, and has tapped into Southeast Asia's booming Internet connectivity and smartphone adoption. Zilingo's latest round of funding in February was led by Sequoia Capital and Temasek Holdings (the sovereign wealth fund of Singapore), raising \$226 million. That valued the firm—with 600 employees across eight countries—at \$970 million, putting it within a rounding error of unicornship.



STEPH KOREY & JEN RUBIO
COFOUNDERS BOTH AGE 31

Since shipping their first soon-to-be-iconic minimalist suitcase in early 2016, Away's Rubio and Korey have sold more than a million bags. They posted \$150 million in sales in 2018 and expect to double that this year. Away is now valued at \$1.4 billion.

AWAY



KYLIE JENNER
FOUNDER AGE 21

That's a lot of lip kits! Jenner's Kylie Cosmetics partnership with Ulta Beauty helped the chain ring up larger than expected 9.4% year-over-year sales growth. Kylie Cosmetics and Jenner have a combined 150 million followers on Instagram.

KYLIE
COSMETICS

Alison Atwell

AGE 31
Voice user interface
designer, Amazon

Hello, Alison. Think of Atwell as Alexa's voice coach, helping the machine understand how humans really talk. She helps companies big (like Sony and Disney) and small better use Alexa to communicate with customers.

Michael Mignano

AGE 36
CEO, cofounder, Anchor

Seeing firsthand how hard it was to make his own podcast, Mignano cofounded Anchor to help others get started. His old bosses at Aviaary and Adobe helped with funding. This year, Spotify bought Anchor for \$150 million.

Parisa Tabriz

AGE 36
Senior director of
engineering for Chrome,
Google

They call her the "browser boss." Tabriz is responsible for Google Chrome, the gateway to the Internet for millions of users. In addition to keeping Chrome safe



4040

and secure, Tabriz manages Google's "project zero" team of good-guy elite hackers.

Bill Liu

AGE 36
Chairman and CEO,
Royole

You might not have heard of Royole, but Liu's \$5 billion company made the world's first foldable phone screen, which it debuted in 2018. The "FlexPai" showcased Royole's flexible technology, which it sells from Shenzhen to manufacturers everywhere.

Carl Pei

AGE 29
Cofounder, OnePlus

Born in China and raised in Sweden, Pei built a cell phone phenom that's more popular in India than Apple, with 33% of the premium smartphone market—slightly less share than Samsung's.

Cal Henderson

AGE 38
CTO, cofounder, Slack

Henderson helped design Slack as an auxiliary project. Making users feel as if they were part of something more than the daily grind, Slack took off. Now the company is prepared to go public with 1,500 employees, 10 million active users, and a \$17 billion valuation.

Transportation

Liz Meyerdirk

AGE 37
Global head
of business
development,
Uber Eats

SHE'S BAGGED takeout schnitzels and cold-called 200-plus restaurants in her mission to build out Uber Eats, which eventually led her to broker major deals with Starbucks and McDonald's. Uber Eats is on pace to be the largest food delivery company in the world outside China, and Meyerdirk is a big reason for that. She's scaled up Eats, which works with over 220,000 restaurant partners in over 500 cities in 35 countries across six continents. As detailed in Uber's IPO filings this spring, her business notched \$1.5 billion in revenue in 2018, up 149% from the year prior. Though Meyerdirk started out in investment banking, Uber wasn't such a U-turn. "Two close friends worked at Uber," she says. "One has known my husband since college, and the other was a former colleague. When two people you trust agree, it probably makes sense to listen."



POLITICS



MAYOR
OF SOUTH
BEND, IND.

PETE BUTTIGIEG
PRESIDENTIAL CANDIDATE AGE 37

Young, handsome, and openly gay, he's a Rhodes scholar and a veteran of the war in Afghanistan—in short, a political unicorn who has some pockets of the Democratic Party giddy with excitement. Yet it's not just his impressive CV and millennial appeal that have helped Buttigieg transform, seemingly

overnight, from the mayor of a midsize Midwestern city into a new player in national politics. A skilled orator who can command a room of any size, he comes across as both articulate and genuinely accessible—capable of parsing complex political challenges in a relatable way. Can he succeed in a crowded field? It's too early to tell, but he's certainly put South Bend on the map.

R.J. Scaringe

AGE 36
CEO and founder,
Rivian

Scaringe stole the spotlight at the Los Angeles Auto Show in November. In a theatrical nighttime unveiling at L.A.'s Griffith Observatory, Scaringe presented his gleaming silver creation, 10 years in the making—the R1T electric pickup truck—with more battery range than anything from Tesla and yet fast enough to keep up with the zippiest sports cars going zero to 60 mph in three seconds. Now, with \$1 billion in backing from Ford and Amazon, he's ready to take on that other genius electric-car-making executive over at Tesla.

Nadiem Makarim

AGE 34
CEO and founder,
Go-Jek

Go Everything!
In 2010, Makarim created Go-Jek to connect Indonesia's buzzing moto-taxi drivers with passengers. He has since expanded into Go-Send, Go-Food, Go-Pay, and Go-Massage.



A.I.

Joy Buolamwini

AGE 29
Founder, Algorithmic Justice League

If you're vaguely aware of A.I. bias, you probably have Buolamwini to thank. She authored a landmark study on machine-learning bias, which led to Microsoft and IBM improving their facial-recognition technologies to better analyze the faces of darker-skinned women. She has recently taken on Amazon's algorithms.

Ian Goodfellow

AGE 34
Director of machine learning in the special projects group,
Apple

Known as the "GAN" father, Goodfellow invented so-called generative adversarial networks, which can create more realistic-sounding audio voices, among other tasks. Expect him to work his magic on Siri soon.

Arjun Bansal

AGE 35
VP of artificial intelligence software and the AI Lab, Intel

Brought to Intel in 2016 when his company was acquired, Bansal oversees a team of 100 aiming to make Intel's chips work swimmingly with the latest A.I. software.

Food

Nathaniel Ru, Jonathan Neman, Nicolas Jammet

ALL AGE 34
Founders,
Sweetgreen

Fresh out of Georgetown University in 2007, these three classmates decided they were done with pizza—and started a salad shop. Or rather, a salad revolution. Sweetgreen has since grown like weeds, with 95 stand-alone restaurants and more than 120 on-demand pickup "outposts" in offices and coworking spaces. From tracking vegetables via blockchain to incorporating the latest buzzy ingredients, Sweetgreen is consistently ahead of the curve—and is now valued at more than \$1 billion.

Laura Kliman

AGE 35
Senior flavor scientist,
Impossible Foods

The organic chemist was working as a pastry chef in 2016 when she heard about Impossible Foods on NPR. Intrigued, she landed a job as a flavor scientist tasked with minimizing the off-flavors that come with using plant-based ingredients to replicate meat. Her research led to the Impossible Burger 2.0, which launched in January. Now Kliman is working on new products like the Impossible Sausage. If she's successful, she'll have convinced meat eaters that the company's products aren't just better for the planet but also just as good as the real thing.

James Rogers

AGE 34
CEO and founder,
Apeel Sciences

In 2012, the materials scientist got a grant

from the Gates Foundation to start Apeel, which is attempting to prolong the shelf life of produce. The startup makes an edible substance out of plant material, which suppliers apply to the outside of fruits and vegetables to slow the rate of water loss and keep oxygen from getting in—two key causes of spoilage. He has raised more than \$110 million from the likes of Andreessen Horowitz and hedge fund Viking Global Investors. Look for Apeel's avocados at Costco and Kroger.

Marisa Bartning

AGE 39
Director of marketing,
Bubly, PepsiCo

The future is clear: In 2018, Bartning led the launch of Bubly in an attempt to disrupt the sparkling water category. Quickly hitting \$100 million in sales, Bubly is one of the biggest names in the business. ■

Where Are They Now?

SEVERAL PAST 40 UNDER 40 HONOREES HAD AN EVENTFUL YEAR:

Marvel Studios boss **Kevin Feige** is bringing his superheroes to Disney+. **Jennifer Hyman's** Rent the Runway hit unicorn status. **Zhang Yiming's** ByteDance and TikTok became global sensations. Macy's hired **Rachel Shechtman** of Story as its brand experience officer. **Andy Katz-Mayfield** and **Jeff Raider** sold their razor startup, Harry's, to the owner of Schick for \$1.37 billion. **Rihanna** became the first woman to create a brand for LVMH. Privacy concerns continued to plague **Mark Zuckerberg's** Facebook. **Elizabeth Holmes's** scandal-riddled Theranos officially dissolved. Production woes dragged down Tesla stock, while CEO **Elon Musk** attracted SEC scrutiny.

MICHAEL KRATSIOS
U.S. CHIEF TECHNOLOGY OFFICER DESIGNATE AGE 32

Kratsios studied political science with a focus on Hellenic Studies at Princeton University, then continued his education under the wing of Peter Thiel, the billionaire contrarian investor and early Trump supporter. Kratsios, who once interned for Sen. Lindsey Graham, hails from the world of

venture capital, an industry that concerns itself with placing big, forward-looking bets. Now he is helping the administration think through its policies on the so-called industries of the future, such as drones, artificial intelligence, and quantum science, while navigating a gauntlet of touchy issues like the climate crisis and nuclear proliferation.



WHITE HOUSE
OFFICE OF SCIENCE
AND TECHNOLOGY
POLICY



Rachael Denhollander,
a former gymnast,
was the first woman to
publicly accuse Larry
Nassar of sexual abuse.



By MARY
PILON

“How Much Is a Little Girl Worth?”

**FOR THE ATHLETES AND
PATIENTS SEXUALLY
ASSAULTED BY LARRY
NASSAR, THE DIFFICULT
MATH OF NEGOTIATING A
SETTLEMENT BRINGS PAIN
OF ANOTHER KIND.**

On

JAN. 24, 2018, RACHAEL DENHOLLANDER walked into a Michigan courtroom to speak about the sexual abuse she suffered as a child from Larry Nassar. She was the last in an extraordinary procession of nearly 150 women to offer an impact statement at the sentencing hearing of the longtime USA Gymnastics and Michigan State University doctor.

Standing at a podium facing Nassar as her words were beamed out worldwide, Denhollander, a former gymnast—and now herself an attorney, an advocate for child safety, and a 34-year-old mother of four—concluded her statement with a question:

“How much is a little girl worth?”

For decades, Nassar’s work as a doctor treating athletes at Michigan State University (MSU) and for USA Gymnastics helped give him unfettered access to girls and young women that he serially sexually abused. Since Denhollander became the first survivor to publicly accuse the doctor of abuse, in September 2016, an estimated 500 women have come forward saying that they, too, were abused by Nassar. Some experts on the case think that number could eventually pass 1,000. In July 2017, Nassar pleaded guilty to child pornography charges, and months later, he pleaded guilty to multiple counts of sexual assault of minors. He will likely spend the rest of his life behind bars. In May 2018, MSU agreed to pay a \$500 million settlement to victims who had sued the university, among the largest sums ever paid in relation to sex-abuse claims.

As a consequence of that financial victory, Denhollander’s question has taken on a painfully literal meaning.

While the settlement represented the end of one long, difficult story, it signaled the beginning of another. Survivors like Denhollander have been deep in negotiations with lawyers and mediators over the disbursement of the settlement funds. In a process that involves an awkward combination of apologetic recognition, dispassionate mathematics, and, often, a torturous recounting of abuse, hundreds of women are learning what their suffering was “worth” in dollar terms.

Roughly a year into the mediation process, many of the survivors

have now received their answers—in decisions about their payouts, known as allocations.

For one woman, it was a low five-figure sum that will help her retire credit card debt and relocate; for another, it was an amount in the high six figures, enough to cover bills related to her mental health treatment and to enable her to work with other survivors. For a third, it’s a donation to a nonprofit she cares about. For each, the check will be worth considerably less than its face value, after taxes and attorneys’ fees. And for many, the money itself is a hurtful reminder of the abuse that took place.

The idea of a process that attaches financial value to acts of abuse is appealing to no one, presenting a challenging tangle of money, law, and trauma. Advocates and survivors are the first to say that settlements are more about a sense of justice than about money; no sum could ever compensate for the damage done. At its worst, the process can feel like an invasive haggle that reduces the experience of profound harm to a flat dollar figure. “It’s the trauma you went through, basically, being ranked against [that of] other girls,” says Grace French, a Nassar survivor who works in marketing and is a cofounder of the Army of Survivors, a nonprofit that helps those who have experienced abuse. “I do think a lot of girls are still struggling with that after getting that number.”

Still, there’s an undeniable need for a systematic way to quantify the harm of abuse. The funds can enable survivors to afford therapy, help with medical bills, or provide reimbursement for lost work time, as well as acknowledge pain and suffering. And for institutions accused of harboring or covering up for an abuser, settlements offer an opportunity for restitution. It’s a chance to acknowledge the harm they’ve enabled and commit to a new, better path—but also to close the book on their liability, since plaintiffs who receive disbursements generally agree not to sue again.

The disbursement talks also bear an important distinction: They’ve become arguably the most visible example to date of how the process works in sex-abuse cases. Unlike plaintiffs in past settlements, many Nassar survivors haven’t signed the “silence clauses,” or non-disclosure agreements, that are often insisted upon by the institutions making the payments. (Indeed, the magnitude of Nassar’s admitted



Denhollander (left, at podium) reads her impact statement at a sentencing hearing for Larry Nassar.

crimes may have taken away any leverage MSU might have had to press for such clauses.)

Denhollander and French and many other survivors have retained the right to talk not only about the abuse they underwent but also about the difficulty of getting financial redress—and they’re using their voices. That, in turn, has put them in the vanguard of a broader trend catalyzed by the #MeToo movement: a growing pressure on both not-for-profit institutions and private companies to publicly acknowledge and address problems of abuse and harassment within their ranks.

“It’s not a lawyer’s decision; it’s a client’s decision whether to accept or reject an offer,” says David Mittleman, a Lansing-based lawyer who represents more than 100 of the women in the MSU settlements. “And many want to be on the side of alerting the public.”

Over the past 18 months, Denhollander and dozens of other Nassar survivors spoke with me about their experiences, offering a detailed description of a corner of the law that is often shrouded in secrecy. Some elements of any settlement process, including

details of specific conversations between survivors and mediators, are shielded by legal confidentiality rules. But together, the survivors’ accounts offer a close look at the protocols of a system that can wield tremendous influence, in ways that victims of abuse can find both empowering and upsetting.

“It’s fair to say that MSU’s approach to the settlement and related lawsuits is a legal-first approach,” Emily Guerrant, a spokeswoman for the school, said in a statement. “I think we, as a university, have learned a lot about dealing with sexual assault and survivors, and

“SO MUCH HAS BEEN SHIELDED BY CONFIDENTIALITY” IN ABUSE SETTLEMENTS. “WE’RE JUST BEGINNING TO KNOW THE START.”



7 Grace French is one of several Nassar plaintiffs now doing advocacy work for other abuse survivors.

realize that we've made mistakes during the past few years in how survivors were treated."

Denhollander says that she's keenly aware of the system's flaws and equally aware that the vast majority of sexual-assault survivors seldom receive any remedy, in or out of the justice system. "That's something that societally we need to wrestle with—that that kind of sacrifice is what it takes" to win redress, she says. "That's what sexual-assault survivors are up against when they go to report their abuser."

DISTRIBUTING FUNDS from a settlement is at best messy. "I don't think I've ever done a compensation program

where there hasn't been some criticism," says Kenneth Feinberg, a former adjunct professor at Harvard, Columbia, and NYU law schools. "It comes with the territory."

Feinberg is the closest thing the world has to a dean of the subject. He was the "special master" on the case that set the template for modern settlements—the Agent Orange litigation in the 1980s, which ended with Dow Chemical, Monsanto, and other companies creating a fund for Vietnam War veterans who had been harmed by the defoliant. Since then, Feinberg has overseen a fund that distributed \$7.14 billion to families who lost loved ones in the Sept. 11, 2001, terrorist attacks (a process *Fortune* documented in a 2002 feature); he's currently working with survivors of sexual assault in cases involving the Catholic Church with co-administrator Camille S. Biros. "Money is a very poor substitute for damage, for loss, but that's the American system," he says. "Offering a fam-

"IT'S THE TRAUMA YOU WENT THROUGH, BASICALLY, BEING RANKED ... I DO THINK A LOT OF GIRLS ARE STILL STRUGGLING WITH THAT."

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**SAVE
THEM
ALL**

┘ Morgan McCaul, now a student at the University of Michigan, received a payout earlier this year.



ily \$5 million for the death of their son at the World Trade Center, it's rather hollow."

A mediator's goals, Feinberg notes, include being transparent with survivors about the workings of that system—even when that involves assigning numbers to the immeasurable. The range of settlement sums is usually determined by plaintiff and defense lawyers, but it's the mediator's discretion to determine where an individual's compensation falls. In administering the 9/11 fund, for example, Feinberg set a flat rate of \$250,000 for pain and suffering for each victim and an additional \$100,000 for each surviving spouse and dependent, avoiding the dilemma of determining whether one suffered more than another. For each victim, he then added factors such as likely lost wages based on Bureau of Labor Statistics data. The result, he says, was 5,300 eligible claims with no two identical amounts. "You have to have a methodology," he says.

In sex-abuse cases, however, methodology can seem simplistic to the point of cruelty. The Altoona-Johnstown diocese of the Roman Catholic Church has reportedly paid out more than \$15 million to survivors of abuse by its clergy and other employees over the decades. In 2016, in a blistering report criticizing the diocese's handling of the cases, the Pennsylvania state attorney general's office published a chart that one bishop had used to determine payouts. The chart, which the report blasted as an example of "cold bureaucracy," featured two columns: "Level of Abuse" and "Range of Payment." One line reads, "above clothing, genital fondling, \$10,000–\$25,000." Another reads, "Sodomy; Intercourse, \$50,000–\$175,000."

In practice, the harmful effects of sexual abuse spread far beyond the acts themselves, encompassing a spectrum of emotional trauma, disability, and physical pain. Distinctions among kinds of suffering do matter, with huge consequences for survivors. But at some point, experts say, settlement negotiators have to agree on how to translate those distinctions into raw numbers. Actuaries for insurers sometimes devise point systems to determine how to allocate payouts. Those systems are often determined based on "peer" cases, with criteria intended to quantify how a survivor has been affected since the assault, and to project how the assault could continue to affect that person.

"I HAD A LOT OF ANXIETY ... ASKING MYSELF IF IT'S ETHICALLY SOUND TO BE HANDED A CHECK FOR SOMETHING THAT CAN NEVER BE QUANTIFIED."

The \$500 million Michigan State settlement in the Nassar case allocates \$425 million to more than 330 claimants who came forward to sue before Dec. 6, 2017; the remaining \$75 million is set aside for survivors who came forward after that date. (There are already 160 people in that second wave, sparking concerns about whether the fund is sufficient.) Roughly one-third will pay for fees for attorneys, including for time spent in the settlement process, according to someone familiar with the matter.

The task of distributing the \$425 million pool falls to William Bettinelli, a former California judge who was appointed last July by the federal district court overseeing the case. (He is being paid from the overall settlement sum, as well.) In roughly 30 years as a professional mediator, Bettinelli has mediated cases involving catastrophic personal injuries, wrongful death claims, and environmental disasters, according to his firm's website; his office did not respond to multiple requests for interviews over several months.

According to people familiar with the MSU case, Bettinelli has authorization to approve payouts of up to the low seven figures per person (before taxes and fees). People with knowledge of the process say Bettinelli is following an "allocation protocol" that includes conducting phone interviews with survivors to assess their settlement amount. Among the questions Bettinelli may ask: whether the abuse happened to them as minors, the duration and frequency of the abuse, and the nature of the abusive acts themselves. The mediator can also take into account such factors as the risk a survivor incurred by coming forward or any retaliation she faced for blowing the whistle.

In many cases, a survivor may bring forward evidence that wasn't used in Nassar's trials—psychologist evaluations and bills, for example. Several survivors submitted journal entries documenting the toll of abuse. New evidence can be submitted to the mediator as paperwork, be brought up in a meeting, or both.

One goal of a settlement process is that survivors won't have to relitigate their case in order to receive their claims. Still, claimants often find themselves recounting horrific details of their experience—especially if that information doesn't already exist in a trial record. And those conversations, even when a survivor stands on a mountain of evidence, can be awful.

Among the harmful impacts that Mittleman, the lawyer for many of the plaintiffs, says his clients have reported are attempted suicide, bills for stays at psychiatric hospitals, hair loss, gastrointestinal issues, and sleep disturbance. It's not uncommon for therapy for those coping with the consequences of abuse to cost \$150 to \$300 per session, with multiple sessions a week or month, often for years. Jobs have been lost, marriages frayed.

The math of a settlement process ideally takes all of this into account. But Mittleman and other advocates say that talks sometimes place excessive emphasis on the number or duration of the assaults. In the context of wide-ranging harm, Mittleman asks, "Is 60 or 100 penetrations really worth more than one time? Because in my opinion, one time is too many."

ONE OF THE AIMS of a mediator or special master is to be both fair and swift.

Meetings to determine a survivor's payout—the worth of her suffering—can be surprisingly short, and in most cases, the mediator's decision isn't open to appeal. The number is final.

Some Nassar survivors I spoke with felt that the amount of money they received was fair and appropriate; others didn't. And for many, a newly difficult phase began after the settlement—as they realized that money alone couldn't right what had been made wrong.

Donna Markham's daughter Chelsey was one of countless girls who bounded into gyms in Michigan in the early 1990s in hopes of making an Olympic team, like the heroes who graced the posters on her bedroom wall. As a child, prosecutors allege, Chelsey was sexually assaulted by Nassar during a doctor appointment. After the abuse, she spiraled into drugs, alcohol, depression, and angry spells that culminated with her taking her own life in 2009. She was 23 years old.

Markham has received her allocation, and she's one of several survivors who felt perplexed by the math behind the payout and overwhelmed by the paperwork and logistics. Abuse "just eats away at your self-worth, your self-esteem," Markham says. That fact, so clear to her, was something she felt the process couldn't account for. "You can't put a price on a human life," Markham says. "And how do you make a determination on an award settlement when Chelsey had her entire life ahead of her?" In Markham's telling, the most important outcome of the process wasn't monetary: She has forged strong bonds with other women involved in the case and is engaged in advocacy work for those who were harmed. "I didn't expect to get anything," Markham says. "I just wanted Chelsey's story to be told."

Some survivors opted not to talk with Bettinelli. Having already testified in legal proceedings or given impact statements, they could let those records speak for them. Morgan McCaul, who was a high school student when she joined the group suing Nassar, is now enrolled at the University of Michigan: "I just felt like [a meeting] would be another thing on my plate that was unnecessary," she says. McCaul received a payout earlier this year.

OUTFOX THE WOLVES ON WALL STREET.

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"My life has not changed" as a result of the money, she says. "But I do know that I had a lot of anxiety in the year and a half leading up to the settlement disbursement, asking myself if it's ethically sound to be handed a check for something that can never be quantified." McCaul has channeled that energy into activism, to "leverage this horrible experience into something that can help other people."

While nothing bars MSU settlement participants from publicly disclosing the sum they received, doing so is not considered a best practice: Talking about the number can make survivors prey to fraud or to criticism that they were fiscally motivated. It can also create conflict with friends or family—and with fellow survivors. Some survivors in the MSU case describe a catch-22 inherent in the process: Those who were resilient and fortunate enough to find help earlier, or to avoid the most severe trauma, sometimes felt that saying so was against their financial self-interest—or, conversely, that a larger check might mean you suffered more than most. That sense of awkward comparison, survivors say, adds to the pain of knowing that the allocation

"THERE IS A COMPLETE REFUSAL ... TO ADMIT WHAT WENT WRONG AND TO DEAL WITH IT."

money is, in a sense, evidence of the abuse. As French, the Army of Survivors cofounder, says, "You cash that check, and it feels dirty."

O LYMPIC GOLD MEDALIST

McKayla Maroney says that she was one of the girls whom Larry Nassar preyed upon. Before his arrest, she received a \$1.25 million settlement from the national governing body for the sport, USA Gymnastics—one that included a nondisclosure provision. But after his attacks came to light, the organization faced criticism for effectively covering up Nassar's behavior by gagging Maroney, and it said that it would not enforce the silence clause.

The cases against Nassar have played a crucial role in intensifying scrutiny of the use of nondisclosure agreements in abuse and harassment cases. Such NDAs have historically been ubiquitous—notably in agreements involving abuse in the Catholic Church. In the private sector, the *Vanderbilt Law Review* points to data showing over one-third of the American workforce is subject to NDAs. There, critics note, nondisclosure language originally intended to protect trade secrets has been stretched to curb an employee's right to speak out about workplace issues including sexual harassment.

"So much has been shielded by confidentiality," says Minna J. Kotkin, a professor at Brooklyn Law School and director of its Employment Law Clinic. "We're just beginning to know the start."

The fact that many MSU settlements didn't require NDAs reflects a broader shift in

thinking about abuse, says Kotkin. What were once thought of as private matters that pitted the reputation of vulnerable individuals against those of more powerful authority figures or institutions are coming to be seen as a societal toxin or contagion—the kind of threat about which others should be warned.

It's difficult to measure how widely this effect is playing out at companies. Some advocates warn that taking silence clauses completely off the table could work against survivors, by encouraging abusers to litigate rather than settle. Still, 12 states, including New York and California, have passed laws to narrow the scope of NDAs in harassment and sexual-assault whistleblowing. Microsoft said in late 2017 that it had removed NDAs involving employees who speak up about sexual harassment; other companies have followed suit, some after scandals within their ranks.

Feinberg, the mediator, argues that the onus for silence should be reversed. "I think it's very, very important that the *institution* agree to confidentiality," he says. "But if the individual victim wants to [speak out], I think that's to be encouraged." That represents a shift in the power balance, from the institution to the survivor.

Painful though it will be, many Nassar survivors will likely be speaking out for a long time. Yet to be resolved is whether MSU will expand its settlement fund if more victims come forward, and how it would pay additional costs. Also looming are lawsuits against USA Gymnastics and the U.S. Olympic Committee (USOC). USA Gymnastics

enlisted Nassar as a team doctor for years and now faces 100 lawsuits from roughly 350 plaintiffs. In December it filed for Chapter 11 bankruptcy, a move that put the brakes on both the lawsuits and mediation discussions. (Leslie King, a spokeswoman for USA Gymnastics, says that the organization "has focused on keeping athlete safety and well-being at the forefront of its efforts.")

Wrangling with these institutions has led Rachael Denhollander to put the settlement process on a long list of issues tied to abuse cases that she believes should change. At worst, she argues, the payments absolve big players of examining their own cultures, giving them in essence a clean slate. "There is a complete refusal to want to discover what went wrong, to admit what went wrong, and to deal with it," she says.

Denhollander and her fellow survivors plan to speak up to keep pressure on the institutions where Nassar worked. "What lessons do we need to take away from this?" she says. "That sentencing hearing was so many women coming forward publicly. It was the first time the entire world has gotten to see names and faces and [connect them] with the idea of sexual assault. We weren't just numbers anymore." ■

Mary Pilon is the coauthor, with Carla Correa, of Twisted: The Story of Larry Nassar and the Women Who Took Him Down, an audiobook to be released in July by Audible.

The Childhelp National Child Abuse Hotline is 1-800-4-A-Child or 1-800-422-4453.

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STANDING TALL
Jordan is managing partner of Andreessen Horowitz, meaning he's running a business while advising entrepreneurs on how to run theirs.

The VC Who's Seen It All Before

JEFF JORDAN has had his ups and downs as an operating executive in Hollywood and Silicon Valley. Now those decades of experience are making him a sought-after mentor for young entrepreneurs as a venture capitalist. Here's how what Jordan learned at Disney, eBay, and OpenTable is helping founders at Airbnb, Pinterest, and Instacart.

BY POLINA MARINOVA

W

WEARING A LONG-SLEEVE BLACK SHIRT, blue shorts, a knee brace on his right leg (basketball injury), and a backpack filled with water bottles and an emergency water-filtration straw (don't ask), Jeff Jordan appears from behind a line of trees. Lean bordering on gaunt, with closely cropped black hair, Jordan has already hiked 40 minutes in the woods before arriving for a scheduled walk-and-talk on a trail near his home in Portola Valley, Calif. "Sorry," he says. "I wake up really early."

Jordan, who is 60, savors his alone time in the morning. Office hours are at the nearby venture capital firm Andreessen Horowitz, where he meets with entrepreneurs, listens to pitches, and decides which of these prospects are worthy of the firm's backing. But in the wee hours, he typically sets out alone. "I have to be an extrovert at work. So to recover, I just walk through the hills," he says, before making the shocking confession, at least in the type A world of Silicon Valley VCs,

that he's "right on the introvert-extrovert line." Says Jordan: "It's the only thing in my day I do that's solitary. Everything else is meeting after meeting after meeting."

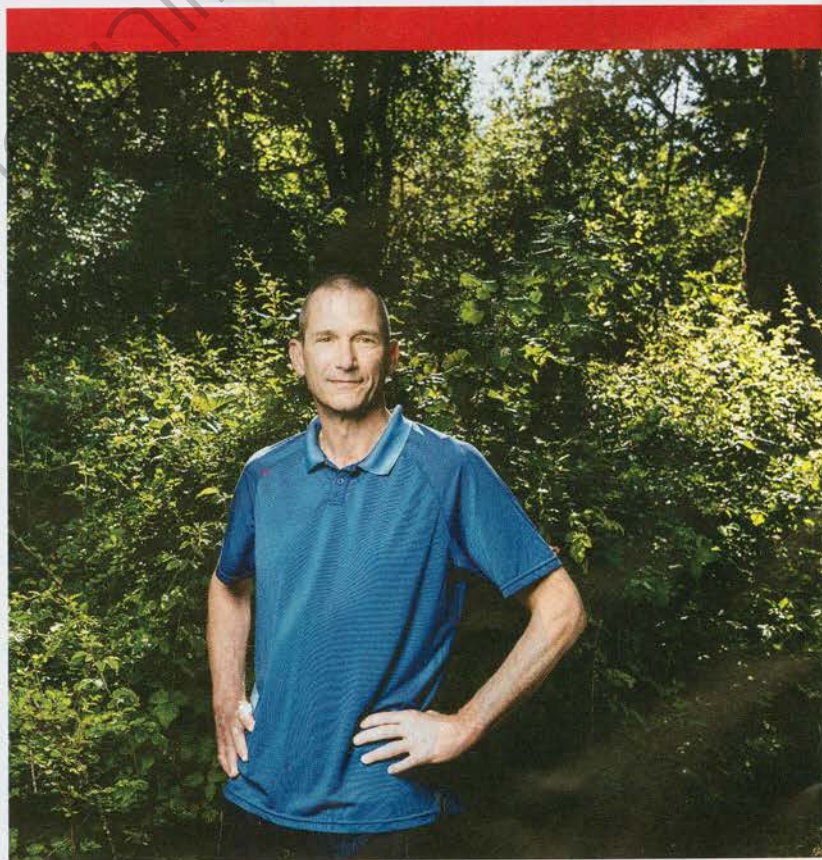
Fortunately for Jordan and his partners, his enervating face time has proved fruitful. On behalf of Andreessen Horowitz, Jordan invested early in what are now some of the hottest companies in tech, including home-sharing giant Airbnb, grocery delivery company Instacart, and the hobbyist site Pinterest. The firm's bet on Pinterest alone, one of Jordan's first after joining the firm in 2011, is worth \$1 billion. Jordan's nonmonetary reward: Earlier this year he became managing partner of the decade-old firm, meaning he's now responsible for personnel, budgeting, day-to-day operations, and the like, all while continuing to invest and sit on boards. (He's currently on nine, including still-private Airbnb and Instacart, newly public Pinterest, and high-stakes e-scooter startup Lime.)

Jordan is a bit of an outlier at the epicenter of the global technology industry, a place of titanic egos and triumphs borne of brilliant ideas. He didn't become a VC, widely acknowledged to be a young person's game, until he was in his fifties. He's not a technologist but rather a general-management type, typically second-class citizens in the Valley. And he at least professes to hate being in the spotlight. What he has, in spades, is something that is gaining currency amid the scandals and missteps of the Valley's behemoths: experience. Says Meg Whitman, Jordan's boss at Disney and later at eBay: "Investing requires pattern recognition, and Jeff was able to recognize the potential" of the companies he has invested in, thanks to what he had seen earlier in his career, particularly at eBay.

Thanks to these successes, and the battle scars Jordan makes no effort to hide, entrepreneurs young and old now want to learn from him. Pattern recognition can't necessarily be taught. But getting advice from someone who can see it—especially when that someone didn't always make the right call or climb to the highest rung on the ladder—is beyond valuable. As for what drives him, well, let's just say Jordan isn't above having something to prove, a trait that makes him fit in rather well in Silicon Valley after all.

JORDAN'S FIRST REACTION to Airbnb was that it was "the stupidest idea I had ever heard." It was 2011, and he was at an Allen & Co. tech-investing meeting in Arizona. Brian Chesky, then a relatively unknown entrepreneur, was explaining his business, and Jordan couldn't help mentally listing the number of risks associated with opening up one's home to strangers. Then it hit him. Airbnb's fast growth and online marketplace that matched homeowners with renters reminded him of eBay. It was, he says, "a déjà vu experience." Having worked in top positions at eBay for seven years, he literally had seen this picture before.

Jordan and Chesky met after the entrepreneur's talk, and the two discussed network effects, the notion that a product or service becomes increasingly valuable the more people who use it. Chesky was looking for investors, and Jordan was interested in becoming one. He'd grown bored running OpenTable, a restaurant reservation site, when Marc Andreessen and Ben Horowitz asked if he'd be interested in joining their young firm. The duo asked Jordan to name a hot company in the consumer sector. The first to come to mind was Airbnb. He got the job and the deal. Jordan guided the firm's \$60 million investment in Airbnb, a stake that has grown 30-fold at the private company's last valuation. Chesky chose Jordan over Andreessen to be an Airbnb board member. "From



◉ LEFT TO RIGHT: JAMES LEYNSE—CORBIS/GETTY IMAGES; KIM KULISH—CORBIS/GETTY IMAGES; SCOTT ELLIS—BLOOMBERG/GETTY IMAGES; STEFANIE KEENAN—GETTY IMAGES

the first time we met, Jeff struck me as somebody I should learn from," he says.

Days after becoming an Airbnb director, Jordan proved his mettle. An Airbnb renter vandalized a home, jeopardizing the trust critical for a marketplace among strangers. Airbnb needed a system to make homeowners comfortable. Jordan had introduced a program at eBay called Buyer Protection, which helped resolve issues between buyers and sellers. He advised Chesky to create a property damage protection policy called Host Guarantee that would cover loss or damage by renters up to \$50,000, a figure that has since grown to \$1 million. Since then Jordan has applied his eBay lessons in advising Airbnb in other ways, including international expansion, adding site functionality, and designing new products, a process Jordan calls "adding layers to the cake" and all steps eBay took.

Jordan claims his investing sweet spot is not a company's earliest stages but rather when he can see some signs of traction. When he encountered Pinterest in 2011, the company had just reached "product-market fit," a hallowed Silicon Valley cliché for the moment when a nifty idea finds willing customers. "I do best in investing when there's a little signal to respond to," Jordan says. Pinterest already had rapid user growth despite limited market-

ing. Jordan, says Ben Silbermann, Pinterest's cofounder and CEO, "saw similarities between Pinterest and the early days of eBay, which had aspects of commerce as well as aspects of community."

Wisdom and the ability to discern patterns aren't foolproof, of course, and Jordan found this out the hard way. The same year he invested in Airbnb and Pinterest he also staked an e-commerce startup called Fab.com. Andreessen Horowitz led the investment round, meaning it put its imprimatur on the deal. It eventually pumped \$40 million into the young company. Jordan saw the positive telltale signs of growth: The company's CEO, Jason Goldberg, said at the time his company was generating \$100,000 in online sales per day.

Fab would eventually reach a valuation of almost \$1 billion, and then it began to falter. It expanded prematurely into international markets and spent too heavily on marketing. "Cake-layering" and otherwise leveraging a

Smooth Operator

After stints at Boston Consulting Group and Stanford Business School, Jordan logged 20 years running companies before he started investing in them. He tried retiring once, but leisure time didn't suit him. Here are some key steps along the way.



The Walt Disney Co.
(1990-1998)
CFO OF THE DISNEY STORES
WORLDWIDE

He ultimately was responsible for strategy, finance, and business development for Disney's retail arm (including the store above), which accounted for about \$1 billion in revenue: "This was my first taste of being in an operating business."



eBay, North America
(1999-2006)
SENIOR VICE PRESIDENT AND
GENERAL MANAGER

Jordan oversaw eBay's early growth into one of the Internet's biggest commerce brands. [That's him holding the "a."] After eBay bought PayPal, he helped the payments company increase revenue by 39% year over year.



OpenTable
(2007-2011)
PRESIDENT AND CEO

He led the online reservation company through its initial public offering in 2009 at the height of the financial crisis. On its first trading day, the company's stock price popped nearly 60%. It increased more than threefold during his tenure.



Andreessen Horowitz
(2011-PRESENT)
MANAGING PARTNER

Jordan credits his operating experience for investing early in some of Silicon Valley's hottest tech companies. They include Airbnb (whose founders are pictured here), Pinterest, Instacart, Lime, Lookout, OfferUp, Accolade, and Wonderschool.

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growing user base didn't work for Fab, and the company sold its assets in 2015 for \$15 million.

Jordan, who calls the Fab experience "painful as hell," feared for his job. He recalls that three other VCs who backed Fab exited their firms soon after. "Boom. Boom. Boom," he says, forming a finger pistol and loudly firing three bullets. Jordan remembers walking into Andreessen's office to ask, "Anything I should know?" Andreessen's response: "Are we still in Airbnb? Are we still in Pinterest? Okay, you can stay."

JORDAN HAS KNOWN real setbacks in his professional and personal life. He grew up in the Philadelphia area, the middle of three children. His father, who worked as a pharmaceutical executive, died of cancer when Jordan was 15. His mother, a homemaker until then, eventually became the family's sole provider and found a job as an executive assistant. There was enough money for tuition at Amherst College in Massachusetts but not, says Jordan, for living expenses. So he took jobs as a cook at campus restaurants and throughout his summer breaks. (He remains an enthusiastic cook.)

After college, Jordan worked briefly for the insurer Cigna, where a boss spotted his ambition and recommended business school. He was accepted at Stanford, where he told the admissions director he couldn't afford to go. She told him, "You can't afford not to." He made it work through a combination of financial aid and student loans. After Stanford and three years at Boston Consulting Group, he joined the venerable strategy group at Disney, where his boss was Meg Whitman.

Despite working for one of the most iconic brands in the country, Jordan answered the siren call of the budding dotcom sector, becoming CEO of online DVD seller Reel.com in 1998. The company was a dud. "That was my huge career failure," says Jordan. "I mean, it was just a terrible business, and I wanted it to be something that it wasn't." He was supposed to take the company public but quit after six months to rejoin Whitman, who was now CEO of eBay.

eBay was tiny when Jordan joined as general manager for North America in 1999. Six years later, the unit had 6,000 people. As a key member of Whitman's leadership team, Jordan championed the \$1.5 billion acquisition of PayPal in 2002. The deal was controversial internally because eBay already owned a payments company called Billpoint. "It was clear Billpoint was an abject failure," Jordan says. He favored PayPal because eBay users favored it. Jordan later became president of PayPal, and at a time eBay was riding high, he was considered a potential successor to Whitman. But she passed over Jordan by hiring John Donahoe, the top executive at Bain & Co., where Whitman had once worked. Jordan, who says he took himself out of the running for the eBay CEO job, quit. And for the first time in his adult life he was out of work.

He considered retirement. "I biked every single mountain path like 50 times, and then when I started doing them for the second time, I said, 'Okay, it's time to get a job,'" he says. Nine months after leaving eBay, he became CEO of OpenTable, a job his eBay fans considered beneath him. One investor thought it was "such a waste having him at the head of that teeny little-ass busi-

ness," Jordan says he was told. Nevertheless, he took OpenTable public and stayed for four years, eventually becoming as restless as a CEO as he'd been as a retiree. "I had started advising companies on the side because I was having fun doing that," he says. That's when Andreessen and Horowitz called.

THERE'S A FRAMED Chicago Bulls jersey above a plaque on the wall of Jordan's Sand Hill Road office that reads:

JORDAN

A true leader.

A role model for other players.

Never steals the limelight.

Understands the need for teamwork.

Never lets adversity get him down.

Always practices excellence on the court.

And we're not talking about Michael.

Good luck, Jeff.

"That was my going-away present from Disney," he says. And then he shows his other business trophies: framed charts and graphs from his time at eBay and PayPal. "I joined eBay in 1999," he says, pointing to the chart. "They did \$3 billion in gross merchandise volume the first year I ran it," referring to eBay's preferred metric for total commerce conducted on its platform. By the time he left, that number had grown to \$19 billion.

Not counting Reel.com, a mistake, and OpenTable, a modest success by the outside standards of Silicon Valley, Jordan always has played supporting roles. As an executive at Disney and eBay, he had helped contribute to the success of high-profile CEOs like

Michael Eisner and Meg Whitman. His name will never be on the door at Andreessen Horowitz.

But he has another measure of success beyond the wealth he accumulated at eBay, OpenTable, and his early wins at Andreessen Horowitz. He calls it his "scorecard," otherwise known as a personal track record. "My biggest issue is that I don't like to talk about myself," he says, while simultaneously noting that he consistently ranks higher than anyone else at Andreessen Horowitz on industry investing lists, a humble-brag of the first order. Indeed, Jordan ranks No. 5 on the most recent CB Insights list of top VCs, a ranking known as more of a quantitative measurement than a popularity contest.

Jordan even wins praise from competitors. "It looks to me that Jeff's behind some of the firm's most iconic investments," says Benchmark's Bill Gurley. (The two have been allies as well as rivals; Gurley was an OpenTable investor when Jordan ran the company.)

Asked why he's still at it—digging through company reports, serving on boards, meeting with so many people when he could be off on his own on the trail, Jordan leans forward and says, "It keeps me young." Later in the day, Jordan joins six Stanford Business School students for lunch to discuss his career and offer advice about theirs. Immediately after finishing his meal and shaking hands with everyone, he's off to Seattle for a board meeting of OfferUp, an e-commerce company. Prominent VCs at competing firms have recently opted to scale back their investments. Not Jordan, who has re-upped as a partner in Andreessen Horowitz's newest fund. "I'll be doing this for a while," he says. ■

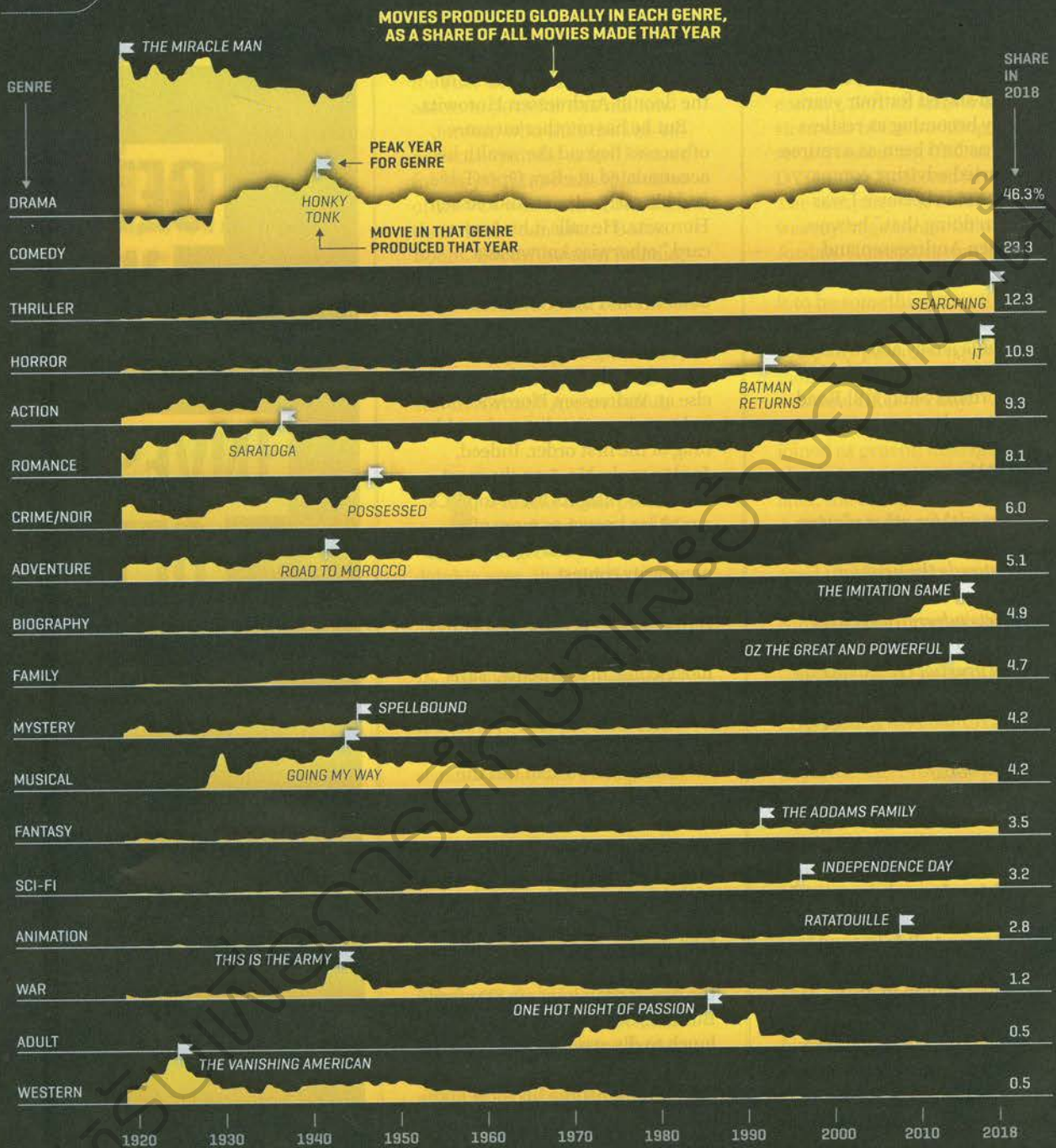
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SCREEN SHOTS

AS MUCH AS MANY OF US LOVE to bash Hollywood, moviemakers do tell us something about our collective psyche—if not with their specific films, then with the types of movies they keep putting into production. That's what *Fortune* discovered when we broke down each year's crop of films by genre, as defined by IMDb. The lonesome, yearning Westerns of the 1920s gave way to musicals and war sagas in the '40s, film noir in the '50s, skin flicks in the '80s, and high-power action movies in the '90s. So what does Tinseltown's output say about us now? Both thrillers and horror flicks reached their production peak during the past two years. Something out there, it seems, has got us running scared. —CLIFTON LEAF



BAGS WITH A MISSION FOR WOMEN ON A MISSION

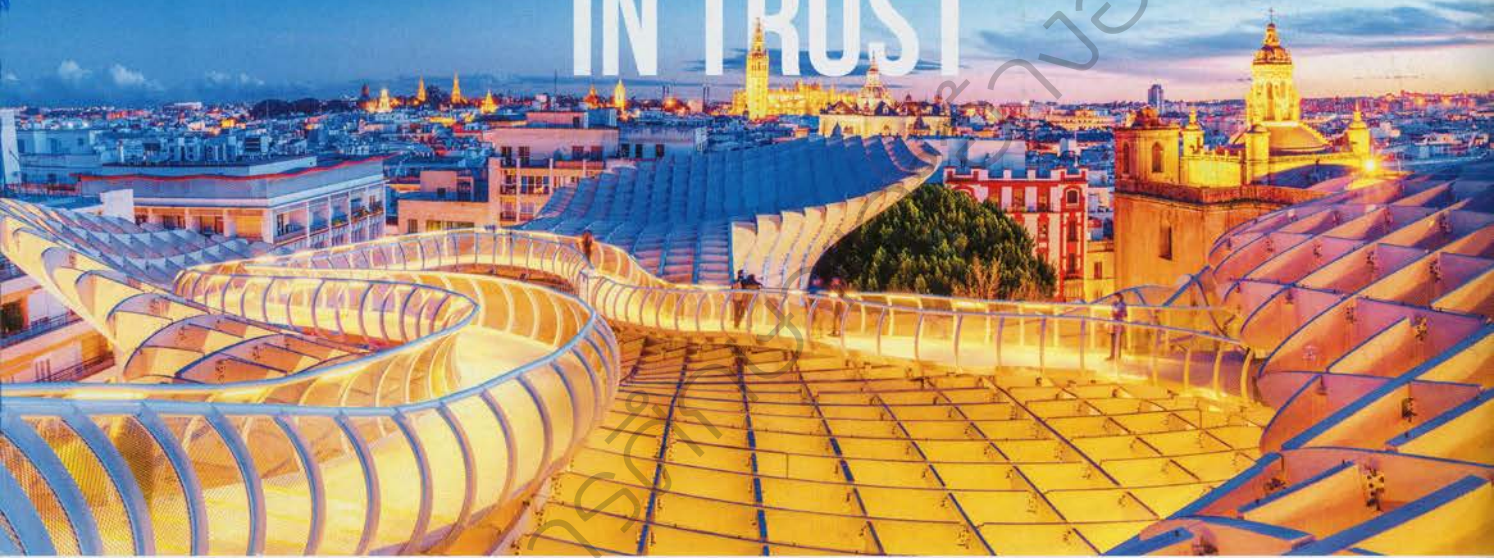
FEED Founder, Lauren Bush Lauren,
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