
CHEMISTRY THAT MATTERS™
سابك
sabic
COLLABORATION.
IT'S THE FUEL OF
THE FUTURE.
SABIC is helping electric and hybrid driving charge ahead.
Our automotive collaborations are helping accelerate the performance of electric and hybrid vehicles. SABIC resins can reduce the weight of components from dashboards to tailgates by as much as 40%. So vehicles can go further. The future is revving up with Chemistry that Matters™.
Meet one of the world's leading chemical companies at SABIC.com

● The lost startup generation 21 ● Free stock trading! Kind of 26 ● Juul, the new Big Tobacco 68

Bloomberg Businessweek

October 14, 2019 ● SPECIAL DOUBLE ISSUE

Tesla's Autopilot could save millions of lives. How many people will it kill first?

The complicated ethics of Elon Musk's grand experiment 54

Bloomberg Businessweek

October 14, 2019

◀ Where Quintillion's fiber-optic cable comes above ground, near Utqiagvik, Alaska

PHOTOGRAPH BY BEN HUFF FOR BLOOMBERG BUSINESSWEEK

CORRECTION

"Buyouts Push Companies to the Limit. Or Over It" (Finance, Oct. 7) said the median debt multiple for recent private equity deals in 2017 was more than 10 times Ebitda. The correct figure is 5.4.

How to Contact *Bloomberg Businessweek*

Editorial
212 617-8120
Ad Sales
212 617-2900
731 Lexington Ave., New York, NY 10022
Email
bwreader@bloomberg.net
Fax
212 617-9065
Subscription Customer Service URL
businessweekmag.com/service
Reprints/Permissions
800 290-5460 x100
or email
businessweekreprints@theygsgroup.com

Letters to the Editor can be sent by email, fax, or regular mail. They should include the sender's address, phone number(s), and email address if available. Connections with the subject of the letter should be disclosed. We reserve the right to edit for sense, style, and space.

Follow us on social media

Facebook
facebook.com/bloomberg businessweek/
Twitter
@BW
Instagram
@businessweek

Cover: AP Photo

YALE LAB: GEORGE ETHEREDGE/BLOOMBERG


SMALLER.
FASTER.
STRONGER.
Meet the all new SimpliSafe.
It's smaller, faster, stronger than ever.
Engineered with a single focus: to protect.
With sensors so small they're practically invisible.
Designed to disappear into your home
And blanket it with protection.
More than easy to use—downright delightful.
All at prices that are fair and honest.
It's home security. Done right.
"The best home security system"
WIRECUTTER
APRIL 2018
"...SimpliSafe belongs at the top of your list..."
CNET EDITORS' CHOICE
3/28/18
"A seamless system"
PCMAG EDITORS' CHOICE
4/2/18
SimpliSafe
Free shipping for a limited time
at SimpliSafe.com/bbw
SimpliSafe™

IN BRIEF

By Benedikt Kammel

● The U.S. blacklisted eight Chinese technology giants, including two video surveillance companies and the world's most valuable artificial intelligence startup. For the first time in the trade war with China, the administration cited human-rights abuse as its rationale behind an order. ▷ 35

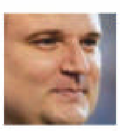
● Donald Trump lost a bid to avoid scrutiny of his tax returns.

A federal court in New York dismissed his suit to block prosecutors from getting the documents for their investigation into whether the Trump Organization falsified records related to hush payments. While it considers his appeal, the Second Circuit in Manhattan will not enforce the ruling.

● "ISIS is not defeated, my friend. The biggest lie being told by the administration is that ISIS is defeated."

Senator Lindsey Graham of South Carolina, normally a close Republican ally of the U.S. president, lambasted Trump's decision to shift troops out of the path of a threatened Turkish military incursion in Syria. ▷ 39

● The NBA came under fire from China, one of its biggest markets, after Houston Rockets general



manager Daryl Morey tweeted an image of a slogan supporting Hong Kong's protest movement. CCTV, the state broadcaster, said it will stop airing NBA games. ▷ 12

● Bang & Olufsen has hired Kristian Tear as CEO. The unprofitable Danish maker of luxury audio systems hopes the former BlackBerry chief operating officer can orchestrate a turnaround following several profit warnings and the stock's collapse.

B&O

● This year's Nobel Prize for chemistry went to a trio of scientists for work on the lithium-ion battery, the energy-storage packs that have revolutionized life on the go, from mobile phones to cars to recording devices. Each researcher will receive 9 million Swedish kronor ($904,000).

● PG&E cut power to about 600,000 customers.

With hot, windy conditions heightening the risk of wildfires, the utility interrupted service in almost 30 counties in Northern and Central California to prevent equipment from sparking blazes. PG&E already faces an estimated $30 billion in wildfire liabilities.

● Activists from Extinction Rebellion blocked streets and bridges in central London on Oct. 7, part of an international protest against what they criticize as slow government action to halt climate change.

● General Electric said it will freeze pension benefits for more than 20,000 employees to trim the shortfall in its retirement plan by as much as $8 billion. GE's underfunded pension liabilities reached

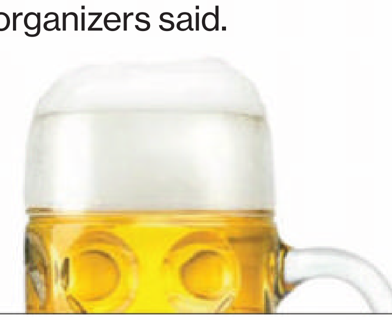
$22.4b

at the end of last year—the largest such deficit among U.S. companies.

● The 6.3 million visitors to this year's Oktoberfest in Munich, a sprawling festival featuring hearty food, fairground attractions, and beer, washed down

7.3m

one-liter steins of suds, organizers said.



● To attract young buyers, Japanese cosmetics giant Shiseido will pay $845 million for skin-care company Drunk Elephant.

● Hong Kong's stock exchange gave up its hostile £29.6 billion ($36.4 billion) pursuit of its London rival.

● North Korea left nuclear discussions with the U.S. in Stockholm, saying the U.S. had arrived to the talks empty-handed.

● An oil spill of mysterious origin has contaminated more than 100 beaches in nine northeastern states in Brazil.

GRAHAM: AARON P. BERNSTEIN/BLOOMBERG. MOREY: AARON M. SPRECHER/AP PHOTO. LONDON: NIKLAS HALLEN/AFP/GETTY IMAGES. BEER: MARIUS GRAF/ALAMY

Trump Won't Stop His Abuses of Power

● The president is violating his oath of office in plain sight. Congress can't accept that. By Michael R. Bloomberg

One could be forgiven for thinking that President Donald Trump wants to be impeached.

On Oct. 4, on live television in front of the White House, he reiterated his call for Ukraine to investigate former Vice President Joe Biden, his leading rival in the 2020 election. He then invited China to do the same—"because what happened in China was just about as bad as what happened with Ukraine."

Trump has never specified what he thinks Biden did. He has, however, engaged in a globe-spanning effort to get others to find out. It bears repeating that federal law prohibits soliciting anything of value from foreigners to aid an election campaign. But more to the point: The president is making it abundantly clear that he intends to keep abusing his power to advance his personal interests. Congress can't, and shouldn't, accept that.

The rough transcript of the phone call revealing that Trump had cajoled the president of Ukraine to dig up dirt on Biden—possibly in return for military aid that Trump had held up—was disturbing. But the information that has come out since, from both the whistleblower and those directly involved in the situation, is far worse.

It's now clear the phone call was part of a broader campaign. Trump also dispatched his personal lawyer to discuss Biden with the Ukrainians, removed a career diplomat who raised questions about the scheme, then enlisted two State Department envoys to pressure Ukraine's president to commit to investigating Biden in return for an audience with Trump—and perhaps, again, for military aid.

An exchange of text messages between Gordon Sondland, an ambassador tasked with carrying out the president's plan, and Bill Taylor, a diplomat at the U.S. Embassy in Ukraine who raised concerns about it, makes the dynamic plain enough:

> [9/1/19, 12:08:57 p.m.] Bill Taylor: Are we now saying that security assistance and WH meeting are conditioned on investigations?
>
> [9/1/19, 12:42:29 p.m.] Gordon Sondland: Call me

Trump has barely bothered to establish an innocent explanation for these acts. Given the facts, it's hard to imagine one. If he thought Biden's conduct constituted a crime, he could have allowed his Justice Department to handle it. If he discovered a previously unexpressed interest in fighting corruption overseas, he could have directed the State Department to make that a priority.

It would be fair game to ask whether Biden's son Hunter unduly benefited from his father's position in his business dealings, as some have alleged. But under no circumstances would it be appropriate for the president to send his lawyer on a freelance mission to ask other governments to investigate in return for personal favors.

Even Trump's stalwart allies are struggling with this one: They've been reduced to quibbling with semantics or musing about bureaucratic conspiracies to frame the president.

Impeachment is never something to be celebrated. It risks doing grave damage to public confidence in government and worsening America's already polarized politics. An election that cast Trump from office would be the soundest and most enduring rebuke to this presidency.

Nevertheless, Congress cannot stand by while any president violates his oath of office, abuses his power for personal gain, and solicits foreign interference in American elections. Even in an administration where the reigning ethical standard is "not technically illegal," this flagrant misconduct stands out.

More Republicans should follow Senator Mitt Romney's lead and state unequivocally that this kind of conduct is "wrong and appalling"—and further, that it cannot be countenanced. Ⓑ

SARAH SILBIGER/BLOOMBERG

TH SCAN O LONDO

● And Europe's, as heavily subsidized diesel engines endanger health

● By Peter Robison

A year ago, my wife, Leslie, and I embarked on an adventure, moving with our two sons from Seattle to London. We put the boys' playhouse on the street, hugged our cedar tree goodbye and, seemingly in an eyeblink, landed at Heathrow, where the kind crew of the British Airways 747 brought our sons, then 7 and 5, into the cockpit. They perched on seats covered in furry sheepskin while the captain, strangely, confided his disappointment in his daughter's new career as a veterinarian.

It was a kind of homecoming. I'd lived in London in my 20s, during the heyday of Oasis and Tony Blair–Cool Britannia–and was excited to return as a seasoned journalist. We moved into a semidetached house in Crouch End, near cricket pitches and tennis courts, across from a stop for the W7 bus that took me to the Tube and on to Bloomberg's offices in the City. It was Instagrammable stuff, except for the pungent chlorine-like smell of exhaust from the diesel-powered cars, buses, and taxis crowding London's hip streets. Even Fortnum & Mason smelled like a petrol station.

No city's perfect. We entered bad smells in the deficit column of our move and tried to settle in. By last fall, two months after we'd arrived, I noticed that a raspy feeling in the back of my throat never really went away. My voice had a new resonant depth, like a smoker's. My chest felt tight. My asthma, a routine condition I'd managed without a problem in Seattle, was flaring up in London.

I went to my local National Health Service clinic, entered an exam room, and blew into a spirometer. My lung capacity was 5% less than normal; nothing unusual to the doctor, who handed me a peak flow meter and a spacer, a plastic holding chamber for an inhaler–the kind my mother uses in her nursing home–and told me to come in if I noticed any big changes. At the pharmacy I picked up inhalers, powders, and pills in a square white bag, folded over at the top like Chinese takeout.

Anyone who's seen *The Crown* knows about the Great Smog of 1952, when thousands died from coal pollution during a cold snap and London was, in Cyril Connolly's famous phrase, the "largest, saddest, and dirtiest of great cities." Before that were the pea souper fogs (also coal smoke) of Victorian days. I'd read about recent concerns over emissions of particulates and nitrogen dioxide (NO_2), tied largely to the massive adoption of diesel vehicles: 12.4 million in the U.K. today, up from 1.6 million when I left in 1998; and across Europe, more than 50 million. But I'd assumed, like many in the West, that pollution was a Third World problem and that stringent-seeming European Union regulations were gradually cleaning the air.

Now, my own lungs burning, I began noticing things I'd looked past in the pell-mell of everyday life: One London friend's strapping teenage son had asthma; another's daughter suffered from unexplained breathing problems. I spotted a twentysomething taking a squirt from his inhaler before watching a National Theatre production of *Antony & Cleopatra*. The city's mayor, Sadiq Khan, has adult-onset

HE NDAL F ON'S AIR

asthma. British people tended to shrug when we asked them about the air. "It's not as bad as India's, is it?" they'd say.

I discovered an undercurrent of agonizing stories from pollution émigrés: the bicyclist terrified by an asthma attack; the doctoral candidate from a rural town who gave up her dream to flee the London air. I was feeling trapped and worried for our own children. Was it all just confirmation bias? Was there any hard evidence to prove what I felt in my chest? Whatever happens with Brexit, this much is certain: For decades, Europe will be united by filthy air and a slowly unfolding public-health crisis caused by its embrace of diesel—something that was supposed to heal the environment.

King's College London operates the world's most extensive network of air-monitoring stations, 117 of them in almost all of London's 32 boroughs. Their instruments generate a pollution map marked red for the highest levels and green for the lowest. The result is something like a bloodshot eye: red in the city's center and down the arteries of major roads. It's a visual representation of what makes this era of traffic-borne pollution so insidious. Conditions are worst exactly where the most people live. Nitrogen oxides produced by the combustion of diesel engines react with air to form NO_2, a toxic gas that inflames the lung, heart, and brain and has been linked to cancer and dementia in addition to respiratory illnesses. Diesel tailpipes also produce tiny particles known as PM2.5s. A secondary pollutant, ozone, forms when the pollutants react with sunlight—and those levels, too, have worsened with climate change.

London has exceeded EU limits for NO_2 since 2010, and levels are also high in Munich, Paris, and other cities that embraced diesel. Some days in London, the average level is higher than in Beijing, more than doubling the legal maximum.

I visited Frank Kelly, head of the Environmental Research Group at King's College, in his office not far from the teeming traffic of Waterloo Bridge. His early research focused on how to give premature babies the right amount of oxygen to save them without hurting them; in recent years he's overseen efforts to determine safe levels for pollutants. He hasn't found them. And he gets especially frustrated by the fatalist streak of people who say the air could be worse. "You've got to bring this home," he tells me. "It's you, your children if you live in London. As an educated society, we shouldn't do this to people."

In study after study, the college has shown evidence of dramatic health effects. One found that pollutants on traffic-clogged Oxford Street wiped out the respiratory benefits of a walk there for people over 60. Another found teenagers living in dirtier air had 70% greater odds of developing psychosis. A third followed 2,500 schoolchildren in east London over seven years. By the end, those who'd breathed the most NO_2 had lungs as much as 8% smaller. Kelly calls that "a clinically important" decrease. Lungs only grow until age 18, and their capacity starts dropping at 30. If the organ starts out smaller, people are more likely to have worse outcomes: twitchy, reactive lungs that develop asthma or other respiratory diseases. "It's a really strong marker for later problems in life," he says. Dutch researchers estimate 33% of new childhood asthma cases in Europe are caused by air pollution. ▶

MATT COOPER/GALLERY STOCK

◀ What's all the more frustrating is that diesel engines were supposed to be a climate savior. Their fuel economy is generally better than that of gasoline engines, and policymakers believed in the late 1990s that they produced fewer emissions of carbon dioxide (a claim questioned by later studies). Diesel buyers in Britain, France, and Germany got tax incentives from their governments, who'd been lobbied by car manufacturers who convinced them the technology was cleaner. And, of course, policymakers believed lab tests were a genuine guide to real-world performance—a lie dramatically exposed in 2015 when Volkswagen AG admitted it had used software to ratchet down emissions during the standard testing protocol. On the road, VWs spewed pollutants at a rate as much as 40 times higher than in the lab. Other carmakers also showed huge gaps: for nitrogen oxides, an average of as much as 700 to 800 milligrams per kilometer on the street vs. 80mg in the lab, according to a June 2019 statement from the European Commission.

Volkswagen has paid $33 billion in fines and settlements, but the real price is measured in lives. The Royal College of Physicians estimated in 2016 that as many as 40,000 deaths a year in the U.K. are caused by exposure to outdoor air pollutants, updating a 2010 assessment of 29,000—in large part because of higher concentrations of NO_2.

London has committed hundreds of millions of pounds to replace diesel buses with hybrid electric models and requires a £56,000 ($69,000) electric model for any new black cabs, famously dirty and foul-smelling. Most controversial, Khan is rolling out Ultra Low Emission Zones, charging £12.50 a day for vehicles that aren't compliant with the latest standards. By 2021, the zones may stretch all the way to the North and South Circular roads that ring London. But tests that measure performance accurately continue to bedevil policymakers.

At the Real World Emissions conference, in March in a Long Beach, Calif., hotel—the same annual gathering of academics and car manufacturing officials where West Virginia University researchers five years ago unveiled the tests that tripped up VW—a procession of independent analyses showed how far vehicles under the demands of cold weather and city driving still diverge from the latest "Euro 6" emission standards. One paper by Andreas Gruber of the Vienna University of Technology estimated that even a plug-in hybrid emits twice the maximum Euro 6 limit for particulates. "So, next step, I hope we can work together to build a better future for us and our children," he concluded, to slight titters from the crowd of industry professionals.

The death of a 9-year-old named Ella Adoo-Kissi-Debrah has the potential to galvanize an air pollution movement in the capital. She grew up in Lewisham, a borough of 300,000 in southeast London, joined a Little Kickers soccer team for Millwall FC at age 2, and loved playing drums, piano, and guitar. Around Christmas of 2010, just before she turned 7, she had a severe asthma attack and went into the hospital, the first of 28 visits over a three-year period. After she died in February 2013, the pathologist called it one of the worst cases of asthma ever recorded in the U.K. The inquest determined her triggers were airborne, and Ella's mother, Rosamund Adoo-Kissi-Debrah, speculated to the *Evening Standard* that pollution was a factor. The family lives 25 meters from the South Circular road.

Stephen Holgate, a University of Southampton professor and one of the country's foremost asthma experts, spotted the article. He contacted Ella's mother and put together a paper correlating the child's hospital visits with spikes in air pollution. It was the backbone for a legal assault orchestrated by Jocelyn Cockburn, a human-rights lawyer bothered enough by the air to move to the coast (a luxury, as she points out, that isn't available to people of less means). In May the U.K. High Court granted her request for a new inquest, likely next year, on the grounds that air pollution should be cited as a cause of death—the first time in any official proceeding. If pollution is confirmed as a cause, it would usher in a wave of litigation to force authorities to clean up illegal pollution and open the door to holding polluters directly responsible. "Banning diesel would be a great start," Adoo-Kissi-Debrah says. She shared a stage at a Vienna conference in May with former California Governor Arnold Schwarzenegger, who mused that climate campaigners might have it wrong by focusing so much on long-term risks rather than the here and now. "We have to let people know that pollution will kill you," he said.

It isn't just asthmatics who are affected by bad air; we are, in fact, more like canaries in the coal mine. One study of heart tissue from 63 young people who'd died in road accidents in Mexico City found billions of pollutant particles per gram associated with early and significant cardiac damage. Asthma expert Holgate says doctors have to educate patients about the dangers of air pollution in the same way they did about smoking.

Europe's struggles are only one part of a pollution reckoning around the world, where 90% of people breathe dirty air, costing 7 million lives a year by World Health Organization estimates. Climate change is causing more intense and frequent wildfires that sometimes blanket parts of the U.S. West Coast, including my hometown of Seattle, in hazy smoke. In part, it's a downside of the urbanization world leaders have encouraged as the best way to address poverty. Residents are packed closer together, increasing pollution. Now people everywhere—from Ulaanbaatar, Mongolia, which banned the burning of raw coal, to Beijing, which is in the midst of the world's most ambitious ramp-up of electric cars—are starting to recognize the trade-off. Those benefits only go so far. Lung-penetrating particles are also generated by road dust and worn tires—solely traffic-dependent.

In December, Leslie and I gave up on London and returned to Seattle with our boys. The *Ham & High* newspaper in our London neighborhood recently reported that the "lollipop lady" (crossing guard) at the local primary school started wearing a gas mask. In Seattle, there was a whiff of wildfire smoke this August, but the wind shifted, and it went away. Ⓑ

Can the Nike of China Go Global?

Beijing's fight with the NBA is making headlines. But the real sports story in China is Anta's bid to expand worldwide

Chinese President Xi Jinping is rarely seen wearing clothes with visible logos. So when a state television segment in 2017 showed him in the ski town of Zhangjiakou—a venue for the 2022 Winter Olympics—wearing the national team parka, investors were riveted by the insignia on his chest: the red logo of Anta Sports Products Ltd.

Was it just a show of support for the games? Or a tacit endorsement of Anta, China's emerging challenger to Nike Inc. and Adidas AG? Investors have voted for the latter: Shares of the Fujian-based apparel company rose 8% over the next two days. Revenue is up 80% in the two and a half years since.

China is expected to surpass the U.S. this year as the world's biggest consumer market, but it's yet to mint a global consumer megabrand of its own. Western companies still dominate the $43 billion domestic sports apparel market, where Nike's share is almost 23% and Adidas holds 20%. Anta is third, with 15%, and few consumers outside China have heard of it.

Anta President James Zheng says his company won't stay back in the pack much longer, predicting it will be China's dominant sportswear brand by 2025. The rest of the world will get to know it, too, he says. One reason: Two years ago, NBA star Klay Thompson agreed to a 10-year, $80 million extension of his endorsement deal with the company. Although Anta's suspended wider negotiations with the league, its relationship with Thompson hasn't been affected by the NBA's current fracas in China, and the KT5, the latest version of Thompson's signature sneaker for the brand, gets a high-profile American release this month.

Domestically, the company has ponied up to sponsor the Chinese Olympic team and the Beijing 2022 games. Zheng declines to say how much the sponsorship cost but calls it Anta's most significant investment ever. "The next two years will solidify our ability to be No.1 in China," he says.

Revenue will rise at least 20% a year during this "crucial period," Zheng says. It will also test his faith in the power of Western, aspirational marketing. "It's not just designing and making a nice pair of shoes," he says. "You have to communicate to consumers what your brand spirit is, your culture, your values."

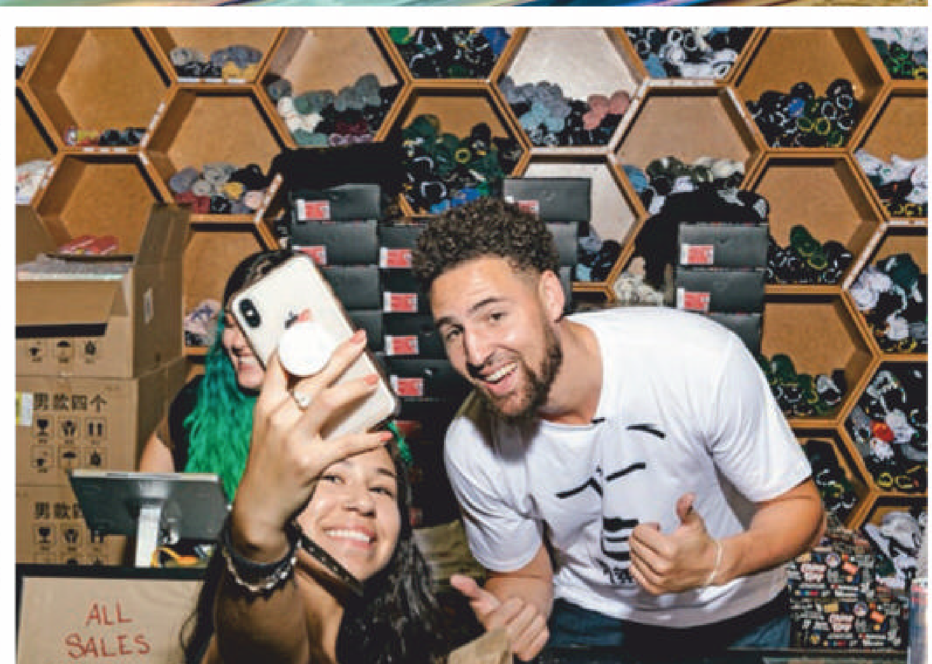
Chinese corporate history has plenty of examples of consumer companies that tried—and failed—to use nationalistic sentiment and celebrity to unseat global competitors. Apparel maker Li Ning Co. Ltd. paid to outfit the Chinese national gymnastics, diving, table tennis, and archery teams before the 2008 Beijing Olympics. The on-air presenters for national sports broadcaster CCTV-5 also wore its Li-Ning brand. And company founder Li Ning, a gymnast who became a mainland sports icon after winning six medals at the 1984 games, lit the torch during the opening ceremony. The company's shares quickly jumped more than 3%.

Yet more than a decade later, sales of the Li-Ning brand and the share price of its parent have collapsed, dragged down by executive turnover and too-rapid expansion. Its share of the local market has stalled at about 6%, barely holding off insurgent Skechers USA Inc.

Pascal Martin, a partner in Hong Kong with OC&C Strategy Consultants, says Anta seems better positioned to challenge the Western sporting apparel giants because it's building a family of brands with reach far beyond China. He says the company has been bolstered by its recent $5.2 billion acquisition of Finland's Amer Sports Oyj, parent of ski brands Armada, Atomic, and Salomon, as well as high-end outdoor gear company Arc'teryx and equipment company Wilson. "Anta is heading towards the Winter Olympics in much better shape than Li-Ning was in 2008," Martin says. "With the winter and outdoor sports brands, it's very relevant. Anta's already in a better position to leverage the sponsorship."

The Amer Sports deal and an earlier licensing pact to sell sportswear and shoes from the Fila brand, whose retro, thick-soled "dad sneakers" are enjoying a global renaissance, are part of a strategy to become what Zheng describes as "the LVMH of the sports world." (The French luxury group owns scores of brands, ranging from Louis ▶

Edited by James E. Ellis, Janet Paskin, and David Rocks



▲ NBA star Thompson in Oakland at the release of his latest Anta signature sneaker

PHOTOGRAPHS BY JASON HENRY FOR BLOOMBERG BUSINESSWEEK

◀ Vuitton bags to Rihanna's Fenty clothing line.) The strategy runs counter to those of Nike and Adidas, which have been selling off sub-brands. Anta also has been bolstering its balance sheet and building its in-house marketing expertise.

For Zheng, who ran Reebok's China operations before taking the reins at Anta in 2008, the established brands give the company time to build the kind of emotional connection to consumers that Chinese brands have traditionally overlooked. When Anta picked up Filipino boxer-politician Manny Pacquiao in 2016 after Nike cut him loose, Zheng praised his strong will and self-discipline as an embodiment of the company's "Fight On" and "Keep Working" slogans.

Anta also sponsors Chen Penbin, who, after becoming the first Chinese athlete to complete an ultramarathon on all seven continents, is training with the nation's cross-country ski team before the 2022 Olympics. And Thompson, who makes regular trips to China, has built a large mainland following. In 2017 a clip of him losing an arm wrestling match to a slight female fan went viral.

In addition to the coming Olympic cycle, the three-year-running U.S.-China trade war has made many mainland consumers eager to support local brands of all kinds; the furor over the NBA's Hong Kong tweet saga could fuel that trend. Smartphone maker Huawei Technologies Co. shot up the ranks of brands most loved by Chinese consumers after the U.S. government precipitated the arrest of Huawei's chief financial officer in Canada.

Nike and Adidas won't cede China easily. "Nike is a brand of China, for China, and the results continue to prove it," Chief Executive Officer Mark Parker said on the company's most recent quarterly earnings call, pointing to "double-digit growth in Greater China every quarter for more than five years."

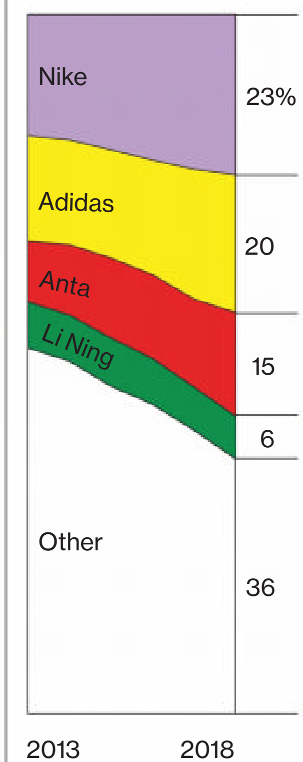
The foreign roots of Western brands remain a huge advantage. "For a big swath of the Chinese middle class, there is a cachet associated with Nike and Adidas that give them an edge," says Chan Wai-Chan, a retail partner at consulting firm Oliver Wyman. "There is an emotional connection and history that those brands rely on—for example, in re-releasing old sneaker models from their archives."

Chinese companies have very little history to sell. Anta was founded in 1991, the same year Nike released its sixth edition of Air Jordans, and Adidas was already into a full-on reboot of its venerable EQT shoe line. Yet OC&C's Martin argues that operationally, that's not all bad: "Nike and Adidas came early to China, but that legacy is difficult to change and evolve," he says. "Anta understands the Chinese consumer, they understand the online ecosystem really well, they have the shortest supply chain."

Even so, Zheng says it won't be easy. "To have a product story become a brand story and have that brand story be charismatic and resonate with Westerners, that's still challenging," he says. "We're going to need time, and luck." —*Rachel Chang and Haze Fan*

THE BOTTOM LINE Anta, the third-largest sports apparel maker in China, has seen its sales grow more than 80% in three years. Now it wants to conquer China and expand into the West.

● Sportswear market share in China



Aramco's Giant IPO Is Finally Set

● The Saudis are promising higher dividend payments to lure investors

Crown Prince Mohammed bin Salman had only just started his rise to global notoriety when he stunned the global business community in early 2016 by promising to sell shares in the Saudi Arabian Oil Co., the state oil producer. Now, after several false starts, the initial public offering of Saudi Arabia's crown jewel—Aramco, which pumps 10% of the global crude oil supply from abundant fields under the kingdom's desert—is finally going ahead.

The government is set to make a formal announcement in late October. While details of the offer haven't been made public, people involved in the transaction say about 2% of Aramco may be sold at a price that would value the entire company at $2 trillion, raising $40 billion and outstripping the $25 billion collected in 2014 by Chinese e-commerce giant Alibaba Group Holding Ltd. "Aramco is ready for listing whenever the shareholder makes a decision to list," Chief Executive Officer Amin Nasser said last month. "It's going to be very soon."

Beneath the hype, the sale isn't quite the exercise in free-market liberalization the prince first suggested. For one thing, there's no plan to list in a global financial center such as London, New York, or Hong Kong. For now, the shares will trade only on Riyadh's stock exchange, the Tadawul.

A local listing will give the government significant input into who buys the stock. The kingdom's richest families have been invited to become anchor shareholders. It's an offer they may find hard to refuse. The offering will also be pushed to Saudi citizens through a countrywide advertising blitz, with banks encouraged to lend money so retail investors can participate, according to people briefed on the plans who asked not to be named before the details are made public. And bankers on the deal are pitching the offering to sovereign investors in Asia and the Middle East, who may have long-term economic and political reasons to cement strong ties with Riyadh.

But the world's money managers may see reasons to stand on the sidelines: a weak oil market, concerns about the strength of the global economy, and last month's attack on Aramco's most important crude-processing plant. Investors are already demanding a premium to hold the country's debt, downgraded in October by Fitch Ratings Ltd.

"Aramco is simply the best oil and gas asset on the planet," says Danilo Onorino, who runs fund manager Dogma Capital in Switzerland and has invested in Aramco's bonds. "But there are problems. Saudi Arabia's cost of capital is relatively high, the oil price isn't where you want it to be, and there are issues with transparency."

Investors worry the IPO won't bring independence from the Saudi state, which has never suggested selling more than a 5% stake. Aramco's tax payments and dividends will remain the biggest source of government income, and Saudi Arabia is the most important member of the OPEC cartel. So oil production will remain a political decision.

"Aramco operates some of the lowest-cost assets in the world," says Rob Thummel, a senior portfolio manager at Tortoise Capital Advisors. "The biggest concern around Aramco is governance."

Valuation is another concern. The crown prince has always insisted that Aramco is worth more than $2 trillion, almost twice the market capitalization of Microsoft Corp. and Apple Inc., the world's most valuable companies today. There's little doubt the company deserves a stratospheric valuation: It pumps almost 10 million barrels a day, more than double its largest American rival, Exxon Mobil Corp., and posted an annual profit of $111 billion last year. But $2 trillion still looks aggressive compared with other major oil producers.

Aramco recently promised to pay a base dividend of at least $75 billion in 2020, significantly higher than the $58 billion it paid to the Saudi government in 2018. That's equivalent to about $20 for every barrel it produces and more than the dividends paid by Exxon, Royal Dutch Shell, and Chevron combined.

The Saudi government also tweaked Aramco's tax structure to allow more scope for shareholder payments, cutting the royalty paid on every barrel to 15% from 20% as long as oil prices stay below $70 a barrel. (They're currently below $60.) It even promised minority shareholders they'd be paid dividends before the government if oil prices were to crash.

Even so, at a valuation of $2 trillion, Aramco's dividend yield will equal just 3.75%. That's a healthy return in a world of zero interest rates, but it's less than holders of the company's 30-year bond are getting. Today, Exxon's dividend yield is about 5%. For Aramco to match Exxon's yield, its market value would have to be closer to $1.5 trillion.

Another concern for potential investors is the outlook for demand. Aramco was built in an era when oil demand would reliably rise year after year as hundreds of millions took to the road. But global automakers such as Volkswagen AG are investing billions in electric vehicles, and some analysts expect gasoline demand to peak within the next decade. More immediately, the International Energy Agency sees a potential mismatch between supply and demand early next year of more than 1 million barrels a day. —*Will Kennedy, with Swetha Gopinath*

THE BOTTOM LINE The long-delayed IPO of Saudi Arabia's Aramco, which pumps 10% of global crude oil, may need to value the company at less than the expected $2 trillion.

▲ A natural gas facility in Aramco's Shaybah oil field

● Crown Prince Mohammed

PHOTOS: BIN SALMAN: LUKE MACGREGOR/BLOOMBERG. OIL FIELD: SIMON DAWSON/BLOOMBERG. DATA: EUROMONITOR INTERNATIONAL

Cut the Script. Bring On the Feathers

● To battle streaming giants, broadcasters in Europe are turning to live shows and reality TV

As Netflix, Amazon, and Apple steal viewers from traditional TV, one German broadcaster is fighting back—with a green-suited grasshopper, a rainbow-hued cockatoo, and a fuzzy pink monster with shimmering wings. The creatures appear in *The Masked Singer*, a mashup of game show and talent competition that ProSiebenSat.1 Media SE aired live on Thursday nights this summer. B-list and C-list celebrities don outlandish disguises and belt out pop songs, while fans vote on who progresses to the next round—and try to guess who's hiding under the sequins, fur, and feathers. *The Masked Singer* averaged 7 million-plus viewers an episode, and for the finale the audience hit 9.5 million—helping the network reach its highest daily market share in 22 years.

It won't likely win Emmys, but these are tough times for traditional broadcasters, and many have concluded that nonscripted TV is their best defense. The shows are relatively cheap, and with the right marketing they can win advertisers' hearts by creating what ProSieben Chief Executive Officer Max Conze calls "bonfire moments"—events viewers will want to see in real time. "Outside of football world championships, there are very few things where you can aggregate that kind of audience," he said at a September media conference in Cologne.

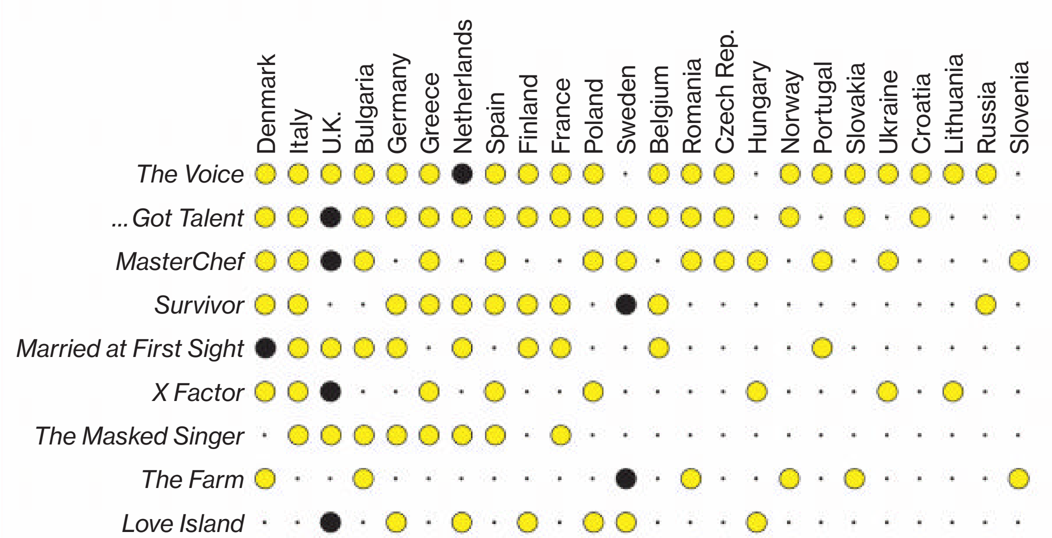
ITV Plc, the maker of hit dating/reality show *Love Island*, has ordered a British version of *The Masked Singer*, a concept developed in South Korea. The show has since spread to about a dozen countries, including the U.S., where it's in its second season on Fox Broadcasting Co. ProSieben's German competitor RTL Group SA is producing a game show where costumed contestants navigate obstacle courses in the woods. And a Danish concept called *Married at First Sight*, in which two people first meet at the altar, has been sold to about 30 countries.

It's a tacit admission that traditional broadcasters can no longer compete for high-profile dramas with the U.S. streaming giants and their mountains of cash. Netflix, Amazon, and Apple are projected to spend more than $20 billion on content this year, most of it scripted shows and movies. In the U.K., the cost of producing an hour of drama has doubled or even tripled in the past decade even as ad revenue has stagnated, says Tom Harrington, a researcher at consulting firm Enders Analysis. "There's been a drop in commissioning dramas," he says, as broadcasters "have less money to spend on something that's getting more expensive."

Instead, traditional broadcasters are turning to live content and gimmicks such as a camera following cops or debt collectors. Enders says the U.K.'s main free-to-air broadcasters have more than tripled the time devoted to nonscripted shows since 2002. In Germany the share of live programs, game shows, and reality TV at the three biggest private networks has more than doubled since 2000, to 43% of productions broadcast last year. At TF1, France's biggest free-to-air channel, scripted shows other than movies dropped to a quarter of content watched last year, down from a third in 2010, according to ratings tracker Mediametrie.

Reality TV

● Country of origin ● Localized version airing 2019-20



DATA: COMPANY REPORTS, NEWS REPORTS. INCLUDES SPINOFF SERIES

The other stronghold for traditional TV is live events such as soccer's World Cup. But while streaming platforms struggle to serve millions of simultaneous viewers, they're getting better. A big sports push by the streamers would leave broadcasters even more dependent on lowbrow fare such as a drag queen talent show featuring German model Heidi Klum as a juror that ProSieben will introduce in November. The channel's content is "more local, more live, more relevant," Conze said at the conference in Cologne. Shows like *The Masked Singer* create a buzz that "has huge power, and that power isn't going away." —*Stefan Nicola, with Angelina Rascouet*

THE BOTTOM LINE Netflix, Amazon, and Apple together will spend $20 billion-plus on content this year, spurring traditional broadcasters to go downmarket in pursuit of "bonfire moments."

Using the Body's Trash Disposals to Fight Cancer

● Drugmakers are betting big on technologies that tag and destroy the proteins behind fatal diseases

Crews pioneered protein degrader drug technology

PHOTO: GEORGE ETHEREDGE/BLOOMBERG

At their most basic level, many of the deadliest diseases are caused by nests of misguided proteins. Most medicines work by attaching themselves to these proteins and temporarily shutting them down. In the 1990s, Yale University scientist Craig Crews and a colleague had a radical idea: What if a drug could destroy a bad protein by making it a target of the body's own molecular trash disposal machines?

For years, the idea was a lab curiosity. Biotech investors wouldn't initially back a company based on the concept, which Crews and a few other academics labored to prove could be a practical way to make drugs. The field got a big boost earlier this decade when scientists discovered that some of the most successful medicines turned out to work by piggybacking onto these human trash collectors. Now it's become one of the hottest technologies for making pills. Crews and a biotech he founded, Arvinas Inc., are racing some of the world's biggest pharmaceutical and biotech companies–Novartis, Amgen, and Gilead Sciences–to turn protein-degrading compounds into drugs. "By hijacking natural quality-control machinery inside cells, we are literally making problem proteins go away," he says.

The new drugs, dubbed protein degraders, could be among the most significant advances in drugmaking technology in decades. Unlike specialized gene therapies, treatments based on protein degraders could be mass-produced in pill form. There could be a range of applications, from vanquishing drug-resistant tumors to clearing clusters of disease-causing proteins from the brains of Parkinson's or Alzheimer's sufferers. "No other technology has the potential to have such a broad impact," says Nello Mainolfi, founder and president of Kymera Therapeutics, a biotech that attracted $70 million in funding in May from Vertex Pharmaceuticals Inc. to use protein degraders to tackle undisclosed specialty diseases.

What's perhaps most intriguing to drug scientists is that degraders could help researchers target thousands of proteins now considered "undruggable," including several linked to common cancers. "This set of technologies is rapidly advancing," says Robert Bradway, chief executive officer of Amgen Inc. "It will enable us to reconceive the druggable ▶

Edited by Rebecca Penty and Jeff Muskus

◀ Something brewing at the Yale lab

◀ genome." In May, Amgen spent $167 million to acquire Danish biotech company Nuevolution AB for its screening technology that will help it hunt for protein degraders.

The first targeted degrader drugs are just beginning human trials, so scientists won't know how well they work in people for several years, and potential side effects remain largely unknown. At least three cancer treatments based on degrader technology have reached human testing, including two Arvinas drugs, and more are expected in the next year or so. In June, Germany's Bayer AG signed a pact worth more than $110 million with Arvinas to develop protein degraders for treating diseases, as well as agricultural applications including weed and insect control. The first drug produced by Kymera, which breaks down a protein linked to certain lymphomas, could begin human trials next year.

The human body's disposal system breaks down old, unwanted, or damaged proteins into parts that later can be recycled into new proteins. A group of enzymes recognizes unneeded proteins and attaches molecular tags that mark them for destruction. Cylindrical structures inside cells called proteasomes then come along and cut the unwanted proteins up into pieces. When the process goes wrong, with key proteins recycled at an excessive or insufficient rate, certain deadly diseases can develop, such as cystic fibrosis, cervical cancer, or kidney cancer. Drugs that block the proteasomes behind the recycling, including Takeda Pharmaceutical Co.'s Velcade, are already available to treat multiple myeloma, whose fast-growing cells can be slowed by the buildup of waste proteins. Only recently did scientists show that it would be practical to make drugs that do the opposite—use protein degraders to speed up the destruction of disease-causing proteins.

When Crews first started pursuing the concept in the late 1990s, he was working on understanding the mechanism of an experimental cancer drug that turned out to block the cell's garbage disposal system. At a conference in Blaine, Wash., he met Raymond Deshaies, who was studying the same system at the California Institute of Technology. Over beers, they came up with the concept of developing drugs to activate the process to get rid of unwanted proteins. The idea was to devise a Tinkertoy-like molecule with one end that sticks to a problem protein. The other end would attach to one of the body's garbage disposal enzymes. This would tag the protein for destruction. But scientists didn't know much about how to latch onto the enzymes that marked proteins for destruction with small chemicals. Crews's colleagues were skeptical that the idea had practical applications. He worked for years to improve the technology. In 2013 he founded Arvinas, which has offices less than a mile from his lab at Yale.

By that time, others in the industry had unpacked some of the world's most powerful drugs and found that degrading proteins played a role in their success. In 2010, Japanese researchers showed that thalidomide—a drug used to treat both leprosy complications and multiple myeloma cancer—bound to a key protein involved in degradation and limb development, which helped to explain how it causes birth defects. Then, in 2014, other scientists showed that multiple myeloma drug Revlimid, a successor to thalidomide that's been a bestseller for Celgene Corp., induced the degradation of proteins that myeloma cells apparently use for growth. "That is when the field went on steroids," says Deshaies, now senior vice president for global research at Amgen.

Another turning point came in 2015, when researchers from several teams working independently, including Crews's lab and scientists from Dana-Farber Cancer Institute in Boston, showed that small chemicals that could potentially be packaged into pills could connect known cancer-causing proteins to the body's disposal system for grinding up.

Novartis AG now has 60 to 100 scientists at any given time working on degraders, says James Bradner, who was on the Dana-Farber team and has been head of Novartis's research arm since 2016. So far they've been able to degrade more than 50 proteins in the lab, leading to a half-dozen drugs in early testing. The first of them, for an undisclosed cancer target, just began human trials, Bradner says.

In New Haven, Arvinas has taken a more conservative approach. It's working first on improving

● Amount Amgen spent on Nuevolution to help it develop protein degraders

$167m

PHOTO: GEORGE ETHEREDGE/BLOOMBERG; ILLUSTRATION BY MARÍA MEDEM existing categories of commercial drugs, before moving toward untried or hard-to-hit targets. The company is testing its prostate cancer drug on patients who have stopped responding to existing hormone therapies. The first safety results are due later this year.

A decade from now, a third of new drug approvals could be degraders, says Nathanael Gray, a chemical biologist working on degraders at Dana-Farber who's also a co-founder and scientific adviser of biotech C4 Therapeutics. The company has a deal with Biogen Inc. to pursue degraders for brain diseases. Says Gray: "There is really no disease that can't be impacted by this technology." —*Robert Langreth*

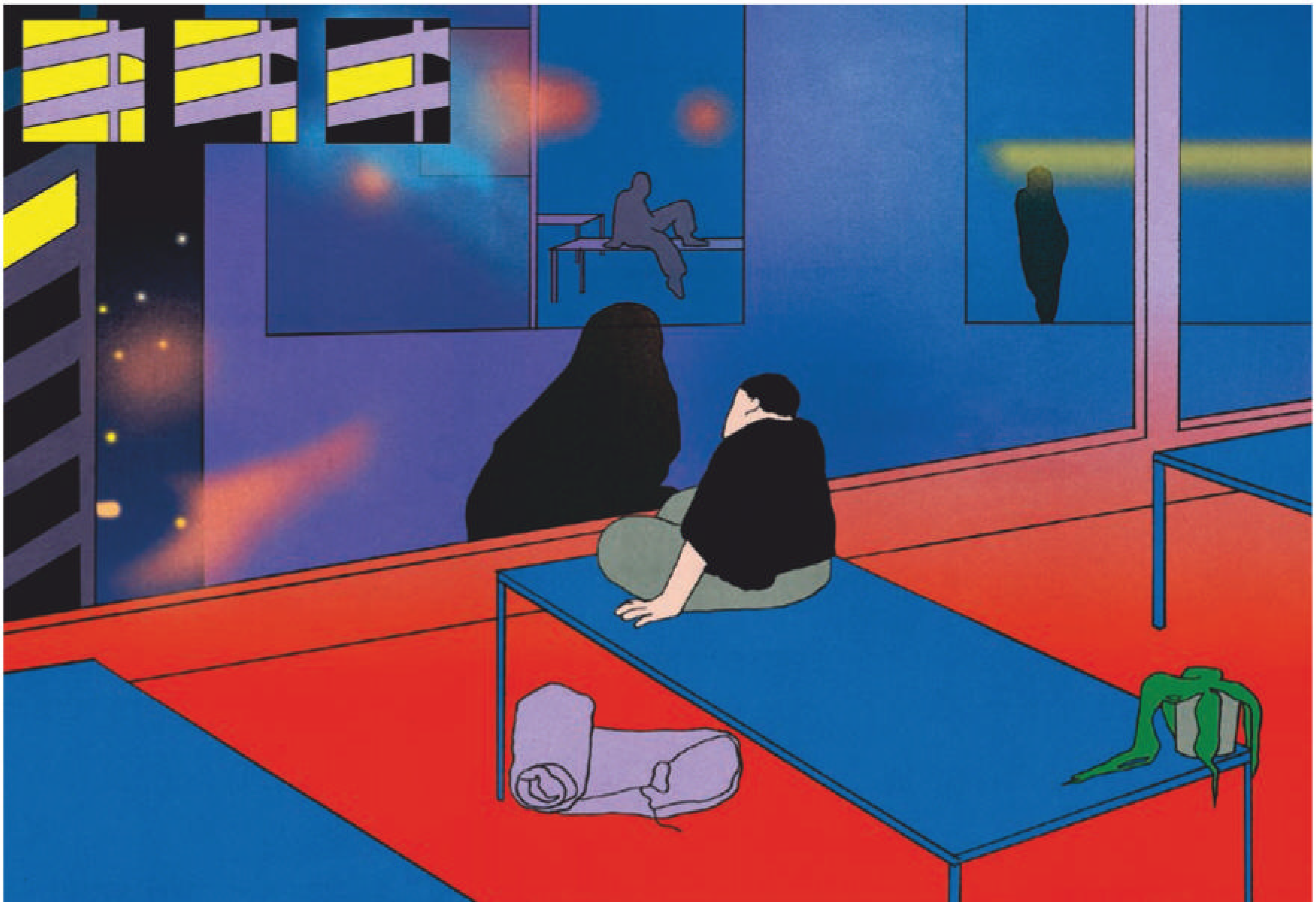
THE BOTTOM LINE Technologies that piggyback onto the body's trash disposal system to destroy diseases have become some of the hottest new ways to make pills.

China's Lost Tech Generation

● Startup employees are pushing back against a relentless work culture as job losses mount

Terry Hu first sensed trouble at the Beijing gaming startup where he worked when his boss stopped showing up. Then the stockpile of freebies for users—gift cards, plush toys—ran out. The founder finally said funding had dried up for the company. Hu and about two-thirds of his colleagues were fired, he says. "He told us we were the best and brightest, that we might come back and work for the company someday," Hu says, asking that the company's name not be disclosed out of fear that it would worsen his career prospects. "It was a load of garbage." It took him three months to land a job at an English-language center, outside the tech sector that once held so much appeal. "I've learned my lesson," he says.

A generation of Chinese tech workers is confronting a new reality as the industry endures its worst slump since the 2008 financial crisis. China's broader economic slowdown and the trade war with the U.S. have ended the boom that birthed heavyweights including Alibaba Group Holding Ltd. and Tencent Holdings Ltd. Startups in Greater China have raised $32.5 billion via venture capital deals so far in 2019, less than a third of last year's $111.8 billion, data from research and consulting firm Preqin shows. Job losses are mounting, and ▶



◀ hiring has slowed: Job postings in the internet and e-commerce sector dropped about 13% in the second quarter, according to recruitment platform Zhaopin. Entrepreneurs are less willing to form ventures, so the pace of startup creation has slowed.

The tacit promise for workers in the country's notoriously relentless tech culture—put in the hours and get rich quick—no longer holds. For years, tech workers in China have accepted a schedule dubbed 996—9 a.m. to 9 p.m., six days a week, plus any overtime required—in return for wealth they'd watched so many before them gain. Many were willing to take meager wages, around $2,000 a month in Hu's case. They've now discovered that such blind loyalty doesn't always pay off. In March a horde of mostly anonymous Chinese programmers took to the code-sharing community GitHub to protest 996. They compiled a blacklist of companies known for not paying overtime and lodged formal complaints against their employers to local labor watchdogs. Their post went viral, garnering almost a quarter of a million followers.

Some of China's most prominent industry figures pushed back. Alibaba's billionaire founder Jack Ma endorsed the extreme work schedule, calling the ability to work 996 "a huge bliss" for workers in an April internal meeting with employees. Richard Liu, chief executive of Alibaba competitor JD.com Inc., said in a WeChat post that while he wouldn't force employees to work 996, people who slack off weren't his "brothers."

China's Communist Party has been grappling for months with foreign threats to the country's tech sector. In May the U.S. banned telecom equipment giant Huawei Technologies Co. from buying American components, and other Chinese tech companies fear a similar fate. Mounting discontent among tech workers could hamper the industry's growth, creating yet another headache for the government. "Facing a more difficult payoff, China's 996 workers may lose enthusiasm," says Brock Silvers, managing director for Shanghai-based investment firm Kaiyuan Capital. "This is precisely contrary to the needs of China's developing tech sector."

Suji Yan, the 23-year-old founder of Shanghai data privacy firm Dimension, says the younger generation values work-life balance, and he allows his 20-person team to keep flexible hours and work remotely across the globe. He thinks it could take a decade or two to fix China's intense work culture. With their dreams of getting rich shattered, "programmers have more and more realized that they are just ordinary laborers, ones that belong to the same class as food delivery guys and are as miserable as them," Yan says.

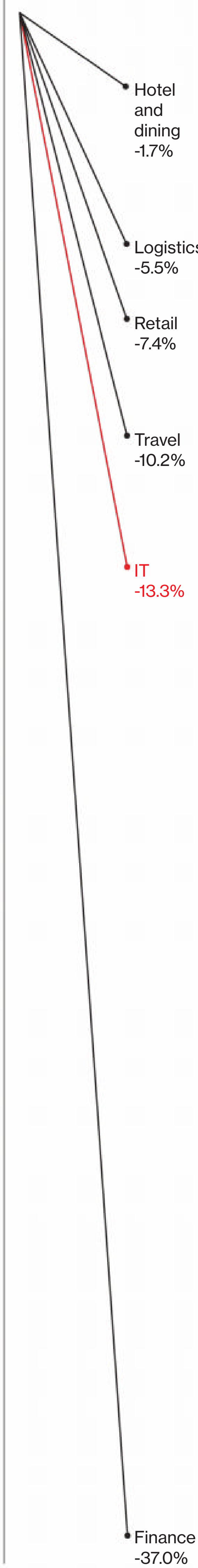
During the country's last tech downturn in 2016, companies froze hiring and cut jobs, and many were told to rewrite valuations, reassess assets, and slash costs. This led risk-averse investors to pour money only into marquee companies, pushing up valuations for the country's largest startups and ushering the rise of a few tech behemoths that took control of almost everything. This time even the hottest startups feel the pain. SoftBank Group Corp.-backed Full Truck Alliance, an app for truck deliveries, scrapped plans to raise as much as $1 billion, while artificial intelligence startup SenseTime Group Ltd. says it's in a "nondeal roadshow" with no funding targets, months after it was said to have held talks to raise about $2 billion. Ride-hailing giant Didi Chuxing internally disclosed plans to cut 15% of its workforce earlier this year—though it intends to hire in certain areas—while online emporium Alibaba was said to have temporarily halted hiring.

At the social networking company where Cherry Wang works, overcrowding used to be the norm, and there weren't enough desks for everyone. Now rows of desks lie empty, and the product manager has watched co-workers pack their belongings on Fridays and leave, never to be seen again. About 10% of employees were eliminated at the end of last year, she says, asking that the company's name not be disclosed so she doesn't lose her job. Wang had been accustomed to an annual bonus of at least three months' salary. This year? "You're lucky not to get laid off," she quoted her manager telling her during a recent evaluation.

Vicky Ren, 26, is grateful to no longer have to endure the long hours expected by Chinese tech companies. After graduating college in 2015, Ren became one of the country's millions of "Beijing drifters"—people who migrate to the capital in search of opportunity. She spent two years as a marketing specialist with a Chinese internet company. After relocating abroad to help the company's expansion in Southeast Asia, Ren grew frustrated by the endless back-and-forth with headquarters in China and the long hours—it wasn't unusual for her to leave the office as late as 10 p.m. Underpaid and overworked, she resigned in May. She's since found a job with a U.S. gadgets seller, where she earns 30% more and works from 10 a.m. to 6 p.m. She says she's more fulfilled and employees are encouraged to complete their tasks during regular office hours. "Everyone here," Ren says, "thinks working overtime is embarrassing." *—Lulu Yilun Chen and Zheping Huang*

THE BOTTOM LINE Tech funding is drying up as China's economy slows amid a trade war with the U.S. Worker discontent threatens the sector's model over the long term.

● Change in job postings in China from Q2 '18 to Q2 '19



DATA: ZHAOPIN

'Stop Stabbing Yourself'

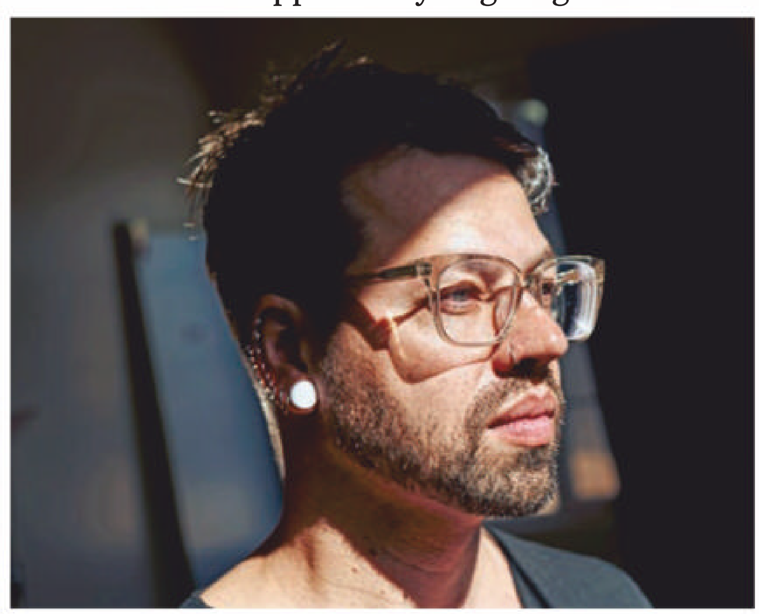
● For biohackers, growing up means appealing to people unimpressed by gene therapy stunts

With every new technology, there are pioneers and there are renegades. Take the Homebrew Computer Club, which foreshadowed the personal-computer revolution with its own do-it-yourself machines in the 1970s and '80s. Ever since the science of genome editing promised to make tinkering with biology as easy as rewriting a piece of computer code, DIY types have argued that this cutting-edge medical science should be available to anyone who wants an alternative to exorbitant drug prices—or to modify or enhance their own biology using technology. At conferences and on social networks such as Facebook, these self-styled biohackers have shown a flair for the dramatic. One injected himself with the gene-editing technology Crispr at a synthetic biology conference. Another dosed himself with an untested gene therapy at a conference called BodyHacking Con in an attempt to cure herpes. One man's DIY effort to cure his HIV resulted in a bad reaction on his midsection, where he stuck the needle.

While the daredevils impressed some in their audiences, they often freaked people out. In July, California passed legislation intended to discourage DIY gene editing, and state regulators have also said they were investigating one biohacker for practicing medicine without a license. Some of the self-taught scientists say that the window to beat the establishment has closed, and now it's time to join 'em. Speaking at the annual Biohack the Planet conference last month, Gabriel Licina, a chef who once developed his own night vision eyedrops, summed up the mood from the podium: "I would like to propose that we grow up a little bit," he said. "Please, for the love of God, stop stabbing yourself."

Biohackers seeking to free science and scientific achievement from the ivory tower have come to realize that they may have to borrow from its conventions, such as seeking peer reviews for their work. Instead of the conference's traditional home in a ramshackle community space in Oakland, Calif., Licina spoke in a bland room at a Renaissance Hotel off the Las Vegas Strip. He announced he'd developed a gene therapy for a rare blood disorder—a \$7,000 generic alternative to a \$1 million corporate drug—but rather than calling for self-experimentation, he appealed to peers to help refine and test it. This year the conference added poster sessions so that scientists, biohackers, and companies could show off their latest research. Some 150 people attended, most of them paying \$199 for a ticket, and a venture capital firm was among the sponsors. Biohacker attendees discussed plans for commercial ventures. In the first half of this year, synthetic biology startups raised \$1.9 billion in funding, on track for record growth, according to SynBioBeta. "I would actually like people to start doing responsible work," says Licina. That means peer review and outside testing, not just stunts.

The biggest biohacker success story thus far is EmbediVet, a health tracker for livestock that started out as a DIY biometric implant for humans. The company behind it, Livestock Labs, saw more of an initial market opportunity targeting animals and received \$2 million in early funding from Australia's livestock industry group, Meat & Livestock Australia.



◀ Zayner runs an online biohacker boot camp

Most DIY gene therapy experiments in people have failed or fizzled out. Todd Kuiken, a researcher at North Carolina State University's Genetic Engineering & Society Center who studies community science labs, says one measure of success for biohackers would be if they could create alternative pathways for careers in science, as computer hackers have for software engineers.

"I would actually like people to start doing responsible work"

Josiah Zayner, who runs Biohack the Planet, has started a biotech boot camp that trains people to get corporate science jobs through an online curriculum. He says it's a way to help ensure the spirit of the biohackers survives in a more thoroughly professionalized genomics industry, though he adds that it's far from ideal. "All good things come to an end in capitalistic societies," he says, "because people figure out how to profit off of them." —*Kristen V. Brown*

THE BOTTOM LINE Even some leading genetic biohackers are fighting their anti-establishment instincts as the field fills with money from more traditional sources.

PHOTOGRAPH BY CARLOS CHAVARRIA FOR BLOOMBERG BUSINESSWEEK

The Day Trading Commissions Died

● Big online brokers have cut them to zero. They don't need them to make money from you

From sharing pictures to sending email to streaming videos, we're all used to the idea that many of the things we do online are free. We also know that none of those things are really free—Facebook Inc., Google, and other internet companies have plenty of ways to make money off of us once we sign up. Now another industry has adopted this business model: online stockbrokers.

On Oct. 1, Schwab said it would cut commissions on trades for stocks and exchange-traded funds to zero, followed on the same day by TD Ameritrade and ETrade the day after. It was the logical endpoint of a decades-long brokerage price war that began when the U.S. Securities Acts Amendments of 1975 ended fixed trade commissions. Some brokerages took that opportunity to increase their fees, but a former newsletter writer named Charles Schwab charged a comparatively affordable $70 a trade. The discount brokerage business was born, and as technology got better and competition grew more fierce, the common price points kept falling—to about $13 a trade in 2005, then $5 by this year.

Some players had already gotten to free. For a few years, the mobile app-based brokerage Robinhood Markets Inc. has offered not only free trades but also a $0 minimum balance as a way to draw in millennial investors. And big financial-services companies have been cranking out other kind of free offers. In 2018, Fidelity Investments Inc. initiated index funds with zero fees, and JPMorgan Chase & Co. rolled out a service that offered clients 100 commission-free stock and ETF trades in their first year. In February, Charles Schwab Corp. and Fidelity announced dueling plans to expand commission-free trades on some ETFs. Then on Sept. 26, Interactive Brokers Group Inc. introduced a service with commission-free trading on U.S. stocks and ETFs called IBKR Lite.

Investors in brokerage stocks have been rattled by the latest price cuts, and the share prices of Schwab, TD Ameritrade, ETrade, and Interactive all fell. Schwab stands to lose about $400 million in yearly revenue from eliminating commissions. Which raises the question for customers: Why are the brokers willing to take such a big hit to give me free stuff? "Let's look at this from a business and economic perspective," says Peter Lazaroff, co-chief investment officer at Plancorp LLC, a registered investment adviser. "If there are no costs for a product you use, then you are no longer the customer—you just became the product."

That's a common one-liner about internet media companies these days. Charles Schwab—the man, not the company—doesn't shy from such comparisons to tech's freebie-driven approach. As early as 15 years ago, he says, he began musing about a seemingly wild decision to bring commission rates to zero. "I've always tracked Google," says Schwab, who's chairman of the brokerage. "Google made the concept of using the internet as the backbone of what you do. You offer the primary service on a free basis and hope to attract enough business, enough clients, that you figure out different ways to make some revenue."

Unlike internet giants, brokers aren't chasing eyeballs and personal data. It's the clients' money they're after.

One of the greatest sources of revenue for brokers is to invest or loan out the money clients don't have in play in the market. It works like this: Schwab and other firms "sweep" the uninvested cash in clients' accounts and place it in one of their banking subsidiaries. They pay customers interest on the money, but it's nothing to write home about—Schwab's current rates are as low as 0.12% for small balances and 0.5% for accounts with $1 million or more. Higher rates are available in other savings accounts and money-market mutual funds, including those sold by the brokers, but access to the cash may not be as convenient for an investor just waiting for an opportunity to put the funds to work in the stock market.

This idle cash can add up. Schwab clients' accounts total about $3.7 trillion, according to

Edited by
Pat Regnier

the latest numbers as of the end of August, with an average of about $265 billion of it earning interest for the company. The money Schwab makes from loaning out its customers' cash surged to 57% of its $10.1 billion net revenue last year. For TD Ameritrade Holding Corp., the figure last year was 23% of its total $5.4 billion in net revenue. At ETrade Financial Corp. it was 64% of $2.8 billion in net revenue.

Schwab says he expects his company also will make up for lost commission revenue with new clients, who may want services the company still charges for, such as investment advice. Brokerages also make money by catering to investment advisers, loaning customers cash to buy stocks on margin, and lending out securities to short sellers hoping to profit on a decline in prices.

And while these companies are no longer charging commissions, that doesn't mean they aren't making money from clients' stock trades. A chunk of their revenue is what's known as "payment for order flow." Basically, the brokerages get fees for sending their customers' buy and sell orders to computerized trading firms such as Citadel Securities and Virtu Financial Corp. Those firms then match buyers with sellers themselves. (The trading firms can make money by picking up the tiny spreads between the prices offered by buyers and sellers, or by trading on any gap between the futures market and stock prices.) Brokers and the trading firms say this process results in a better deal for retail investors.

Some financial advisers worry that free trades will encourage regular investors to trade more—and trip themselves up in the process. "I would anticipate those that were on the fence with regard to excessive trading might now be pushed over the edge," says Charles Sachs, director of planning at Kaufman Rossin, a CPA and advisory firm in Miami. "One thing is for certain in my mind, and that is the game for the retail investor has changed—and not necessarily for the better." —*Annie Massa, with Michael P. Regan and Suzanne Woolley*

THE BOTTOM LINE Brokerages can make money from simply lending out the cash you aren't using. And once you sign up for free trades, they have a chance to sell you other services.

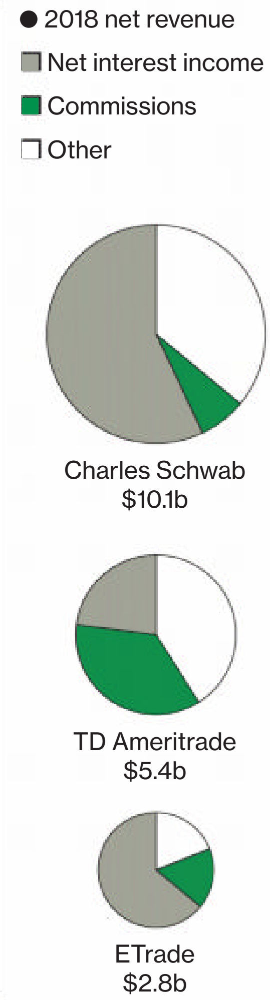


ILLUSTRATION BY PATRIK MOLLWING; DATA: COMPANY FILINGS

How to Put AI in Team

● A startup says it can use algorithms to screen a more diverse pool of Wall Street job seekers

It's been one of the safest bets on Wall Street: Study business at Wharton, Harvard, or the University of Chicago and apply for a job in investment banking. Play squash or lacrosse? That helps. So can the right fraternity or club.

When recruiting talent, the overwhelmingly white, male, and elite-educated cohort who run America's top financial firms reflexively seek out younger versions of themselves. Psychologists call this tendency the "like-me" bias. Aspirants with a preppy pedigree have the inside track on coveted jobs in mergers and acquisitions, capital markets, corporate finance, and restructuring. Everyone else, including women and minorities, starts at a disadvantage.

But finance needs to change in this era of diversity and inclusion, and firms have turned to artificial intelligence for hiring help. A growing number, including Houlihan Lokey, Lazard, Moelis, and PJT Partners are using predictive algorithms to sift through applications and find those candidates most likely to become top performers—looking past the kinds of superficial signals that might sway a campus recruiter. Think of it as Match.com for finance.

They're all working with Suited Inc., a Los Angeles startup that's developed a recruiting tool expressly for investment banks. As in online dating, each applicant fills out a profile. This one covers everything from college education to personality traits and takes about 30 minutes to complete. A computer program runs those responses through a model, scoring them against an ideal set of attributes for each firm. "When you talk about it in the abstract, that's one thing," says Steven Murray, PJT Partners Inc.'s head of human resources. "But when you turn up with a pile of résumés and our bankers can see the data, suddenly they're asking, 'Oh, how did this person score?'"

The way investment banks prospect for hires hasn't changed much in decades. They start by focusing on an exclusive group of schools. There's an information session on campus, followed by a round of "speed dating" in which students try to meet and impress as many bankers as possible. The recruiting team then considers résumés and personal references in deciding who gets invited back for interviews. Summer internships—as an analyst, for junior-year undergrads, or as an associate, for first-year MBA hopefuls—are the prize.

Many of those interns go on to become great dealmakers, but it's never clear whether the system really works or is just self-reinforcing. What if the banks considered candidates from a wider range of schools? What if unconscious bias didn't play a role? Suited's proposition is that AI can automate the labor-intensive part of recruiting, making ▶

▼ Spencer

PHOTOGRAPH BY SASHA TIVETSKY

◀ it more efficient, and improve the end result.

Starting with the next class of MBA applicants, PJT will consider scores generated by Suited's algorithm. Initially, some of Murray's colleagues joked that "the robots" were taking over. Now, he says, they've come around.

Every employer says hiring well is important. That's especially true in investment banking, where there's no killer app, only people. A financing or merger mandate can generate millions of dollars in fees, and bankers are compensated accordingly. The typical full-time analyst makes upwards of $125,000 a year. Senior rainmakers pull in seven or eight figures. "Our franchise is only as sustainable as our ability to find and promote new talent," says Michele Miyakawa, one of the founding partners at Moelis & Co. "I can't tell you the number of hours we spend on recruiting, from the top leadership down."

Limiting the talent pool to familiar colleges may miss a lot of potential stars, but it makes the effort manageable. All roads lead to Philadelphia, home to the University of Pennsylvania's Wharton School, and a few other B-school hot spots. No one has to stop in Omaha or Milwaukee.

That doesn't mean the process is optimal. Matt Spencer came up with the idea for Suited soon after starting as chief human capital officer at Houlihan Lokey Inc., an investment bank based in L.A. It was 2015. As a former M&A banker deeply involved in the firm's recruiting efforts, he'd witnessed the hunt for talent devolve into an industrywide circus of predatory tactics, absurdly high salaries, and "exploding" job offers that expired after 24 hours.

Looking for a better approach, Spencer and Suited co-founder Sam Fogarty assembled a team of volunteers, contractors, and, eventually, staffers with experience in data science, AI, software engineering, and industrial-organizational (I/O) psychology, the field specializing in workplace behavior. Houlihan Lokey encouraged Spencer to pursue the project and raise venture capital funding. He left in March to become Suited's chief executive officer.

In only a few months, more than 10,000 job seekers have filled out Suited profiles. Spencer, who studied economics at Vanderbilt University, has opened the platform to applicants at hundreds of colleges, well beyond the usual investment-banking targets. He wants to expand into other areas that put a high value on human capital, such as sales and trading, commercial banking, asset management, and law.

One risk in bringing AI to recruiting is that it could reinforce biases instead of eliminating them. After all, Suited's data is culled from employees in an industry where some 73% of senior-level managers are white men. Spencer is conscious of the hazard. He says every one of the company's models is tested rigorously for discrimination by race, gender, and age group before it can be used by a client.

Moelis is still training the model to pinpoint candidates whose attributes correlate with those of its best bankers, such as warmth and curiosity. That means feeding it more profiles and validating the results. "It's early days," Miyakawa says. The firm plans to use Suited as a supplementary tool starting next spring.

It'll be years before banks can tell if candidates who scored well in the Suited algorithm really do fit in better and perform at a higher level. For now, they're embracing the principle. If data science can improve everything from online sales to radiology, perhaps it can do something good for Wall Street recruiting. —*Erik Schatzker*

"But when... our bankers can see the data, suddenly they're asking, 'Oh, how did this person score?'"

THE BOTTOM LINE Investment banks rely a lot on campus-based recruiting at a handful of top schools, which makes them susceptible to a "like-me" bias in hiring.

Wealth Managers in China Stir Up Risk

● High-yield products backed by company loans could falter as the economy slows

Analysts on the lookout for China's next financial shock are training their sights on the least regulated corner of the nation's sprawling "shadow banking" system.

Their concern centers on independent wealth managers, which have expanded rapidly in recent years by selling high-yield products to affluent investors. Largely untouched by a government clampdown on almost every other form of shadow banking—that is, financing that takes place outside of conventional banks—the industry has become a major source of funding for cash-strapped Chinese companies.

The worry now is that the products arranged by the wealth managers will face mounting losses as China's economic slowdown deepens and corporate defaults surge. Confidence in the industry has plunged since July, when Noah Holdings Ltd. said that 3.4 billion yuan ($477 million) of credit products overseen by one of its units was exposed ▶

Luchita Hurtado, *Untitled*, 1971. Oil on canvas, 127 × 88.6 cm. Courtesy the artist and Hauser & Wirth. © 2019 Luchita Hurtado. Photograph: Jeff McLane

LUCHITA HURTADO

I LIVE I DIE I WILL BE REBORN

23 MAY – 20 OCTOBER 2019

Serpentine Galleries
West Carriage Drive, Kensington Gardens
London W2 2AR
United Kingdom

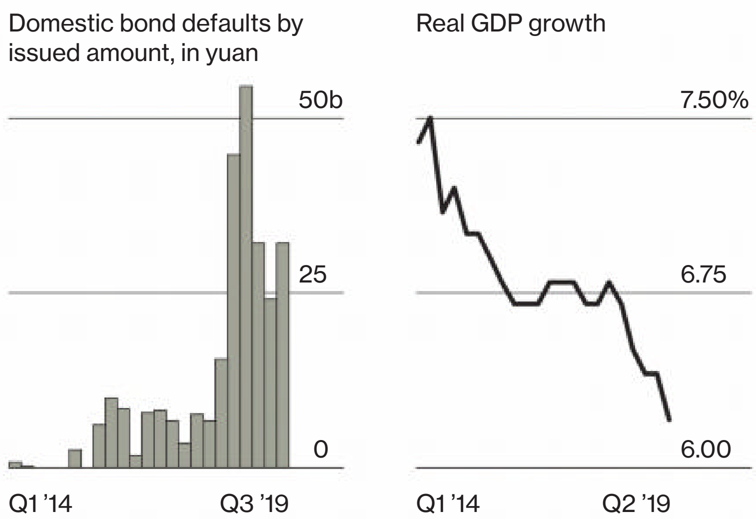
SERPENTINEGALLERIES.ORG

◀ to an alleged fraud by a Chinese conglomerate.

Shares of Noah, one of China's biggest independent wealth managers, have tumbled 38% in the U.S. in the past three months. "I wouldn't be surprised to see some losses," says Jasper Yip, Hong Kong-based principal of financial services at Oliver Wyman, a consulting firm. "More borrowers will run into payment difficulties in a slowing economy." The repercussions could be significant if losses on such products fuel a broader retreat from high-yield assets in the world's second-largest economy. One factor that concerns analysts: The products are opaque and regulation is minimal, so nobody knows exactly how much money is at risk.

The industry has experienced breakneck growth. Assets under management at a Noah unit that structures its own products climbed 40%, to 169.2 billion yuan, in the two years ended in December 2018—a period when the broader Chinese shadow banking system shrank because of tighter regulation.

China's Shaky Debt and Slowing Economy



DATA: NATIONAL BUREAU OF STATISTICS OF CHINA, BLOOMBERG

At Jupai Holdings Ltd., another U.S.-listed independent wealth manager, assets under sole or shared management have more than quadrupled since 2015, to 56.8 billion yuan, according to the company. Official industrywide figures don't exist, but Noah estimated in 2016 that China had more than 8,000 independent wealth managers.

While the firms offer a wide variety of investments including plain-vanilla mutual funds, many of the products are backed by high-yield loans to companies—often property developers—that lack access to traditional sources of funding. Because the credit products are sold only to investors who have at least 3 million yuan of financial assets or have earned an average 500,000 yuan in the past three years, they fall outside the increasingly strict rules governing mainstream wealth management products offered by Chinese banks.

That's allowed them to ramp up exposure to riskier debt and offer higher yields. Marketing materials for some of Noah's products show an expected annualized return of 7.7% for an investment duration of nine months, five times higher than the benchmark deposit rate.

Critics of independent wealth managers such as Sun Jianbo, president of China Vision Capital Management in Beijing, argue that the firms often understate the risks of their products when marketing to investors. That worry has only increased in recent months as China's economy has slowed to the weakest pace since at least 1992 and the nation's companies have defaulted on domestic bonds at the fastest pace on record.

Noah's failure to spot the risks of lending to Camsing International Holding Ltd., the conglomerate it accuses of fraud, provided another reason for caution. Camsing's chairwoman was detained by Chinese police in June. The Camsing case is still under investigation by police, who haven't announced any charges. Noah says it's offering loans at a preferential rate to some clients whose money is tied up in the affected products. Camsing and the China Securities Regulatory Commission didn't respond to requests for comment. Jupai, whose stock has dropped 50% on the New York Stock Exchange this year, didn't reply to questions on its market performance.

Because independent wealth managers focus on affluent investors, they may pose less of a systemic risk than bank wealth management products that cater to the nation's masses. The CSRC published draft rules in February for wealth managers and distributors of investment products that would increase punishments for those that fail to disclose risks properly. The Shenzhen Asset Management Association last month published draft rules on winding down products that run into trouble, saying that some wealth managers have failed to meet professional standards.

The proposed regulations will help reduce risks, but the industry's problems are probably bigger than most investors realize, according to Liu Shichen, Shanghai-based head of research at Z-Ben Advisors, a fund management research firm. That's partly because many wealth managers have been using their own capital to make clients whole when products suffer losses, he says. (Noah and Jupai say they don't use their own cash to repay investors.) "What we have seen is only a fraction of the problematic products," Liu says. —*Bloomberg News*

THE BOTTOM LINE China's regulators have sought to rein in so-called shadow banking, but independent wealth managers that work with the affluent have received less scrutiny.

● Fall in Noah shares in the past three months

38%

A RECESS LIKE NO OT

It's geopolitics,

INFLATION IS MIA!

● Federal Reserve rate cuts may not be enough to head off a downturn caused by a crisis of business confidence

This won't be a run-of-the-mill recession—if in fact the U.S. ends up tumbling into one.

Traditionally, U.S. downturns are homegrown and household-led, usually triggered by a spike in inflation and interest rates and fueled by an unwinding of financial and economic excesses. None of that is arguably at work this time.

Instead, what's at play is a global geopolitical shock to business sentiment that's prompting U.S. companies to curb spending amid uncertainties including the U.S.-China trade war and Britain's messy divorce from the European Union. "The global economy continues to soften, and we are taking steps to cut capacity," said Fred Smith, chief executive officer of FedEx Corp.—a company that's regarded as an economic bellwether—during a Sept. 17 conference call. The softness is being "driven by increasing trade tensions and policy uncertainty," he said.

That poses problems for Federal Reserve Chairman Jerome Powell and his fellow policymakers as they weigh whether to cut interest rates later this month for the third time this year. The unusual nature of the forces at play—and the fact that many of them are geopolitical and emanate from abroad—makes it more difficult to decide how far to go in easing credit. There's also the question of how effective rate cuts are at treating what is, at its root, a confidence problem: Businesses are loath to invest because they fear supply chains are unraveling.

"The broader geopolitical risks are important right now," Powell told an economic conference in Denver on Oct. 8. "You have to be watching those carefully and assess the implications." He left open the possibility that the Fed would cut interest rates again while voicing confidence that the 10-year economic expansion would remain on track. "This feels very sustainable," he said.

If businesses become more optimistic, there's a chance the economy could snap back as companies restart spending plans they put on hold and monetary stimulus kicks in with greater force. "The scenarios are quite extreme," says JPMorgan Chase & Co. chief economist Bruce Kasman. "Either we bend and then break or we bend and then bounce."

A study by IHS Markit's Macroeconomic Advisers calculated that gross domestic product could be boosted by about 0.5% if uncertainty over trade policy ultimately dissipates. That doesn't look likely (next page).

Bloomberg Economics' model puts the odds of a recession in the next 12 months at about 25%. "The chances of a recession are higher than they were at

Edited by Cristina Lindblad

SION THER

stupid

There's NO BUBBLE TROUBLE

the start of the year. They are lower than they were over the summer and before previous downturns," wrote Bloomberg economists Eliza Winger, Yelena Shulyatyeva, and Andrew Husby on Oct. 2.

Moody's Analytics Inc. chief economist Mark Zandi reckons a recession is all but inevitable if President Trump follows through on his threat to impose tariffs on virtually all U.S. imports from China by the end of the year. Such a move would probably rock financial markets and hurt the economy, says Matthew Luzzetti, chief U.S. economist for Deutsche Bank Securities. If that happens, he says, the odds of a recession would rise to 50-50.

Some other analysts are not as pessimistic. Former International Monetary Fund chief economist Maury Obstfeld believes a ratcheting up of tariffs on China would probably lead to slower growth, but not a recession. "I just don't see what would set off a broad contraction in activity," says Obstfeld, who's now a senior fellow at the Peterson Institute for International Economics.

That's because many of the traditional drivers of downturns seem to be absent. Inflation isn't high and rising. If anything, it's too low, at least as far as the Fed is concerned. And the central bank isn't raising interest rates. It's lowering them. Stock prices are elevated, but they are arguably not in bubble territory given the low level of interest rates. And households aren't overburdened with debt, as they were heading into the Great Recession. "The consumer right now in the U.S., at least in terms of our business, is doing really well," says Hugh Johnston, chief financial officer for PepsiCo Inc.

"You have a lot of trouble identifying what the trigger would be for a recession in the U.S., especially a deep one," says Andrew Hollenhorst, chief U.S. economist for Citigroup Inc. "That makes us feel a little less concerned." He puts the chances of a recession over the next 12 months at about 30%.

For veteran forecaster Allen Sinai, the situation is reminiscent of the lead-up to the 1990-91 recession. Then, companies responded to a profit squeeze from rising wages by cutting back spending and hiring. This time, slowing sales abroad could prompt U.S. companies to pull back, says Sinai, president of Decision Economics Inc. He says the lesson from the earlier period is that the Fed needs to respond aggressively and preemptively to the dangers of a recession.

The trouble is that the outlook is far from clear. Some risks, such as Brexit, have yet to materialize. Others, like the U.S.-China tit-for-tat tariffs, have soured business sentiment but only recently begun to crimp output at U.S. factories. "We are having a hard time judging how large this geopolitical shock is," says JPMorgan's Kasman, who reckons that the odds of a recession over the next 12 months are 35% to 40%. —*Rich Miller, with Craig Giammona and Thomas Black*

THE BOTTOM LINE Most economists say the odds of a U.S. recession are less than 40%, but another round of tariffs and countertariffs could make it more of a certainty.

Trade Standoff

● The path to a U.S.-China deal is becoming ever narrower as both sides dig in

Relations between the world's two largest economies were a mess long before the latest round of U.S.-China negotiations was set to get under way on Oct. 10-11. But things were only getting worse as the talks approached, putting a damper on hopes of a potential truce.

On Oct. 7 the Trump administration announced it was placing eight Chinese technology companies on a blacklist, accusing them of being implicated in human-rights violations against Muslim minorities in China's Xinjiang region. Among those targeted are Hangzhou Hikvision Digital Technology Co. ▶

◀ and Zhejiang Dahua Technology Co., which by some estimates control as much as a third of the global market for video surveillance gear, and SenseTime Group Ltd., the world's most valuable artificial intelligence startup. This marked the first time the administration has cited human rights as a reason for action against China. Hikvision and other companies have denied any wrongdoing.

There was also news on Oct. 7 that, despite White House denials, the administration continues to explore ways in which the U.S. can restrict financial flows into China, including pressuring companies that compile emerging-markets indexes such as MSCI and Bloomberg Barclays Indices to reduce the weighting of Chinese companies. Also under discussion is how to stop federal government pension funds from investing in China.

Meanwhile, a bill that would strip Hong Kong of its special trade status with the U.S. has bipartisan support on Capitol Hill and could pass through Congress within weeks, presenting President Trump with a dilemma over whether to sign it into law. One reason the bill looks like an increasing certainty is China's angry response—and the NBA's subsequent bending to Beijing—following a Houston Rockets executive's tweet backing the protests in Hong Kong. The incident has further fed anger about how American companies often have to kowtow to do business in China. Now Chinese sponsors of NBA events are cutting ties with the league.

In meetings with U.S. visitors to Beijing in recent weeks, senior Chinese officials have indicated the range of topics they're willing to discuss has narrowed considerably, according to people familiar with the discussions, who requested anonymity because of the sensitive nature of the talks. China's top negotiator, Vice Premier Liu He, told visiting dignitaries he would bring an offer to Washington that doesn't include commitments on reforming Chinese industrial policy or the government subsidies that Trump trade adviser Peter Navarro calls one of the "seven deadly sins." It's emblematic of what analysts see as China's strengthening hand as the Trump administration faces an impeachment crisis and a slowing economy blamed by businesses on the disruption caused by the president's trade wars.

Trump has said repeatedly that he's opposed to a "partial" or interim deal that would see the Chinese step up purchases of U.S. farm exports and his administration put further tariffs on hold. However, some close to his trade team see the recently concluded pact with Japan as a model of what such a deal could look like.

Trump called the Japan pact "historic" at its Oct. 7 signing. Yet in reality its scope is modest at best. American farmers will face reduced tariffs on the approximately $7 billion in shipments they send to Japan each year. But that's not largely different from what they'd been awarded in the Trans-Pacific Partnership that Trump pulled out of in January 2017. Notably absent from Trump's Japan deal is any mention of automobiles, which dominate the bilateral trade. —*Shawn Donnan*

THE BOTTOM LINE As the scope of the U.S.-China conflict widens to include technology, Hong Kong, and Beijing's treatment of ethnic minorities, a grand bargain seems more elusive.

Japan's Latest Monetary Experiment

● The country that pioneered zero interest rates is being desperately inventive again

Japan, a nation often bound by tradition, has been wildly unconventional in its monetary policy. As the first major economy in the postwar era to grapple with deflation and a pronounced downshift in long-run growth, policymakers have had little choice but to get creative. The Bank of Japan was the first to take interest rates to zero and, when that didn't work, pioneered quantitative easing in 2001. Now the central bank has again embarked on a daring experiment: driving certain interest rates higher.

After years of trying to spark economic growth by bringing down both short-term and long-term interest rates, the BOJ in recent weeks has been moving to lift yields on government bonds, particularly the super-long-dated ones. In normal times, such a maneuver might be construed as monetary tightening. But BOJ Governor Haruhiko Kuroda has continually stressed that the bank is very much in easing mode. He said last month that the BOJ "will not hesitate to add stimulus" if needed, and a number of forecasters expect that he and fellow board members will cut the bank's short-term policy rate—now at negative 0.1%—on Oct. 31.

Kuroda lately has warned that ultralow yields on super-long-term bonds—say, 20 years and up—could be bad for the economy. "It will have a negative impact on consumer sentiment," he said on Sept. 19. Low yields are psychologically damaging since they reinforce the expectation that economic growth will remain sluggish over the long term, incentivizing households to save rather than spend. The paltry returns also represent a very real threat to Japan's population of pensioners, which numbered 40 million at last count and is headed inexorably higher.

Following those comments, BOJ officials have been trimming their bond purchases to an annual pace of 5 trillion yen, according to a calculation by Bloomberg Economics. That's just a fraction of the official target of 80 trillion yen ($47 billion), though that's been disregarded for some time now. In its latest monthly plan, the BOJ also signaled it even might stop buying bonds with maturities surpassing 25 years.

"They want to have their cake and eat it, too," says Paul Sheard, a senior fellow at Harvard's Kennedy School who worked as an economist in Japan over a three-decade span. In other words, the BOJ seeks, on one hand, to boost the economy by depressing short- and medium-term rates, while, on the other, it wants yields at the very long end to reflect the success it envisions in generating growth and inflation.

To convince markets and the public that it's committed to easing for the long haul, the BOJ has pledged to keep expanding its balance sheet via bond purchases. So if it stops buying some bonds to drive up yields—as prices and yields move inversely—then it must buy more of others. "The problem is, it's kind of like whack-a-mole," where the central bank then needs to keep changing its operations to address problems with excessively low yields at differing maturities, Sheard says.

They may yet try to do just that, though. "Lowering short-term rates while lifting up longer ones will be very challenging," says Masaaki Kanno, who worked at the BOJ from the 1970s to the 1990s and is now an economist at Sony Financial Holdings Inc. "Obviously the BOJ has to care about pension funds and life insurance companies," he says, which are hurt if there are negligible interest payments on long-dated bonds. "Japan is aging rapidly, and it's becoming a big part of the economy."

The BOJ's latest moves came after 20-year bond yields slumped to just 0.02% in early September. Since Kuroda started sounding the alarm and officials rejiggered their bond purchases, they climbed to 0.18% by Oct. 7.

What makes these maneuvers tougher is that the BOJ has already bought more than 43% of the entire Japanese government bond market. (In the U.S. the Federal Reserve has about 13%.) In the process, it's expanded its balance sheet beyond 100% of gross domestic product—much more than the levels of its U.S. and European counterparts at 18% and 39%, respectively.

"Japanese financial institutions were kind of squeezed out" of the domestic bond market, says Tadashi Kikugawa, a veteran bond trader who now works at Nomura Holdings Inc. on investment products for asset managers. "They are happy to come back" anytime yields rise.

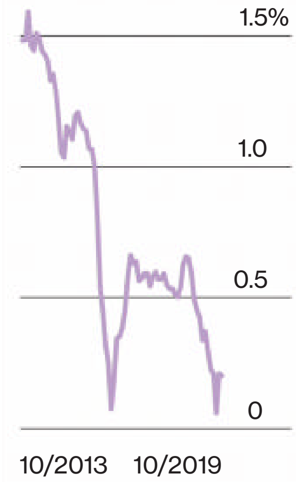
At the end of the day, the only assured way to boost superlong yields would be to raise the short-term policy rate, Kikugawa says, but that would also risk boosting the yen, which would have an adverse effect on an economy that is heavily reliant on exports.

The BOJ is the first central bank to go through these contortions, because Japan's institutional investors have been the longest exposed to extraordinarily low bond yields. Germany joined Japan with sub-1% 10-year yields in 2014; both countries are now below zero. Even the U.S. has seen bond yields test historic lows, with potential for further declines, given the latest weakness in economic data and the likelihood that the Fed will cut interest rates again.

Whatever the chance of the BOJ's success with this new push, now is the time to try, Sony's Kanno argues. After all, Japan and the global economy aren't in recession, and the job market is strong. "The BOJ is walking on a tightrope, but in hindsight it could be seen as a good time, because they may end up where there is no rope." —*Chris Anstey, Toru Fujioka, and Tomoko Sato*

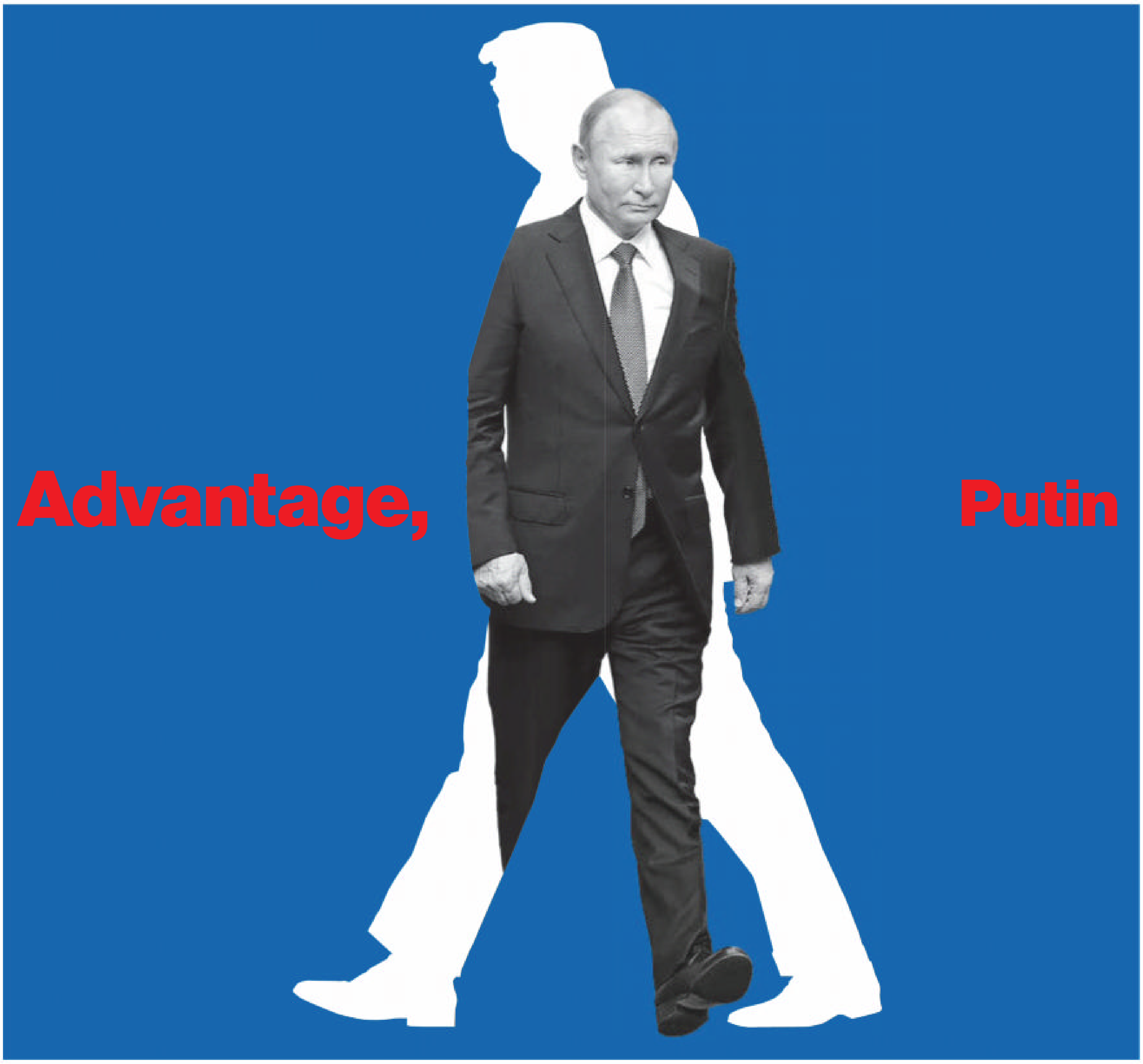
THE BOTTOM LINE The Bank of Japan wants to nudge up yields on long-term bonds while curbing short-term rates, a maneuver never tried by central banks.

● Japan 20-year government bond yield



● Kuroda

ILLUSTRATION BY NICHOLE SHINN ; KURODA: MUNEYUKI TOMORI/KYODO NEWS/AP PHOTO; DATA: COMPILED BY BLOOMBERG



Advantage, Putin

Trump's decision to step out of the way of a Turkish offensive leaves the region to Moscow

PHOTO ILLUSTRATION BY 731; PHOTO: MIKHAIL METZEL/TASS/GETTY IMAGES

The day after he decided to shift U.S. troops out of the path of the Turkish military incursion in Syria, President Donald Trump took to his usual platform to defend his actions. "The two most unhappy countries at this move are Russia & China," he said as part of a pair of tweets, "because they love seeing us bogged down, watching over a quagmire, & spending big dollars to do so."

Some Russian and U.S. analysts and officials, however, see Moscow as likely to be a major beneficiary of the move. More broadly, a White House decision to abandon the predominantly Kurdish Syrian Defense Force—an ally that supplied ground troops for the U.S.-led fight to defeat the so-called Islamic State in Syria—risks extending a narrative of American unreliability that began during the 2011 Arab Spring. At that time, the U.S. was widely seen in the region as having failed to give its longtime ally, Egypt's autocratic President Hosni Mubarak, the support he needed to survive the protests. Russia has since filled that vacuum, from Syria to Libya, even persuading Turkey to buy a Russian-made S-400 missile-defense system despite U.S. opposition.

"Bottom line: Trump tonight after one call with a foreign leader provided a gift to Russia, Iran, and ISIS," Brett McGurk, Trump's former envoy for combating Islamic State, tweeted in the early hours of Oct. 6, referring to Trump's conversation with Turkish President Recep Tayyip Erdogan the night before. Since leaving his post in December, McGurk has become a fierce critic of the administration's Syria policy, not least because of the president's "impulsive" management style. Just before McGurk resigned, Trump used Twitter to announce a ▶

Edited by Jillian Goodman, Alan Crawford, and Bernie Kohn

◀ withdrawal of U.S. forces from Syria, only to change course months later and agree to keep some troops in the region after encountering opposition from the security establishment and fellow Republicans, especially Senator Lindsey Graham. While the U.S. had abandoned select command posts by the time Turkey began its offensive in Syria on Oct. 9, it was still unclear whether it would follow through with a complete drawdown.

A complete U.S. pullout would remove Russia's only military equal from the contest to shape Syria's future, McGurk says. Moscow would then have to deal only with Turkey, a weaker and more compliant regional player, as it works to achieve its primary goal: a political settlement that returns the entire country to the control of its ally, President Bashar al-Assad.

Erdogan's plans have been long-gestating. On Sept. 24 at the United Nations General Assembly in New York, he described a plan to move as many as 2 million Syrian refugees—there are 3.7 million registered in Turkey—into a 30-kilometer-deep, 480-kilometer-long "safe zone" he wants to create in the swath of the country claimed by Kurds. The vast majority of Syrians who've fled since the civil war began in 2011 are ethnic Arabs, meaning the proposed population redistribution would transform the territory's ethnic composition.

The area of Syria controlled by the U.S. and its Kurdish allies stretches about 320 kilometers (200 miles) south from the proposed Turkish safe zone and includes Raqqa, the former Islamic State headquarters, and most of Syria's oil and gas resources. Turkish control of the northeast would represent a setback for Russia's goal of reunifying Syria under Assad's control, says Vladimir Frolov, a former Russian diplomat and foreign policy analyst in Moscow. "But on the whole, the Turks are better for us than the Americans."

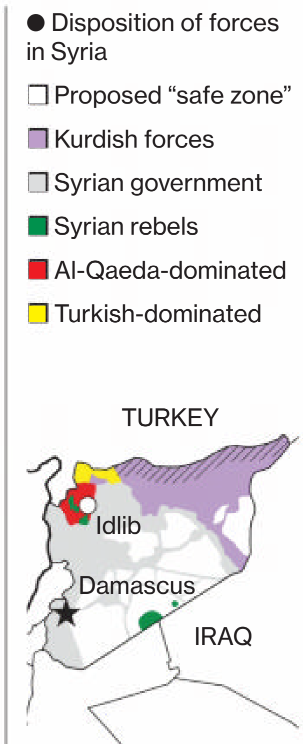
Frolov says it's likely that in exchange for greenlighting a new Turkish incursion, Moscow has extracted a commitment from Erdogan to allow Russia-backed Syrian government forces to begin a final assault on Idlib, the last major area of Syria still controlled by rebel forces, some of which are affiliated with al-Qaeda. Since September 2018, Idlib has been subject to what amounts to a cease-fire agreement brokered between Russia and Turkey.

Addressing the annual Valdai conference in Sochi in late September, Russian Foreign Minister Sergei Lavrov gave a by-now familiar indictment of alleged U.S. irresponsibility and inconsistency across the Middle East. He also appeared to approve Turkish military action while suggesting a more limited scope for it. In a question-and-answer session, Lavrov said Turkey had the right, under a 1998 agreement with Syria, to pursue terrorists up to 5 kilometers across the border. Asked by Bloomberg News if that might be accompanied by a Syrian government assault on Idlib, Lavrov replied that "Idlib should be considered separately."

Kremlin spokesman Dmitry Peskov said on an Oct. 7 conference call that Russia understands Turkey's need to ensure its security but hopes Syrian territorial integrity will be the priority. "All foreign forces that are in Syria on an illegitimate basis should leave," he said.

So long as the U.S. gets its troops out of the way, "Erdogan's operation against the Kurds could have a positive effect for Russia," says Ruslan Mamedov, a Middle East analyst at the Russian International Affairs Council, a Moscow-based research group founded by the Kremlin. It "will make Kurds realize that they need to make a deal with Damascus." —*Marc Champion and Henry Meyer*

THE BOTTOM LINE A Turkish invasion of northern Syria isn't ideal for Putin as he seeks to end the conflict on terms favorable to Russia, but it's better than having U.S. forces there instead.



Stay *Radical* or Get Boring?

● Mexico's groundbreaking ruling party is suffering through an identity crisis

For most of its five short years in existence, Mexico's Morena party, short for the Movimiento Regeneración Nacional, has revolved around one politician: Andrés Manuel López Obrador. AMLO, as he's known, treated the party as his personal platform, made most decisions unchallenged, and neglected to build any institutional framework to sustain it. In July 2018 he was elected president in a landslide, receiving 53% of the popular vote, more than twice his nearest rival and the most since an opposition candidate first won Mexico's presidency in 2000. Even more remarkable, Morena and its allies won majorities in both houses of Congress, surprising even some of the party's own leaders.

Now, almost a year into its dominance of the government, Morena is suffering through a period of fierce infighting ahead of its first scheduled

IVAN STEPHENS/GDA/AP PHOTO. DATA: INSTITUTE FOR THE STUDY OF WAR leadership contest in late November. At stake is the party's direction, whether it should double down on the anti-establishment agitation that helped it ascend to power or become more like a traditional political group (formal, organized, hierarchical). The contest has become so contentious that AMLO threatened to quit Morena.

"It's a debate between the more confrontational, radical wing of the party and the more pragmatic, progressive one," says Verónica Ortiz, a lawyer and co-host on Mexico's nonpartisan Congress channel. "How this plays out will be extremely important for determining the success of the president and his project."

The experiences of AMLO's previous party, the left-leaning Partido de la Revolución Democrática, or PRD, and the conservative Partido Acción Nacional, or PAN, serve as cautionary tales. Each is now much diminished in national and regional representation after becoming mired in internal tribal warfare.

Both of the leading candidates for the Morena chair are pledging to get along with AMLO: In interviews they try to outdo each other in pledging support for his agenda. Their differences are less about how to run the country than how to run the party, implement AMLO's vision, and continue Morena's electoral success. No matter who wins, as a popular president, AMLO is likely to exert a greater influence over the party head than vice versa.

The incumbent, Yeidckol Polevnsky, is a longtime leftist who inherited the party's top spot after AMLO stepped down in 2017 to seek the presidency. Polevnsky got her political start as the PRD's candidate for governor of the state of Mexico in 2005, running against the eventual victor, Enrique Peña Nieto, who went on to serve as president from 2012 to 2018. His administration was rocked by corruption scandals, economic insecurity, and disappointing growth, which helped fuel Morena's many victories.

Having led an industrial chamber of commerce before entering politics, she has more recently praised the late Cuban leader Fidel Castro and spoken favorably of Venezuela under Nicolás Maduro. In Mexico she's promoted greater state intervention in the economy through projects including an $8 billion refinery for the national oil company, Petróleos Mexicanos. Polevnsky says her comments on other world leaders are irrelevant to the Morena leadership race and describes the party as a big tent with diverse ideologies. "If you think that I'm a radical, there are people who are much more radical than I am in Morena," she says. "Ideological or intellectual differences shouldn't scare us, they should enrich us."

◀ Polevnsky speaking at a summit in Puerto Vallarta in 2018

Polevnsky's main challenger, lower house Majority Leader Mario Delgado, studied economics at Mexico's elite ITAM university alongside others who would become finance ministers in conservative governments. "I'm pragmatic and moderate in the public policies that I support to achieve objectives," he says, "but I'm radical in the vision for change," which includes stamping out corruption and ending poverty.

A Delgado win could signal that Morena will choose more moderate candidates for the key 2021 midterm elections. "There's space for Delgado to take a more reasonable position, where he tries to influence López Obrador on some issues and might not need to adopt as radical a stance as" Polevnsky, says Alejandro Schtulmann, who heads the Mexico City-based political consulting firm Empra. "The challenge for the next Morena chair is to consolidate and try to transform a grassroots movement into an institution."

Yet it isn't even clear how the party head should be chosen. AMLO said in August that he'd like it to be by national poll. An internal party Committee for Honesty and Justice rejected that option. Delgado then suggested the candidates agree among themselves on rules for a group of polls that would determine the winner, who would simply be ratified by party members at the convention, scheduled for Nov. 23-24. Polevnsky says the party rolls, at 3 million, include more than a million whose party loyalty hasn't been sufficiently proven.

A September poll of 810 Mexican adults by the newspaper *El Financiero* showed Delgado and Polevnsky in a statistical tie with 15% and 12% support, respectively. Two other candidates—Alejandro Rojas, a former tourism minister for Mexico City, and Bertha Luján, the comptroller when AMLO was mayor of Mexico City—drew 4% and 3%, respectively. Two-thirds of those polled said they hadn't yet chosen a favorite.

Polevnsky has accused Delgado of dividing the party and criticized him for serving in Congress while also campaigning for Morena leadership, ▶

"If you think that I'm a radical, there are people who are much more radical than I am in Morena"

◀ in effect using a taxpayer-financed position as a party launching pad. (Mexican party leaders traditionally haven't held other elected offices at the same time.) The infighting caused AMLO to issue a stern warning. "It's very unfortunate that parties that emerge to defend just causes end up very badly," he said at a daily news conference in August. "If Morena, the party that I helped to found, rots, not only would I resign from it, but I would ask that it change its name, because that's the name that gave us the opportunity to bring about the fourth transformation in the public life of this country, and it must not be stained."

The success of whoever leads the party will be important to maintain the two-thirds majority Morena and its allies have achieved in the lower house, the threshold to make constitutional changes, says Ortiz, the TV political analyst. "That's the trial by fire that will determine the second half of AMLO's presidency and set the stage for the next presidential election in 2024," she says. "That's why these disputes and fights within the party are so strong." —*Eric Martin*

THE BOTTOM LINE The Morena leadership contest has little bearing on AMLO's agenda but may greatly affect the party's ability to shape Mexico's future.

No, You Still Can't Bring Your Gun on a Plane

● More permissive laws have led to a rise in TSA firearm seizures

The Transportation Security Administration has gone to great lengths to get the message through to Atlanta airport passengers: Don't bring your gun through security. It's plastered signs on checkpoint walls. It's blared announcements over loudspeakers. It's thrown a warning up on video screens for passengers to stare at while they wait in line.

And yet, 298 firearms were seized at Hartsfield-Jackson Atlanta International's security checkpoints in 2018, the most at any U.S. airport that year. According to a Bloomberg Government analysis of TSA records, gun seizures there have tripled since 2014, when then-Governor Nathan Deal signed a law that allowed Georgians to carry a firearm in more places. Even as a percentage of the almost 26 million passengers who passed through security there last year, the number of gun seizures put Hartsfield-Jackson flyers in a virtual tie with those at Austin-Bergstrom International Airport in Texas for worst-offender status among the nation's 30 largest airports.

Overall, the 10 major airports with the highest gun seizure rates are in states that, like Georgia and Texas, either don't require a permit to carry a concealed weapon or require officials to issue a permit to all law-abiding applicants, while 8 of the 10 with the lowest rates are in states that allow the government more discretion to deny permits, according to an analysis of National Rifle Association data. Nationwide, the number of guns confiscated at TSA checkpoints jumped about 92% from 2014 to 2018; the number of passengers screened increased 22% in the same period. Seizures so far this year are running close to 2018 levels.

Putting a gun in checked baggage is legal as long as it's empty of bullets and properly secured. But it's illegal to carry a gun into a plane's cabin, even unloaded. If an agent finds a firearm in a carry-on, they'll stop the screening line and call local police. Many offenders, TSA officials say, have simply forgotten their gun is there.

The frequency of guns being brought to security checkpoints has hampered efforts to check travelers quickly. "Assuming that all those people

ILLUSTRATION BY THOMAS COLLIGAN

who are caught with a firearm aren't terrorists, that's a huge distraction from the mission of TSA to keep terrorists off planes," says John Pistole, a former TSA administrator who's now president of Anderson University in Indiana. TSA agents halted screening processes after detecting guns in carry-on bags more than 4,200 times in 2018, a record. More seized guns than ever are also loaded: about 86% of those confiscated last year. More than a third had a bullet chambered, creating the risk the gun could go off accidentally at a checkpoint or inside a plane.

The increase "has nothing to do with the population of travelers," says David Chipman, senior policy adviser at Giffords, a gun violence prevention group, and a former U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives special agent. "It has everything to do with the frequency of people carrying guns outside their home."

As of the mid-1980s only a handful of states operated under so-called shall-issue concealed carry permit laws. Today more than 40 states have passed such laws or allow concealed carry with no permit. Most of the states whose airports have the highest rates of TSA seizures—Georgia, North Carolina, Utah, and others—have passed additional laws expanding firearm-carry rights in recent years, including those that allow guns in bars, churches, buses, schools, and courtrooms.

In Texas, home to three of the top six airports for guns seized per 100,000 passengers, those with the proper license have been allowed to openly carry their handguns in a hip or shoulder holster since 2015. Since then, the number of seizures at Dallas's DFW Airport, a key hub for American Airlines, has increased 43%. Meanwhile, 33 million people passed through security last year at John F. Kennedy International Airport in New York, which has some of the strictest gun laws in the country. The number of guns seized: two.

Knowing where your gun is at all times is a crucial lesson taught in firearm safety classes, says Alan Gottlieb, founder of the Second Amendment Foundation, a gun-rights group. Keeping your firearm loaded when it's not in your control is "careless," says Dave Workman, an editor at the Second Amendment Foundation's online publication, TheGunMag.com. "That has always just stunned me that people do that."

Even though Democrats said gun control would be a priority after Congress's return from its summer recess, no legislation related to guns in airports has been introduced. And with Democrats attempting to balance a Trump impeachment inquiry with legislation on drug pricing and trade, it's unlikely any bills will be offered before the end of the year. At the state level, there weren't any bills relating to TSA checkpoints and firearms as of mid-September, according to the National Conference of State Legislatures.

House Homeland Security Committee Chairman Bennie Thompson, a Democrat from Mississippi, says that while he supports more technology upgrades to help the TSA screen for weapons, for now he's satisfied the agency is confiscating firearms. "I see it as a positive in a sense that we are catching the people, even if we catch it more," he says. And yet the agency has struggled for years to detect bombs and weapons in covert tests. In 2015 agents failed to uncover a weapon in 95% of internal tests, according to data leaked to ABC News.

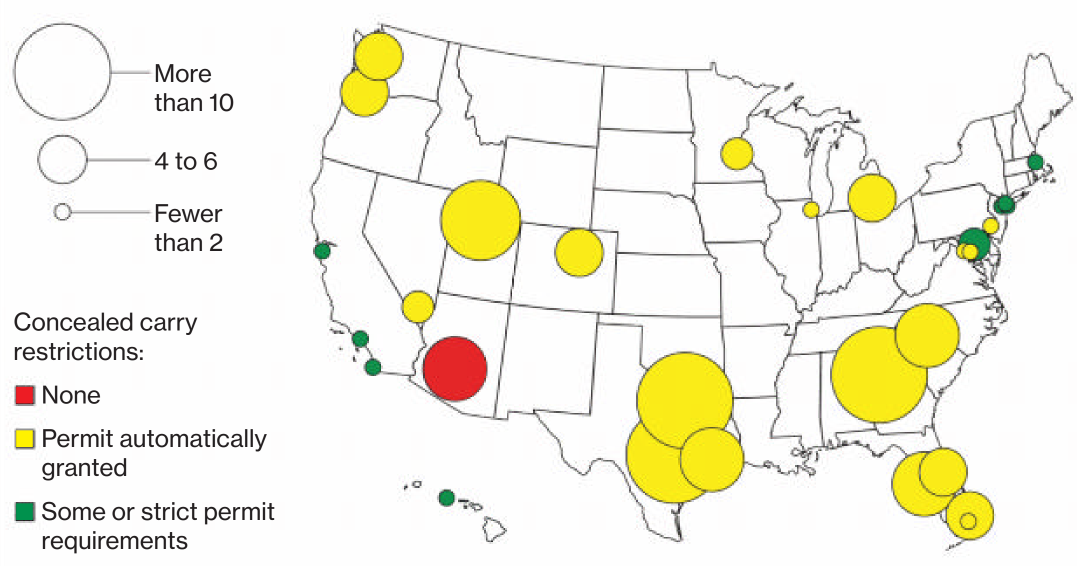
The agency has improved its rate since then, acting Deputy Administrator Patricia Cogswell told reporters on Sept. 11 following a Senate oversight hearing. She declined to share its current fail rate. TSA Administrator David Pekoske says the agency is monitoring the rise in seizures and will consider potential action if the issue continues to escalate over the next year.

● From 2014 to 2018, the number of guns confiscated at TSA checkpoints jumped about

92%

Put Your Guns Where I Can See Them

Firearms seized per million passengers at the 30 top U.S. airports by traveler volume



DATA: TSA

Tim Peek, who heads Atlanta's airport police team, suggests airlines should offer more detailed gun policy reminders to customers when they're buying plane tickets. "Ultimately it's not our goal to have to deal with it," he says. —*Courtney Rozen and Michaela Ross*

Michael R. Bloomberg, founder of Bloomberg News parent Bloomberg LP, is a donor to groups that support gun safety, including Everytown for Gun Safety.

THE BOTTOM LINE While the TSA's record of detecting threats isn't pristine, forgetful gun owners are sucking up resources at airport security checkpoints and delaying travelers.

The Cloud

The Curse of a Silicon Valley Midcap

Cloud company Box is stuck in a sales rut, and activist Starboard just walked in

ILLUSTRATION BY SAM ISLAND

October 14, 2019

Edited by
Dimitra Kessenides and
Rebecca Penty

Even in Silicon Valley, it's tough to be the middle child. Wedged between hot new startups and technology giants, midcaps must prove their mettle when the pace of growth dips and competition intensifies. Such is the dilemma of Redwood City, Calif.-based Box Inc., whose revenue growth lags those of its cloud-computing peers and is slowing, compounding investor concerns that the 14-year-old company has yet to turn a profit.

Chief Executive Officer Aaron Levie's answer has been to diversify Box away from its roots as a single-product file-sharing provider and position it in the cloud content management market, with offerings to help businesses secure data and automate workflows. But he's yet to show the strategy revamp is bearing fruit. Box's shares are down more than a quarter since its 2015 initial public offering. Shareholder advisory firms have been raising concerns about the structure of the company's board. And in the biggest blow to Levie yet, activist investor Starboard Value LP disclosed a 7.5% stake in Box—calling the shares "undervalued" in a September filing and saying it could seek changes, including business combinations, asset sales, and a board revamp.

Starboard's entry could distract Box from dealing with its problems, according to John Barrett, an analyst at Morningstar Inc. "Sales execution remains the biggest issue for the company," he says, pointing to Box's difficulties delivering consistent revenue results. The company's sales have been growing more slowly than its consumer-focused file-sharing rival Dropbox Inc. While two years younger than Box, Dropbox has more than double the revenue: It boosted sales by 26%, to about $1.4 billion, in the fiscal year ended Dec. 31, with Box's revenue rising 20%, to $608 million, in the fiscal year ended Jan. 31. Box forecasts sales growth of 14% this year.

For Levie and fellow co-founder Dylan Smith, Box's chief financial officer, Starboard's involvement could lead to existential repercussions if a battle ensues. The hedge fund has successfully agitated for changes at a range of companies, including EBay, Papa John's International, Symantec, and MGM Resorts International. Jeff Smith, Starboard's CEO, became chairman of Papa John's in February, and in August, the pizza maker said it would replace its chief executive after 18 months on the job.

The Box executives have put on brave faces amid early talks with Starboard. "We're taking in a lot of their feedback, spending more time with them, understanding what their views are on the business, where do they think that we should and can be performing better," Levie said on the sidelines of Box's annual user conference, BoxWorks, this month in San Francisco. "We actually agree on most if not all of those dimensions around how do we drive more operating leverage and profit in the business while making sure that we're still investing in growth and continuing to put up healthy growth."


● Levie

Starboard's move follows criticisms of Box by two shareholder advisory firms, Institutional Shareholder Services Inc. and Glass Lewis & Co. ISS recommended against reelecting two directors to the board earlier this year, in protest against what it sees as corporate governance shortcomings: Only three directors are put up for election at any one time, and there's a high threshold of shareholders required to vote to change bylaws. Glass Lewis said Smith shouldn't be on the board, which now has nine directors, arguing a CFO's control over company finances means the executive should report to the board. The board structure and set of rules aren't unusual in Silicon Valley. Box plans to add more independent directors over time, says a person familiar with the matter who wasn't authorized to speak publicly about the plan.

Levie, 34, once occupied an enviable role in Silicon Valley. He was the upstart who had an idea for a simple digital file-sharing system and took shots at established technology players such as Microsoft Corp. whose programs had grown stale. Levie delivered this message on the business-to-business tech conference circuit, where his enthusiasm, humor, and irreverence stood out, spurring *Business Insider* to call him a wunderkind and *TechCrunch* to say he brought "sexy back" to enterprise tech. Levie founded Box in 2005, joined by co-founders Smith, Jeff Queisser, and Sam Ghods. Queisser now has an engineering role at the company. Levie then reached out to billionaire Mark Cuban, who agreed to be an investor. They decided to keep Box focused on serving other companies rather than consumers. Box experienced fast growth but didn't do much to consider what products should come next.

The young leaders ran into trouble when Box first tried to pursue an initial public offering in 2014. Some investors balked at the company's securities filing, which showed that Box was spending more money on sales and marketing than it was generating in revenue. Wall Street's concerns about Levie and Smith's level of experience swelled. The IPO was delayed by nine months. "When we went public, it was definitely very apparent that we were early in our career," Levie says. "The conviction of our vision sorta gave us some degree of moral authority on why we should be running it."

Facing another challenge, the executives say they've got the same confidence in their plan. Levie discusses what he's learned about running his business at his favorite Indian restaurant in Redwood City, where the

PHOTO: DAVID PAUL MORRIS/BLOOMBERG. ILLUSTRATION BY SAM ISLAND waiters know his order without him uttering a word. "You'll kind of just have to withstand periods of time where the business is gonna be viewed differently than what's actually happening and what you're building on the inside," he says. "And so you have to have the fortitude and conviction to be able to push through that."

Still, Starboard's involvement has caused Levie to take a closer look at his strategy and consider what he could do differently, he said at the BoxWorks conference, noting that he's looking at ways to cut more costs.

Levie reads business-management books before bed and receives mentoring from John Chambers, the former CEO of Cisco Systems Inc., who says he's progressed as a leader. "He's learned to listen better to both the people he trusts and agrees with but also his critics," says Chambers. He declined to share his specific advice for Levie, but he says the Box CEO was "very much focused on continuing to reinvent his company, which in today's world you've got to do every three to five years." He pointed to Levie's $180,000 base salary—low by Silicon Valley standards—as an example of his dedication. (Levie's total compensation, including stock options, exceeds $3 million.)

For Box, the question has never been whether Levie cared enough about the company or was a serious enough person to run the business. It was about whether his best was enough. All of the company's steps have failed to produce predictable growth. Levie says he still feels optimistic that he, Smith, and the rest of the management team can pull off a turnaround and meet financial targets, as new products are expected to start delivering more sales as soon as later this year. He says he doesn't spend much time thinking about what might happen if things don't go as planned. —*Nico Grant, with Scott Deveau*

THE BOTTOM LINE Box wants to jolt its flagging sales growth and plunging stock by becoming a go-to cloud provider for security and data management. Activist Starboard's entry risks distracting executives.

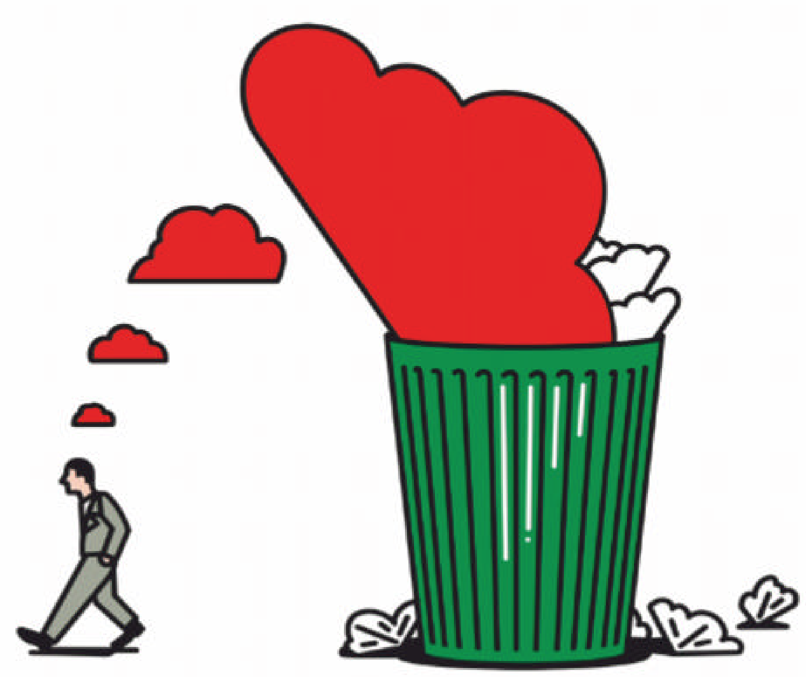
Oracle Resets Its Ambitions

It's focusing more on databases and applications than on infrastructure

Three years ago, Larry Ellison, the chairman of Oracle Corp., stood on a stage in San Francisco at his company's annual OpenWorld user conference, boasting about his cloud aspirations. "Amazon's lead is over," he declared, pledging "serious competition going forward" to become the biggest provider of cloud computing and data storage, also known as infrastructure services. He would make similar promises in 2017 and 2018. But now it looks like he's changed his mind.

Ellison spent millions of dollars to try and grab more of the infrastructure market in recent years, hiring thousands of employees, including engineers from Amazon.com Inc. and Microsoft Corp., whose Azure is No. 2 to Amazon Web Services (AWS). He also revamped much of Oracle's existing software to run on the new service. Then early this year, layoffs began in the infrastructure unit. It soon became clear Ellison is scaling back his infrastructure ambitions, refocusing on Oracle's cloud applications and database businesses.

Infrastructure is one of three types of cloud technology the company provides—and it's been the weakest. Despite the talent and backing, and even though its product is more affordable than those of rivals, the



infrastructure unit failed to win business. It didn't have the data centers necessary to compete with AWS and Azure, and it struggled to persuade large clients to spend the money to move their existing Oracle workloads—stored in traditional data centers—to the cloud. Its business represents such a small share of the cloud ▶

◀ computing and storage market that research firm Gartner Inc. classifies Oracle as a "niche player." Oracle will now give away a version of its cloud infrastructure services to software developers, students, and others to encourage them to use it. The company declined to comment on the cloud division's performance.

Oracle commands a stronger position in its other two technologies, especially platform services, which include databases and tools that organizations use to build applications. It's also a leader in cloud software that companies use to manage such tasks as marketing and human resources.

The shift away from infrastructure is significant for a company that thought it would use the power of its brand to dominate a rapidly growing technology. It's a prudent move, experts say. Oracle can more readily boost profits from applications, especially its accounting and database software, says Osama Elkady, chief executive officer of software maker Incorta Inc. and a former Oracle executive. And the cloud applications business is more than twice the size of the infrastructure market, $80 billion vs. $30.5 billion.

In an interview with Bloomberg News last year, Don Johnson, who has day-to-day responsibility for the Seattle-based Oracle Cloud Infrastructure unit, said beating AWS isn't the point of its infrastructure efforts. The storage technology will continue to underpin all of Oracle's current and future software; and customers can have access to it over the internet with a subscription, rather than pay big sums upfront to own Oracle software. "First and foremost, we're really the foundation on which all the other stuff in Oracle sits," he said.

Johnson said that by the end of next year, it will have more global data center hubs than Amazon. Some of the existing hubs are rented facilities within larger server farms owned by other businesses, Oracle executives have said. The company recently announced that it would hire 2,000 workers to support the expansion. Still, the company's capital expenditures—more than $2 billion in the current fiscal year ending in May 2020—are dwarfed by the spending of Amazon, Microsoft, and Google.

Johnson, who was hired from Amazon in 2014, flies to Oracle's Redwood City, Calif., headquarters every week for marathon meetings with his bosses, including Ellison. He oversees a part of the business that at one point numbered more than 6,000 people. Soon after Johnson's arrival, the company embarked on an infrastructure hiring spree, luring engineers with big paychecks. Midlevel product managers were being offered $750,000 a year; engineers with vice president titles were paid more than $5 million, according to people familiar with the matter who asked not to be identified discussing internal business.

The cloud infrastructure unit was the envy of the company. It had almost limitless resources, in contrast to the staid operations across the rest of Oracle, and was separate from the control of CEOs Mark Hurd and Safra Catz. Its offices displayed the excess typical of technology companies—decorated with fake trees meant to resemble the forests of the Pacific Northwest, *Dr. Who*-style British telephone booths, pool tables, and a giant chessboard on the floor.

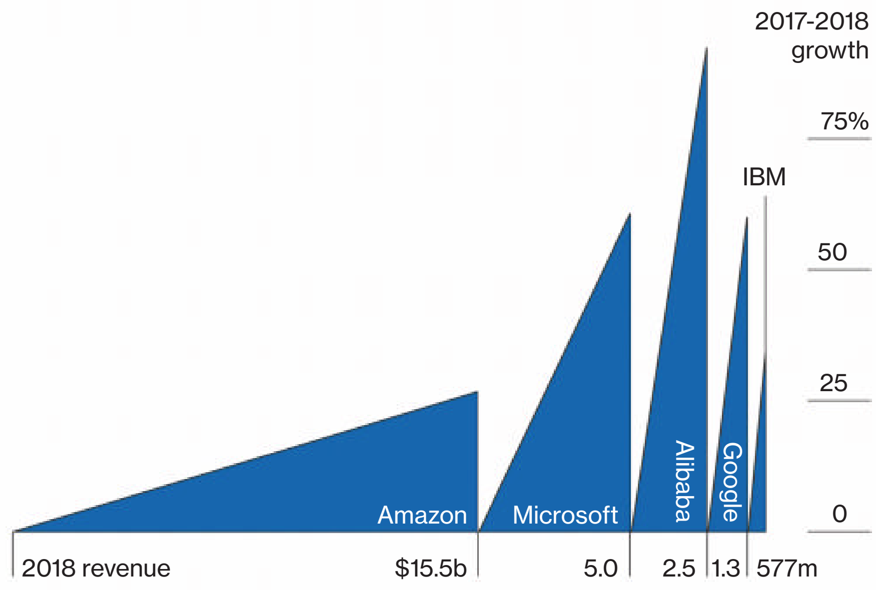
But, after five years, Oracle's management decided the infrastructure division was too expensive and announced cutbacks, first in March and later in June, that struck at the heart of Johnson's unit, according to people with knowledge of the matter. All told, about 2,000 positions were eliminated. Not everybody was fired; some employees moved into jobs elsewhere at Oracle.

The company's cloud ambitions are now much smaller. In June, Oracle announced a partnership with longtime rival Microsoft to connect the two companies' cloud networks, offering customers a way to link different business services. Oracle knew it could no longer go it alone, say analysts who observed the move. It's begun more partnerships with other cloud vendors. At this year's OpenWorld event in September, the company unveiled cooperation agreements with software makers VMware Inc. and Box Inc. to connect their applications to Oracle's cloud.

Hurd laid out a goal earlier this year for the company to become the world's No. 1 cloud applications company, eyeing 50% of that market. Ellison says that doing well in the database market and with financial applications is enough for him. In a September call with analysts, he said, "If we're successful in those two markets, it should be enough to make a living." —*Nico Grant*

Dominating the Market

The top five infrastructure-as-service providers account for almost 77% of the $32.4 billion global market



DATA: GARTNER

THE BOTTOM LINE Oracle's shift away from infrastructure is significant. Despite spending millions of dollars to capture more of that market, the company hasn't been able to dominate the rapidly growing technology.


NICE SAVE.
2+2=5-1
Have another nice save by switching to GEICO.
GEICO®
geico.com | 1-800-947-AUTO | Local Office
Some discounts, coverages, payment plans and features are not available in all states, in all GEICO companies, or in all situations. GEICO is a registered service mark of Government Employees Insurance Company, Washington, DC 20076; a Berkshire Hathaway Inc. subsidiary. GEICO Gecko image © 1999-2019. © 2019 GEICO

Andrea Illy

Chairman, Illycaffe SpA

"If you are not sustainable in business...you will have reputational damage"

Leading the global coffee empire started by his grandfather 86 years ago in Italy, Illy speaks with *Bloomberg Businessweek* Editor Joel Weber about tradition, innovation, climate, and sustainability—and whether or not to take milk with your coffee. The two spoke at the Conduit's Good Business Festival in London.

Photograph by Marton Perlaki

JOEL WEBER: There are few businesses in the world that have stayed in the family for multiple generations. You're the third generation. How has Illy defied the odds?

ANDREA ILLY: All businesses more or less start with family. Then it depends: It stays in the family or you go public. Typically, businesses go public because the family wants to withdraw from the day-to-day work, or because the company needs to raise some equity, or something goes wrong and the company has to be sold. I think there are families who are good at managing the business and can preserve control forever, possibly. There are businesses that have been in the same family for 10 generations.

How do other businesses learn from you? What should they use to measure performance?

I was surprised by the skepticism and the misinformation with which many people received the Business Roundtable declaration by chief executives this summer [that corporations shouldn't focus only on share prices]. What they listed was a very old-fashioned argument supporting the theory of shareholder value, which is, first of all, increasing value, not profit. Value is how much cash flow you generate over time—10 years, 20 years. The net present value you generate depends on the cash flow you generate in the long period ahead.

And it's complete nonsense to talk about profits or shareholder value without considering sustainability as a main value creator. This wasn't written in the press when the CEOs made their declaration. I was surprised, because, if you do a finance course, you'll learn it immediately.

If you are not sustainable in business, then you will have reputational damage that will make you sell less because consumers buy less from businesses with low reputation. If you aren't sustainable, you're going to have higher costs because of liabilities. Then you have to pay liabilities, so you're going to diminish your cash flow. If you have an unsustainable business, you're going to be more risky, so your cost of money is going to be higher. You'll have factors which are worsening your net present value.

You've described your business model as a stakeholder model rather than a shareholder model. What's the difference?

The theory and culture of shareholder value is typical Wall Street. Cash flow, profits, are for shareholders to increase their wealth. In the stakeholder model, there are many more parties involved. In our case, we have a hierarchy: consumers and customers, then our business partners, then the talented people who work for the company and create the product, then our suppliers who produce the coffee beans. Then, at the bottom of the pyramid, the shareholders.

In this case, that's you.

Me, my son, my family, at the service of the company. Not the other way around. So the main difference is that a stakeholder model is about the shareholder serving the business.

Sixty percent of your business is now outside of Italy. How do you take that model and keep your brand integrity while expanding into new markets?

The dream of my grandfather, the founder, was to offer the greatest coffee to the world. Offering is more than producing or selling or distributing. It's not about quality or value. Greatness is beyond being the best; it encompasses the way you do things. Our mission is about delighting people who appreciate quality of life all over the world with the best coffee that nature can provide, enhanced with the best technology. And beauty. Beauty is beyond ▶

◀ goodness. It's an enhancer of the coffee experience.

That's why Illy decided to have only a single blend. Because by blending, we get to the fundamental attributes—richness, elegance, balance, and consistency. Our single blend, globally and universally, is designed for the ultimate coffee experience, which is Italian espresso. And that's the focus of our strategy: expanding, distributing, developing new occasions for consumption.

You've expanded your business substantially. Revenue is at about half a billion dollars right now. What is it about coffee? Why is it such an incredible business?

It's a dream, because it's about success in life and in business. And, it's very good for your health. It makes you live better and longer. It's really the best way to enjoy caffeine: 90% of the human population consumes caffeine in one way or the other—and coffee should be the preferred one. Tea still beats us out in number of consumers, even though we're the best.

What's your goal from a growth standpoint?

Growth is not a goal per se. It's a way to stay competitive, a way to delight more and more consumers, a way to self-finance the business. It shouldn't be seen as a kind of a greedy goal in itself. We believe a company must have a purpose, and the purpose has to be completely coherent with the business development. That means that we will never compromise our ethical values or our sustainable quality just for growth.

You're a chemist by training. How does having a science background affect the decisions you make as a businessman?

In 1990 we started direct sourcing from coffee-bean-producing countries. We now buy 100% of our coffee directly from growers. The aim was to not only get 100% traceability to farmers, but also to exchange knowledge with growers so they can elevate the sustainable quality of their products. Because sustainability and quality are two sides of the same coin. In Brazil we work a lot in the state of Minas Gerais and in the state of Rio de Janeiro, hand in hand with our coffee growers. We founded the University of Coffee to teach what people need to know from the soil to the cup. We have five agronomists and technicians visiting a minimum of 100 farms per year, training and auditing them so they can implement our sustainable quality guidelines.

Virtuous agriculture is one of your passions. What does that mean?

It's beyond a passion. The mother of all causes is climate change. We absolutely must reach the Paris goals. From 2020 to 2030, we need to reduce emissions by 50% and become carbon neutral entirely—the entire world—by 2050. This is a challenge, a very serious one. I believe my company must contribute to this goal. So I wanted to pursue this idea to be carbon free in 2033 because 2033 will be our centennial. But we don't want to buy carbon credits outside our value chain. It doesn't work. So we need to have a soil-to-soil carbon cycle. We need to sink carbon in

"Our mission is about delighting people who appreciate quality of life"

the same soil where we grow our coffee. And this is how I started studying this opportunity to sequester carbon from the air into the soil. It will not only reduce net emissions in the atmosphere but also make the soil much more healthy, fertile, biodiverse, and resilient to pests, diseases, and extreme weather events, including droughts and floods.

How do you do it?

You have to enrich the soil. About 98% of agriculture is so-called conventional agriculture. Starting with the green revolution, the paradigm has been to maximize productivity. But this productivity maximization eventually depletes the soil, impoverishes it, and makes it dry and arid. This agriculture is more and more dependent on chemical fertilizers, billions of tons per year, and 3.5 billion tons of pesticides per year.

This overdependence on chemistry makes a substantial contribution to greenhouse emissions and climate change. In 2018 the world produced more or less 32 billion gigatons of carbon emissions, and agriculture was responsible for 11 of those. Instead of emitting, agriculture can sequester carbon in the soil. If Elon Musk is extremely successful, he will completely offset emission that comes from mobility. Agriculture can be a net carbon sequestrator. Negative emissions instead of neutral.

This is why I'm starting to enrich the soil with organic carbon, and, thanks to that, making better coffee, coffee that's more resilient to climate change, and showing the way to the rest of agriculture, that this is feasible with very good results.

And there's a part of virtuous agriculture that we didn't speak of. Soil health is also about human health. If you have less chemistry in the soil—and more biodiversity—then you're going to have a healthier plant, a healthier fruit or seed, which eventually is going in your gut, is going to have a better health impact.

There are many different components in our food that can make a positive contribution to our bodies. I'm not talking about healthy diets—the kind that prevents damage—I'm talking about having a virtuous diet, one in which your food provides a positive contribution to your health, food that also has curative effects. Take the example of stress, the major source of inflammation and free radicals. It may sound counterintuitive, but coffee, which is very rich in antioxidants, can fight those negative health effects of stress. I took a sabbatical to study this.

How bad might climate change be for coffee?

Coffee has been impacted by climate change for over 15 years now. It's about drought. It's about too high temperature in some countries. It's about excessive humidity and rain or floods in some other countries. It very much depends on the region, and it very much depends on the season, and, in the ocean, with La Niña and El Niño.

In Brazil, by far the leading producer with over 40% of world production, the region where coffee is grown used to be the enormous Atlantic forest, which has been deforested by 98% in the last century. There's now a microclimate there where temperature increase due to climate change is twice the global average. That means that coffee-growing regions in Brazil are already suffering what is going to happen in the rest of the world in 20 years.

Coffee has a massive water footprint, each cup requiring almost eight times as much water. How could the industry change its approach to water management?

In the coffee plantations, it's not necessary to use so much water. Typically in Brazil, once again, because you have flat land and you can dry the coffee under the sun instead of washing it, fermenting, and then drying mechanically. In other countries where the conditions are different, the predominant processing technique is washed coffee using a ton of water. This isn't necessary. So our partners in Guatemala, in Colombia, in Ethiopia, and many other countries process semiwashed coffee. That means that we use, I think, one-fifth of the water that's used for washed coffee. There's no water usage along the rest of the chain until you brew it. And all the water you use for coffee brewing goes in the cup. And you can reduce the volume of water in the cup by drinking a beautiful Italian espresso.

This is also being improved by the use of capsules and the portion system, because the old traditional way of brewing coffee ended up with at least one-third of the coffee in the sink.

But capsules have a downside—they can enter landfills as trash. Is there a better way?

Capsules do have an environmental impact. They're typically made with 100% recyclable materials, either plastic or aluminum. I hope in the future there will be compostable products. We produce our paper pod. In this case, it's not a capsule. It's a pod in compostable paper. There are some kinds of capsules that claim to be compostable in the market, but they have a footprint that is much worse than the noncompostable ones. Perhaps the future may bring more compostable materials, but it's difficult, because we use hot water and pressure at the same time, and this is really stressful for material.

What trends are you seeing with younger consumers, the millennials and Gen Z?

They're drinking more coffee, thanks to quality. Not only quality, because the coffee experience is also a gathering and a sense of place. Cafes are a kind of lifestyle for the younger generation, particularly students. That's very good, because it's decreasing the average age of coffee consumers, which used to be 25 to 35. Now it's becoming even younger.

You're not known for a retail presence. What are your ambitions there?

We're incubating this business. Although we're a tiny retailer, we have 250 self-branded cafes in the world, and we want to accelerate that in the U.S. In San Francisco, we have seven or eight directly operated stores just to fine-tune the formula. We hope to find a partner for our U.S. expansion. We're actively seeking a retail partner to help us grow, opening more of our cafes, having good business synergies, even if not from the coffee sector.

You've also partnered recently with JAB Holding Co., a huge global brand based in Luxembourg that's become very interested in coffee of late. Why?

The most dynamic segment of the coffee business is portion systems, the capsules. In the U.S., you have these K-Cups. In Europe, the de facto standard is the compatible capsule. It's about standards and technology. We needed to have this standard technology. They have it, and they're still the best technology within the standard. And so we decided to partner with them.

You've seen a number of changes in the culture and business of coffee. How do you see consumer tastes changing?

Coffee used to be a commodity, a pure commodity. People woke up, got their caffeine kick, and then ran. There was basically no quality because, as a commodity, it was just coffee at a minimum possible price.

Now consumers are more educated. It's just the beginning of a revolution, similar to what happened with wine. Wine has been made for five millennia. Coffee only one. So we have a long way to go to catch up, but we're accelerating, pursuing the same kind of paradigms as the wine industry. The consumer gets better quality, but also growers can get a higher price because the consumer is ready to pay for the quality.

I know you're an espresso fan. What do you say to people like me who drink their coffee with a little milk?

People typically pour milk in the coffee if it's bitter, right?

Yeah.

But if the coffee's really good, it's not bitter. Then you don't need any milk. Drink a bit of espresso. You will enjoy better quality. You will enjoy the richness of the aroma, the refined aromas. Without milk. Ⓑ

Edited for space and clarity

You Gotta Smash a Few Cars To Make an Autonomous Vehicle

Tesla's Autopilot could save the lives of millions. It will kill a few of us first

A nonfatal crash in Laguna Beach, Calif., in May 2018, involving a Tesla in Autopilot mode and an unoccupied police cruiser

By Zachary R. Mider

On the last day of his life, Jeremy Banner woke before dawn for his morning commute. He climbed into his red Tesla Model 3 and headed south along the fringes of the Florida Everglades. Swamps and cropland whizzed past in a green blur.

Banner tapped a lever on the steering column, and a soft chime sounded. He'd activated the most complex and controversial auto-safety feature on the market: Tesla Autopilot. It's a computer system that performs all the functions of normal highway driving without any input from the driver. When the computer is in control, the car can speed up, change lanes, take exits, and—if it spots an obstacle ahead—hit the brakes.

Tesla Inc. aims to dominate the global auto market by building the world's first self-driving car, and it considers Autopilot to be the crucial first step. Customers adore it. They've logged more than 1.5 billion miles on Autopilot, often pushing the limits of the software. Although the owner's manual warns drivers to closely supervise the car at all times, that hasn't stopped some from reading books, napping, strumming a ukulele, or having sex. Most of the time, the car gets them where they're going.

But on that morning in March, Banner's sedan failed to spot a tractor-trailer crossing the four-lane highway ahead of him. So did Banner, whose attention had apparently strayed. He struck the trailer broadside at 68 mph, the top of his car shearing off like a sardine can. The 50-year-old father of three died instantly.

Computer mistakes don't look like human mistakes. Autopilot has lightning reflexes and its attention never flags, but it sometimes fails to spot hazards in its path. Such oversights appear to have played a role in four of five known fatalities since Autopilot was introduced in 2015. Banner's wreck, in fact, bore an uncanny resemblance to an earlier one. In August, Banner's estate sued Tesla under Florida's Wrongful Death Act. The estate's argument is a straightforward product-liability claim: Tesla promised a safe car and delivered a dangerously defective one.

But Autopilot is unlike almost any other consumer product in history, in ways that offer a preview of the uncomfortable questions we'll confront in the dawning robot age. Tesla's flamboyant chief executive officer, Elon Musk, says the technology saves lives, and legions of Tesla owners offer their own testimonies of hazards spotted and collisions avoided. (And they have YouTube videos to prove it.) It's possible that both sides are right, that the computers are killing a few drivers who otherwise would have lived, but that they're also saving the lives of many more. In the coming years, society—in particular, regulators and the courts—will have to decide whether that's an acceptable trade-off.

The question is no longer academic. Musk's decision to put Autopilot in the hands of as many people as possible amounts to an enormous experiment, playing out on freeways all over the world.

I was in the passenger seat, heading north on Interstate 405 in Los Angeles, when Omar Qazi took both of his hands off his steering wheel. We were going about 50 mph on the most heavily traveled highway in the country, and the wheel of Qazi's black Model 3 turned slightly to the left, keeping the car centered in the gently curving lane. "This is like L.A. rush-hour traffic, right?" said Qazi, a 26-year-old software engineer. "It's, like, flawless."

Tesla has legions of die-hard fans, many of them well-to-do, tech-obsessed, and male. Qazi is pretty close to the archetype. His Twitter handle, @tesla_truth, is a bottomless font of Muskolatry. Before we met in August, he'd emailed Musk to give him a heads-up and encourage him to speak with me. The billionaire CEO, who declined to be interviewed for this story, replied to his fan the same day. "Your Twitter is awesome!" he said, before adding a warning: "Please be wary of journalists. They will sweet talk you and then wack you with a baseball bat." Musk cc'd me on the message. Tesla also declined to comment.

Qazi

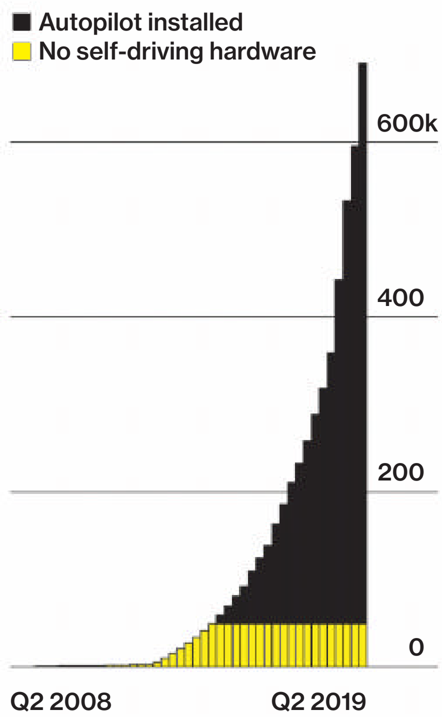
Qazi met me at the charging station outside Tesla's L.A.-area offices, with one of Musk's SpaceX booster rockets looming nearby like an industrial obelisk. Qazi wore a day's worth of stubble and blue Nike Airs. He immediately showed me the experimental Smart Summon feature, at the time available only to a select group of Tesla beta testers. (Qazi got it after begging Musk on Twitter; the feature rolled out to regular customers in September.) He pressed a button on his phone, and his car pulled out of its spot. Qazi watched it cross the parking lot and roll toward him. "It's not useful—yet," he said, grinning. But he loves showing off this trick so much he's been known to linger in a parking lot, waiting for an audience.

Smart Summon offers a tiny glimpse of the driverless future Musk is promising, but for road driving, Autopilot is as close as it currently gets. Tesla says the technology isn't reliable enough yet for humans to turn their attention away, even for a second, so it requires them to keep their hands on the wheel. Because most U.S. states are still figuring out how they'll handle driverless cars, this also serves a legal purpose. To state regulators, Autopilot is just an advanced driver-assistance program—a souped-up cruise control, basically. Autopilot can't yet tackle off-highway features such as traffic lights and stop signs. But during its four years on the road, it has gradually shouldered more complex tasks: merging smoothly, avoiding cars that cut in, and navigating from one highway to another.

"It can't drive itself perfectly, but the rate of advancement of the software is like—every couple of weeks you get an update, and the car's driving a little more humanlike. It's very eerie," Qazi said. A few minutes later, a silver sedan cut into our lane, and the car smoothly braked to let it in. "See that?" he asked.

It's not as if human drivers set the bar very high. In Los Angeles, on the day I met Qazi, an illegal drag racer died when his Mazda hit a parked truck; a motorcyclist fatally struck a broken-down van in a carpool lane; and a high school junior on a bicycle was critically injured after a car dragged him 1,500 feet and then sped away.

Cumulative Tesla vehicle deliveries



In fact, driving is one of the most dangerous things most adults do. It killed 40,000 Americans last year and 1.4 million people globally. And yet we're all pretty complacent about it. In 1974, in the name of fuel savings, the U.S. capped highway speed limits at 55 mph. One study found the change cut highway deaths by at least 3,000 in its first year. But people like driving fast, and Congress later removed the cap. A few years ago, traffic deaths began inching up, a development experts attribute to distractions from smartphones. Still we drive, and text, and drive.

Whatever their flaws, computers don't get drunk, or tired, or angry, or feel an irrepressible urge to check Instagram while driving on interstates. Autonomy promises to preserve our car-centered lifestyle but eliminate the estimated 94% of crashes caused by human error. Viewed from that angle, the self-driving car could be a lifesaver in the same class as penicillin and the smallpox vaccine.

Qazi has done the math: He says autonomous cars will someday save 3,000 lives a day. By his logic, anyone standing in the way of that progress has blood on their hands. "Imagine someone delaying the software by one day," he says. "You are really going to end up killing a lot of people."

Less than two months after Banner's fatal crash, Musk invited about 100 investors and analysts to Tesla's headquarters in Palo Alto, greeting them in a cavernous meeting hall. Born and raised in South Africa, he made a fortune in Silicon Valley and then undertook a series of audacious projects: commercial rockets, high-speed tunnels, brain implants, electric cars. His many admirers consider him a world-changing visionary; his foes, a bloviating phony. On that April morning, Musk occasionally interrupted the Tesla scientists who shared the stage with him and mused freely about, among other things, whether life might be a computer simulation.

Tesla's stock had been sinking for months. Despite having delivered the world's best-selling electric car, the Model 3, the company was still far from profitable, and Musk would soon be forced to raise more cash from investors. Over the course of the 2½-hour presentation, Musk pointed investors toward a new focus: building the first truly driverless car. Cars on the road today, he said, would be able to use Autopilot on local roads within months. By sometime in 2020 they'd no longer need human oversight and could begin earning money as drone taxis in their downtime.

"It's financially insane to buy anything other than a Tesla," Musk said, throwing up his hands. "It will be like owning a horse in three years."

Musk's timetable sounded particularly bold to anyone following the self-driving car business. Some three dozen companies, including General Motors, Daimler, and Uber, are racing to develop the technology. Many observers consider the strongest contender to be Waymo LLC, the Google spinoff that's been working on the problem for more than a decade. None of them is anywhere near selling a driverless car to the public.

Tesla will overtake them all, Musk told the assembled investors, thanks to the more than 500,000 Autopilot-enabled Teslas already on the road. Although he didn't use these words, Musk described Autopilot as a kind of rough draft, one that would gradually grow more versatile and reliable until true autonomy was achieved.

Releasing still-incomplete software to customers now, and hoping to work out bugs and add capabilities along the way, is, of course, how Silicon Valley often introduces smartphone apps and video games. But those products can't kill people. Waymo, GM, and the others have rough drafts, too, but they're installed in only a few hundred test models, deployed in a handful of carefully chosen neighborhoods around the country, and almost always supervised by professional safety drivers. Safety is an obsession, especially after an Uber test car mowed down a pedestrian last year. GM's prototypes crawl San Francisco's hilly streets at a maximum speed of 35 mph.

Musk, on the other hand, is putting his rough draft into consumers' hands as fast as he can. This allows Tesla engineers to collect terabytes of data from customers and use the information to refine the Autopilot software based on real-world conditions. Even Teslas that aren't on Autopilot pitch in: ▶

PHOTOGRAPH BY LIZ KUBALL FOR BLOOMBERG BUSINESSWEEK. PRECEDING SPREAD: LAGUNA BEACH POLICE DEPARTMENT. DATA: "TESLA VEHICLE DELIVERIES AND AUTOPILOT MILEAGE STATISTICS," LEX FRIDMAN

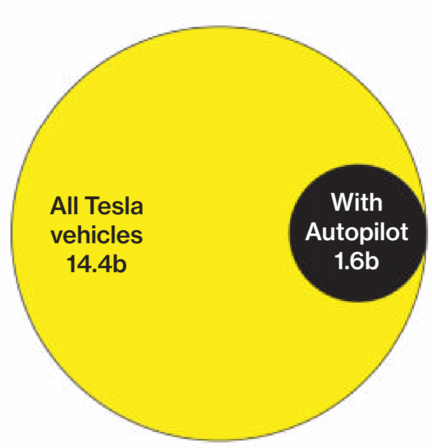
◀ They silently compare the human driver's choices with what the computer would have done. Every few weeks, Tesla completes a new and improved version of Autopilot and uploads it to the cars, to the delight of Qazi and other fans.

"Everyone's training the network, all of the time," Musk said in Palo Alto. He called this virtuous cycle "fleet learning," comparing it to the way Google's search engine improves with each of the 1.2 trillion queries a year it fields. Someday soon, he declared, the software will be so good, drivers will start unbolting the steering wheels from their cars and throwing them away.

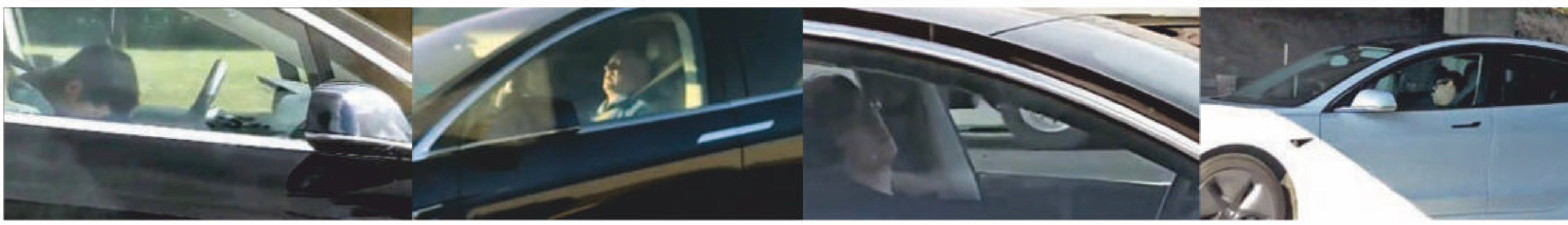
When a Morgan Stanley analyst pressed Musk about Autopilot's safety record, he quickly changed the subject to the dangers of human driving and the potential for technology to fix it. He compared cars to old-fashioned elevators controlled by human operators. "Periodically, they would get tired, or drunk or something, and then they'd turn the lever at the wrong time and sever somebody in half," he said. "So now you do not have elevator operators."

Considering the life-and-death stakes, it isn't surprising that Musk sometimes talks about driverless cars as a kind of righteous crusade. He once said it would be "morally reprehensible" to keep Autopilot off the market. But he and his acolytes aren't the only ones to talk this way. The first U.S. driver to die on Autopilot was Joshua Brown, a Navy veteran from Ohio who, like Banner, also rammed into a crossing semi. After his crash in 2016, his family issued a statement that basically endorsed Tesla's moral calculus. "Change always comes with risks," they wrote. "Our family takes solace and pride in the fact that our son is making such a positive impact on future highway safety." Brown had become, in effect, a martyr to Musk's cause.

Miles driven



Until drivers go the way of elevator attendants, Musk says, Autopilot is the next best thing: all the safety of a human driver, plus an added layer of computer assistance. But automation can cut both ways. When we cede most—but not all—responsibility to a computer, our minds wander. We lose track of what the computer is supposed to be doing. Our skills get rusty. The annals of aviation are full of screw-ups caused by humans' overreliance on lowercase "a" autopilot. Two Northwest Airlines pilots once zoned out so completely they overshot Minneapolis by 100 miles.


Videos and photos of Tesla drivers who appear to be napping are a fixture of social media

"It's just human nature that your attention is going to drift," says Missy Cummings, a former Navy fighter pilot and a professor at Duke University's Pratt School of Engineering who wants Autopilot taken off the market. Waymo, the Google spinoff, developed an Autopilot-like system but abandoned it six years ago. Too many drivers, it said, were texting, applying makeup, and falling asleep.

Computers, meanwhile, can mess up when a driver least expects it, because some of the tasks they find most challenging are a piece of cake for a human. Any sentient adult can tell the difference between a benign road feature (highway overpass, overhead sign, car stopped on the shoulder) and a dangerous threat (a tractor-trailer blocking the travel lane). This is surprisingly hard for some of the world's most sophisticated machine-vision software.

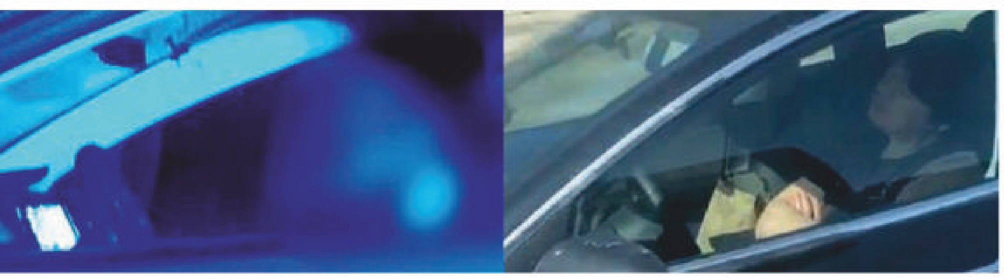
Tesla has resisted placing limits on Autopilot that would make it safer but less convenient. The company allows motorists to set Autopilot's cruising speed above local speed limits, and it lets them turn on Autopilot anywhere the car detects lane markings, even though the manual says its use should be restricted to limited-access highways.

To those who'd test the car's limits, Musk himself offers winking encouragement. When he showed off a Model 3 to Lesley Stahl on *60 Minutes* in December, he did precisely what the manual warns against, turning on Autopilot and taking his hands off the wheel. Then in May, after an Autopilot porn video went viral, Musk responded with a joking tweet: "Turns out there's more ways to use Autopilot than we imagined." Qazi says he and an ex-girlfriend used to make out while it was on. He did his best to keep one eye on the road.

Given that Autopilot now has more than 1.5 billion miles under its belt, determining its safety record ought to be easy. Musk has claimed driving with Autopilot is about twice as safe as without it, but so far he hasn't published data to prove that assertion, nor has he provided it to third-party researchers. Tesla discloses quarterly Autopilot crash-rate figures, but without more context about the conditions in which those accidents occurred, safety experts say they're useless. An insurance-industry study of Tesla accident claims data was mostly inconclusive.

After Brown's 2016 crash, the National Highway Traffic Safety Administration investigated Autopilot and found no grounds for a recall. It based its conclusion, in part, on a finding that Teslas with Autopilot installed were crashing 40% less than those without. But that was based on a series of dubious calculations. While Tesla had handed over mileage and collision data on 44,000 cars, key data was missing or contradictory for all but 5,700 of them. Within that modest group, the crash rate with Autopilot was actually higher. The faults came to light only when Randy Whitfield, an independent statistics consultant in Maryland, pointed them out this year. The NHTSA has said it stands by the finding.

Part of the problem with assessing Autopilot, or fully autonomous technology for that matter, is that it isn't clear what level of safety society will tolerate. Should robots be flawless before they're allowed on the road, or simply better than



the average human driver? "Humans have shown nearly zero tolerance for injury or death caused by flaws in a machine," said Gill Pratt, who heads autonomous research for Toyota Motor Corp., in a 2017 speech. "It will take many years of machine learning, and many more miles than anyone has logged of both simulated and real-world testing, to achieve the perfection required."

But such a high standard could paradoxically lead to more deaths than a lower one. In a 2017 study for Rand Corp., researchers Nidhi Kalra and David Groves assessed 500 different what-if scenarios for the development of the technology. In most, the cost of waiting for almost-perfect driverless cars, compared with accepting ones that are only slightly safer than humans, was measured in tens of thousands of lives. "People who are waiting for this to be nearly perfect should appreciate that that's not without costs," says Kalra, a robotics expert who's testified before Congress on driverless-car policy.

Key to her argument is an insight about how cars learn. We're accustomed to thinking of code as a series of instructions written by a human programmer. That's how most computers work, but not the ones that Tesla and other driverless-car developers are using. Recognizing a bicycle and then anticipating which way it's going to go is just too complicated to boil down to a series of instructions. Instead, programmers use machine learning to train their software. They might show it thousands of photographs of different bikes, from various angles and in many contexts. They might also show it some motorcycles or unicycles, so it learns the difference. Over time, the machine works out its own rules for interpreting what it sees.

The more experiences they have, the smarter these machines get. That's part of the problem, Kalra argues, with keeping autonomous cars in a lab until they're perfect. If we really wanted to maximize total lives saved, she says, we might even put autonomous cars on the road while they're still more dangerous than humans, to speed up their education.

Even if we build a perfect driverless car, how will we know it? The only way to be certain would be to put it on the road. But since fatal accidents are statistically rare—in the U.S., about one for every 86 million miles traveled—the amount of necessary testing would be mind-boggling. In another Rand paper, Kalra estimates an autonomous car would have to travel 275 million failure-free miles to prove itself no more deadly than a human driver, a distance that would take 100 test cars more than 12 years of nonstop driving to cover.

Considering all that, Musk's plan to simultaneously refine and test his rough draft, using regular customers on real roads as volunteer test pilots, doesn't sound so crazy. In fact, there may be no way to achieve the safety gains of autonomy without exposing large numbers of motorists to the risk of death by robot. His decision to allow Autopilot to speed and to let it work on unapproved roads has a kind of logic, too. Every time a driver wrests control from the computer to avoid an accident, it's a potential teachable moment—a chance for the software to learn what not to do. It's a calculated risk, and it's one that federal regulators, used to monitoring for mechanical defects, may be ill-prepared to assess.

"It's, like, flawless"

The U.S. already has a model for testing potentially lifesaving products that might also have deadly side effects: phased clinical drug trials. Alex London, a philosophy professor at Carnegie Mellon University, is among those calling for auto regulators to try something similar, allowing new technology onto the road in stages while closely monitoring its safety record. "Even if my proposal is not the best proposal, I can tell you what the worst proposal is," he says. "The worst proposal is to take the word of the person who designed the system, especially when they are trying to sell it to you."

On my last ride with Qazi, we drove to Rancho Palos Verdes, snaking through rolling brown hills and bluffs overlooking the Pacific. We weren't on a limited-access highway, but Qazi, defying the manual again, turned on Autopilot. The car did great, mostly.

As the road skirted a steep cliff, we approached a cyclist headed the same way. The Tesla correctly identified him as a biker and moved to overtake him. Just before it pulled alongside, Qazi braked, allowing the man to advance to a wider part of the road before we passed. He said he hoped the computer would have done the same, but he wasn't willing to find out.

But Qazi seemed resigned to the statistical certainty that as Teslas proliferate on the world's roads, there will be more Autopilot fatalities. "The biggest PR nightmares are ahead," he told me before we parted. "There's only one way to the goal. Through the minefield." Ⓑ —*With Dana Hull and Ryan Beene*

REDDIT (6). DATA: "TESLA VEHICLE DELIVERIES AND AUTOPILOT MILEAGE STATISTICS," LEX FRIDMAN

FAKED A

A satellite farm near Utqiagvik in Alaska, where Quintillion has set up broadband fiber

Elizabeth Pierce promised to b
through the Northwest Passage and m
the CEO of Warner Music G

By Austin Carr

ALASKA

oring superfast internet cables
nanaged to scam a billionaire oligarch,
roup, and the FCC chairman

Photographs by Ben Huff

When he discovered that the ship's underwater plow was stuck at the bottom of the Arctic Ocean, 50 miles off Alaska's coast, Frank Cuccio thought of Ernest Shackleton. In October 1915, the British explorer was forced to make a desperate escape from the Antarctic after pack ice and floes crushed his ship, the *Endurance*. The vessel Cuccio was aboard, the *Ile de Batz*, had been laying fiber-optic cable along the inhospitable route known as the Northwest Passage. But the *Ile de Batz*'s 55-ton excavator, which had been cutting a trench for the cable, had dug too deep in the hard-clay seabed. If they didn't unclench it fast, the ocean surrounding them would soon freeze. "I realized we don't have time to fool around, or we're going to get trapped in a Shackleton situation," Cuccio recalls. "The weather was getting uglier, and other ships had been gone for weeks."

Cuccio worked for Quintillion Subsea Holdings LLC, a telecommunications startup in Anchorage that was trying to build a trans-Arctic data cable it said would improve web speeds for much of the planet. This idea captivated the public, but by the time the *Ile de Batz*'s plow got stuck, in September 2017, the company was struggling. Co-founder Elizabeth Pierce had resigned as chief executive officer two months earlier amid allegations of fraud.

Pierce had raised more than $270 million from investors, who'd been impressed by her ability to sign up major telecom services contracts. The problem was that the people on the other side of those deals didn't remember agreeing to pay so much—or, in some cases, agreeing to anything at all. An internal investigation and subsequent federal court case would eventually reveal forged signatures on contracts worth more than $1 billion. In a statement about the controversy, a Quintillion spokesman said, "The alleged actions of Ms. Pierce are not aligned with how Quintillion conducts business. Quintillion has been cooperating fully with the authorities." Pierce, through her lawyer, declined to comment.

The company resolved the *Ile de Batz* crisis, coordinating with Cuccio and dozens of partner engineers and divers to hoist the plow from the depths. But it's unclear whether Quintillion's business will find momentum again. Pierce is serving a five-year prison sentence after pleading guilty to one count of wire fraud and eight counts of aggravated identity theft. The U.S. Department of Justice has said it believes nearly all the investment capital she secured was acquired fraudulently. The company is trying to repair its reputation while planning the extension of its internet pipeline from Asia to Europe. "I don't care what Elizabeth's original plan was," says George Tronsrue, the interim CEO. "Short of the headlines she grabbed with her bad behavior, she's irrelevant to Quintillion's future."

Much of Pierce's behavior, though, wasn't so different from that of other tech founders and CEOs who promised vast rewards right over the horizon. A *Bloomberg Businessweek* review of hundreds of pages of court documents, as well as interviews with three dozen people familiar with Pierce's Quintillion fraud, suggest that her ability to conjure up a Shackleton-esque vision of achieving the impossible proved as captivating as her forged signatures. "Elizabeth was so committed to making Quintillion successful that she just dreamt all this shit up," says a former company executive, who, like many sources, spoke on the condition of anonymity for fear of retaliation. "The question is not why Elizabeth did it, but rather, how did she think she'd get away with it?"

Arctic fiber has been an entrepreneurial fantasy for decades. Soaring demand for broadband helped drive companies, including Google, Facebook, and Amazon.com, to spend tons on high-speed underwater cables that keep customers watching Netflix and YouTube with minimal delay. But many of those lines run in parallel in the Atlantic and Pacific along well-established ocean routes, leaving the world's internet vulnerable to earthquakes, sabotage, and other disasters both natural and human-made. A trans-Arctic route would help protect against that while offering a shorter path, potentially making internet speeds much faster.

From Quintillion's inception in 2012, Pierce focused her ambitions on her home state of Alaska. The state's satellite internet was slow and expensive. In the lower 48, connections approaching 1 gigabit per second hover around $70 a month. Rural Alaska customers could pay double that for dial-up speeds. "If you wanted to watch *Game of Thrones*, you'd be better off getting a friend to record it on a CD and mail it," says Quintillion engineer Daniel Kerschbaum.

In theory, this meant a big opening, particularly as climate change warmed open more paths for construction in the Arctic. Pierce and her co-founders, who all had experience working at Alaskan telecom companies, figured they could develop faster, fiber-based broadband and then sell it wholesale to local internet service providers. The team spent most of 2013 conducting research, assessing environmental concerns, and negotiating cable routes with indigenous tribes. Even without completing any intercontinental routes, wiring Alaska for fiber would end up requiring 14 ships and 275 government permits and right-of-way authorizations. "The dream of a Northwest Passage makes sense on paper," says Tim Stronge, vice president for research at the consulting company TeleGeography. "But it's so hard to get funding."

"The dream of a Northwest Passage makes sense on paper. But it's so hard to get funding"

After Pierce met a Canadian father-son entrepreneur duo named Doug and Mike Cunningham, who were pursuing a similar network with their startup, Arctic Fibre Inc. (AFI), they decided to form a partnership. The Cunninghams said they could raise $640 million and committed to overseeing the international portion of a 9,500-mile cable that would run from Japan to England. Quintillion would be responsible for Alaska, arguably the most difficult segment.

Pierce, with her blonde bangs and Quintillion-branded puffer vests, looked like a friendly-yet-stern camp counselor. People close to the former CEO say she could be aggressive in business dealings, perhaps a result of her years working with Alaska labor unions on contract negotiations in the 1990s.

This style—my way or the Dalton Highway—extended outside the company, too. In 2014, Quintillion filed a defamation lawsuit against a telecom lobbyist in Juneau for allegedly calling the business a "big scam" in an email to a customer. At an industry conference, one attendee recalls making a joke to friends that Arctic cables felt as sci-fi as a Jules Verne novel. After she heard the comparison, Pierce confronted this attendee. "I'd never even met Elizabeth," this person says. "My comment was so trivial, but she was really angry and defensive. She seemed under a great deal of stress."


Quintillion fiber-optic cables are wired to downtown Utqiagvik, population 4,200

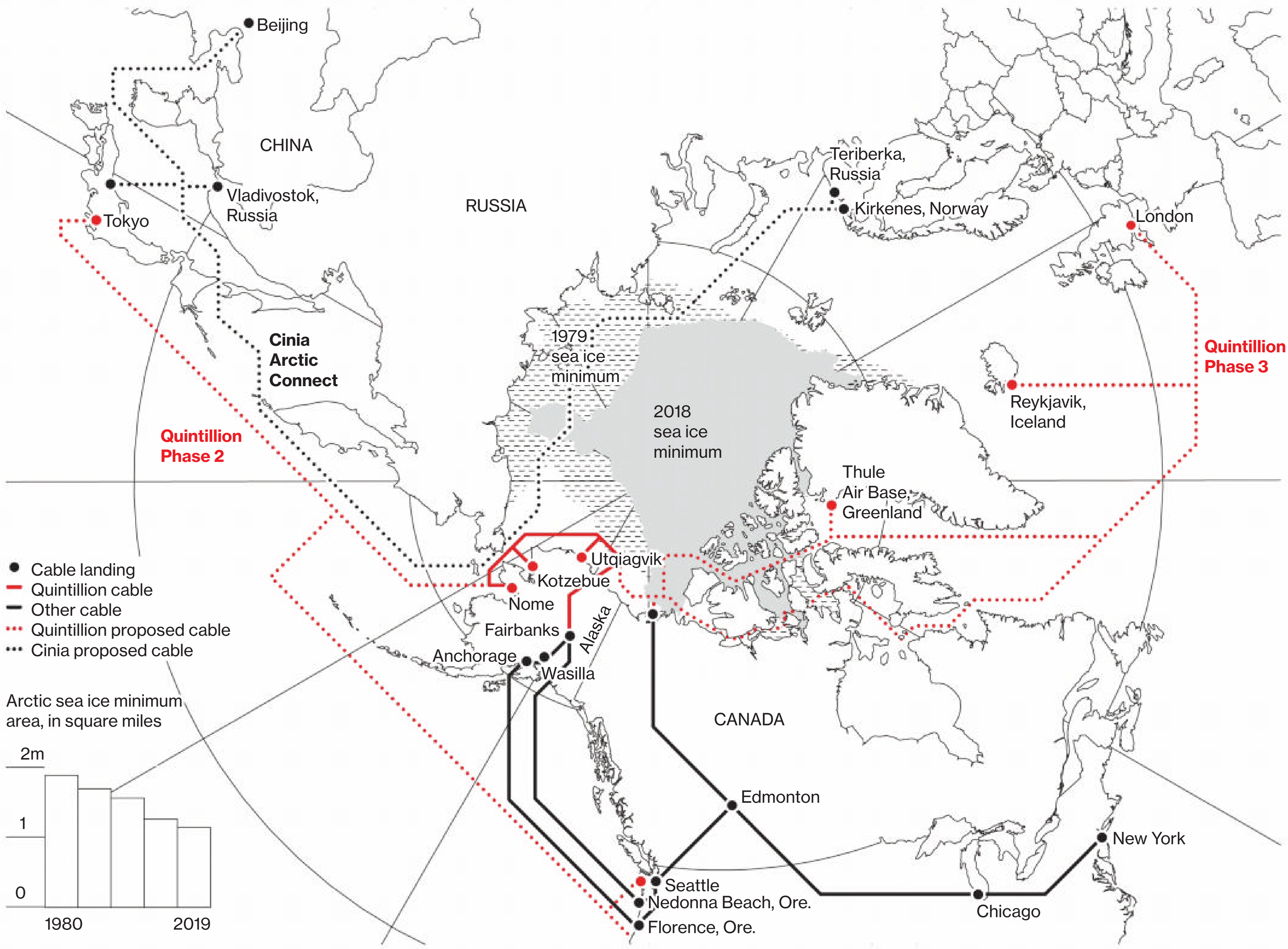
No major venture capital firm invested in the Quintillion-AFI project prior to 2015, according to court documents. The market of teeny Arctic communities didn't seem to justify the huge upfront expense, one reason Quintillion's rivals in Alaska mostly used satellites and microwave antennas, rather than fiber lines, to reach low-population centers in a state more than twice the size of Texas.

At a crossroads, the Cunninghams proposed a merger. Pierce agreed but ultimately orchestrated an acquisition of AFI's assets and cut the Cunninghams out of management, according to people familiar with the matter. She was willing to peddle promises grander than what she could deliver, these people say. At a meeting with investment bank Oppenheimer & Co., a relationship Pierce took over from the Cunninghams to seek financing, an Oppenheimer analyst predicted that Quintillion could squeeze only $30 million in annual contracts from its Alaskan cable. Pierce pounded the table and promised $75 million a year, says a person present at the meeting. "Whenever you challenged Elizabeth, she'd double down," the person says. An Oppenheimer spokeswoman declined to comment.

Oppenheimer set up talks with Cooper Investment Partners, or CIP, a private equity firm in New York founded by Stephen Cooper, the CEO of Warner Music Group. Leonard Blavatnik, a Soviet-born oil magnate who owns WMG, is CIP's largest shareholder through a variety of holding companies, according to an FCC filing. At an introductory meeting, CIP representatives said the firm would invest only if Pierce could show them completed contracts that guaranteed a certain amount of revenue upfront. Although Quintillion had previously struggled to close such deals, Pierce convinced CIP managing director ▶

Arctic Cable Guys

Pierce outlined an aggressive plan for wiring the Arctic



◀ Adam Murphy she could do it, and by early 2015, the firm invested $10 million. (Blavatnik and Cooper declined to comment. Murphy declined interview requests and didn't respond to a detailed list of emailed questions. In a statement, he said, "We are focused on the future, not the past.")

Pierce's solution wasn't complex. It was "so rudimentary," she later submitted in court, that it's shocking nobody caught the grift sooner.

Pierce scribbled her first forged signatures on contracts with the Matanuska Telephone Association, which services south-central Alaskan towns such as Wasilla, in May and June 2015. Although Matanuska CEO Greg Berberich had been reluctant to strike a deal, Pierce assured her investors in New York in an email that Berberich was "nervous but very committed." The next day she uploaded a contract, worth hundreds of millions of dollars, with what looked like Berberich's signature to a personal Google Drive account she shared with Murphy. Pierce also said she was close to locking in another gigantic contract with the nonprofit Arctic Slope Telephone Association Cooperative, whose customers include residents of remote Inupiat communities and the city of Utqiagvik. Soon she sent Murphy a contract with a phony version of the Arctic Slope CEO's signature, too.

She perpetrated similar deceptions at least eight times, and the fraudulent contracts totaled more than $1 billion, according to court filings. Sometimes she completely fabricated deals; other times she negotiated real contracts, then substituted key pages with ones that had more favorable terms. Quintillion's other 10 or so employees were kept at arm's length. "I am the only person at Quintillion to authorize or otherwise accommodate customer requests or alleged contract issues," she wrote in an email to a customer. She solely controlled the password to her Google Drive and stored printed contracts in a private filing cabinet, which she once scolded a subordinate for opening, according to a former employee. On a team conference call with Murphy, this person remembers Pierce kicking a Quintillion executive under the table to stop his report of new accounting data.

Murphy, who became more involved with the business as Pierce's apparent sales streak continued, spent time in Alaska meeting customers, several sources say. When he inquired about a $600 million contract that Pierce said she'd struck with another Alaskan telecom, Pierce admitted

DATA: NATIONAL SNOW AND ICE DATA CENTER, NATURAL EARTH, COMPANY REPORTS negotiations had soured but said she had more contracts coming that would offset the lost revenue. Over time, Pierce raised $270 million from CIP and French investment bank Natixis SA. “There were signs things were screwy,” says a Quintillion backer. “You wanted to believe in the good she was doing. How many people were putting together billion-dollar projects in Alaska?” A Natixis spokeswoman declined to comment.

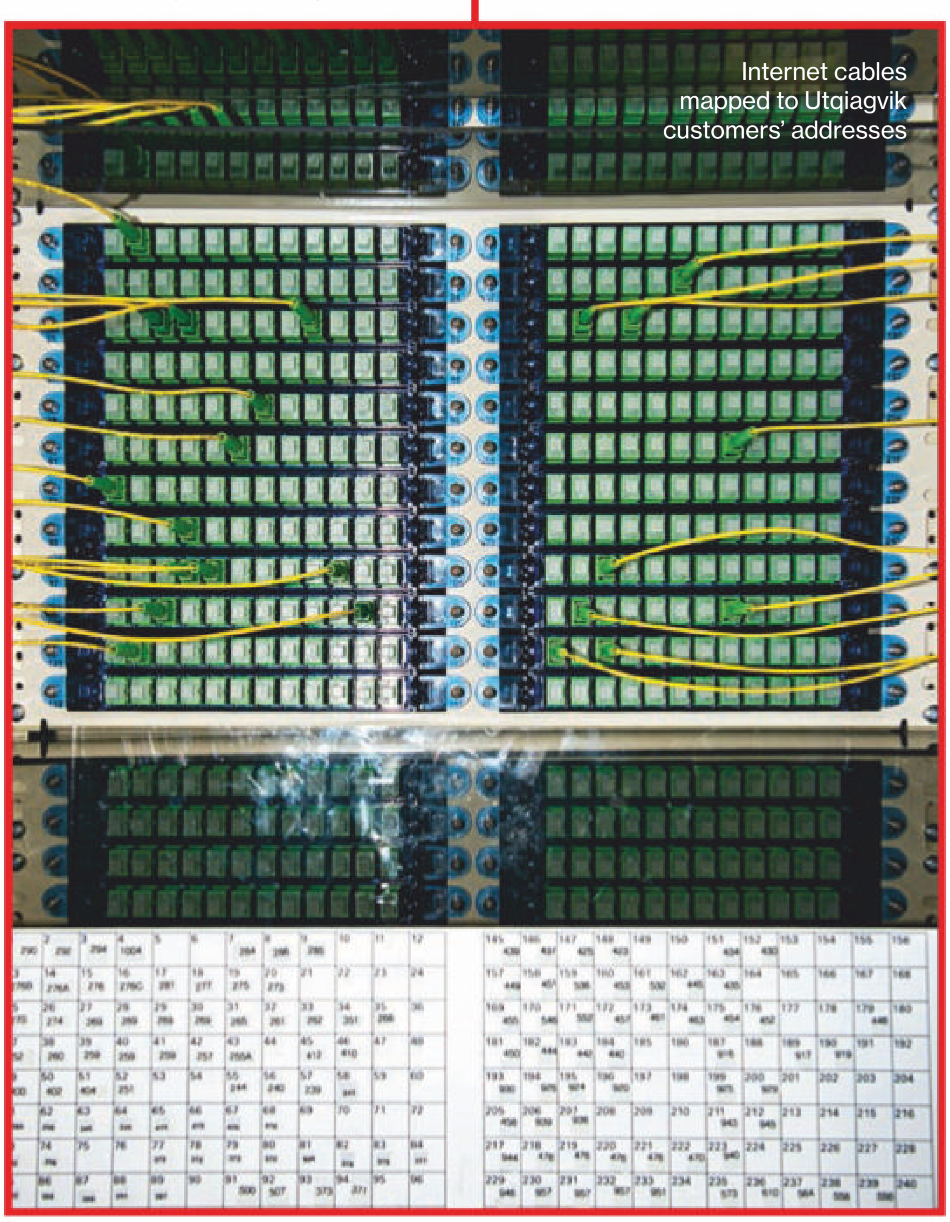
This perception contributed to an aurora-like glow around Pierce, whose earnest-sounding pitch for closing the digital divide in Alaska made her a star of telecom conferences. In August 2016, Governor Bill Walker joined her at a media event in the Aleutian Islands. Federal Communications Commission member Ajit Pai, who’s since become the FCC chairman, even flew to Alaska to tour Utqiagvik, where he met Pierce and later appointed her chair of an advisory committee on rural broadband. Pai declined to comment.

Still, the mounting pressures began to take a toll on Quintillion’s CEO. Friends assumed Pierce’s severe respiratory issues, which they say led to repeated cases of flu and other illnesses, were a result of the stresses of 14-hour days and frequent travel. Later they’d attribute these problems to crippling anxiety, which seemed to keep her forever on the brink of a breakdown.

During this time, Pierce’s income averaged at least $146,000 per year in salary and other benefits, according to public records. She and her husband, William, lived in a four-bedroom home. On the side, they ran a construction business out of a garage-turned-office near Quintillion’s Anchorage headquarters. Quintillion operated in the former garage, too, before moving into a brick building that could double as a rural post office, recall three people familiar with the matter. Elizabeth’s assistant sat in a hallway near Bill’s truck.

Unusual financing supported the family’s lifestyle. In 2013, Pierce mentioned an opportunity to invest in Quintillion to an old work acquaintance, Julian Jensen, who says he thought the project was “strategically viable.” In May that year, according to court documents, he wrote her the first of three checks totaling $325,000, a third of his savings.

Pierce deposited the initial check, for $100,000, into her personal bank account, court documents indicate. That same day, these documents show, she established her own retirement plan at Wells Fargo & Co. and transferred $30,500 into the account. She also used Jensen’s funds to pay off her and Bill’s credit card bills and mortgage, cover household expenses, and invest $10,000 into their construction business. At one point, she cut their son a $500 check, jotting “just because” in the memo line. Pierce did allocate a portion of Jensen’s capital to Quintillion: Prosecutors later claimed she “loaned” $43,300 to the company and spent $28,000 to acquire shares in her own name. By the end, there was $49 left in her Wells Fargo account. (At her trial, Pierce denied opening a retirement account with Jensen’s investments, which she said she mostly used for Quintillion.)

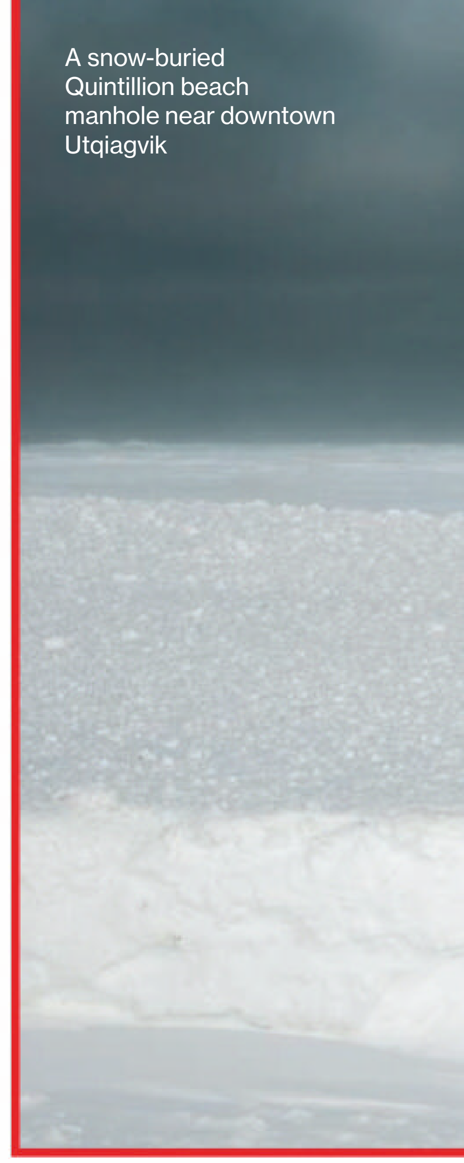

Internet cables mapped to Utqiagvik customers’ addresses

In 2015, Pierce found another source of income after a Quintillion worker and former coffee shop barista, Erica Blair, inquired about investing. (Blair’s real name was redacted in court filings. She spoke to *Bloomberg Businessweek* on the condition that she be identified only by a pseudonym.) Pierce told her that if she could come up with $40,000, that would buy her 225 Quintillion shares. Blair cobbled together the cash from family, hoping it would turn into a nest egg for her kin. Pierce deposited those funds into her Wells Fargo account, according to court documents.

The following year, Quintillion kicked off construction of its subsea cable network, partnering with Alcatel Submarine Networks Ltd. But the seabed was stiffer than expected, and weather conditions quickly worsened. Pierce had to cease operations and delay the project a year.

The costly setback made investors skittish. But whenever Jensen and Blair would ask for shareholder documentation, Pierce convinced them their investments were solid. She gave Jensen a spreadsheet showing his shares had gained in value. Murphy and the CIP team also pressed for greater insight into Quintillion’s contracts, but Pierce insisted that Alaskans simply didn’t trust outsiders and that it would be better for her to keep managing everything alone.

In early 2017, a Quintillion employee prepared to send out invoices for ▶



A snow-buried Quintillion beach manhole near downtown Utqiagvik

◀ Quintillion's supposed megadeals, but Pierce came up with reasons to delay the process, likely to keep her forgeries from being discovered. Matanuska Telephone, she said, might break its purchase obligations for internet capacity on their land cable. According to court documents, Pierce advised CIP to avoid litigation because it might jeopardize a larger sales agreement she claimed to have struck with Matanuska for underwater cable usage. She vowed to supplement the disappearing revenue and continued to repeat this process as a similar pattern played out with another customer.

By mid-2017, Pierce had run out of excuses to delay sending out invoices. She could no longer hide her scheme after customers saw their bills. Berberich, who'd retired two years earlier as Matanuska's CEO, said the hundreds of millions of dollars he didn't remember committing to Quintillion would bankrupt his old company. (A Matanuska spokesman says it's taken the necessary steps to safeguard its stakeholders.) Lawyers for Quintillion's customers disputed the invoices, and one telecom company contacted CIP. Disconcerted, a CIP employee logged into the Google account Pierce shared. All the contract files were now missing. Two days earlier, on July 14, the Google log read, "Elizabeth Pierce moved 78 items to the trash."

A week later, a CIP lawyer questioned Pierce, who'd brought her own personal lawyer. She said she was unable to recall the circumstances of every contract signature. After 30 minutes she left the interview, saying the inquiries felt so out of the blue. They rescheduled for the next day. Hours before that meeting, her attorney canceled and the following day submitted Pierce's resignation.

Murphy scrambled to find a successor, especially because Quintillion had ships going back to work near Alaska to complete the fiber-optic network. CIP recruited Tronsrue, a seasoned telecom executive and Army veteran, who joined in early August. Tronsrue focused on Quintillion's operations aboard the *Ile de Batz*, where, over the course of 15 days, Alcatel Submarine Networks repaired the 55-ton plow and finished the subsea cable as ice sheets bumped their boats. Meanwhile, Quintillion says, it reported Pierce's actions to federal authorities in late September.

Throughout 2017, Pierce behaved as if nothing were awry. She held a ribbon-cutting in April with Alaska Senator Lisa Murkowski at a cable-landing site in the oil town of Deadhorse and calmly delivered keynotes at conferences into the summer, even after her scams had been uncovered. "Elizabeth is a dreamer, an innovator, and a person who just likes to get things done," said the host at a May event at the University of Alaska at Fairbanks. A grinning Pierce quipped, "Obviously, I didn't write that bio."

In early 2018, she met with Blair, the former Quintillion worker who invested $40,000. Over coffee they chitchatted about family. Pierce said she'd left Quintillion to spend more time at home. But, she said, there might be a problem honoring Blair's shares in Quintillion. (In truth, the shares didn't exist.) There was good news, though: She'd decided to make Blair a beneficiary in her life insurance. "Why would you do that?" Blair asked, confused. Pierce responded cryptically: "You never know what can happen."

In April 2018, the Department of Justice announced Pierce's arrest. Shortly after, public records indicate, her family sold her Anchorage residence for $415,000 and purchased a home in Texas near Austin, which was put in Bill's name. (Prosecutors argued this was an attempt to shield assets from forfeiture. Bill Pierce couldn't be reached for comment.) Near the time of her arrest, Pierce phoned a longtime friend who was oblivious of her misdeeds; the call went to voicemail. "'Things are about to get crazy—we'll talk later,'" she said, according to this friend. "That's the last time I ever heard from her."

On a freezing May afternoon, Tronsrue and Kerschbaum, the Quintillion engineer, are smashing along in a white van on the icy outskirts of Utqiagvik, the northernmost community in the U.S. Kerschbaum steers through ashen snowdrifts, and 20 minutes outside town, we stop at a nexus of Quintillion's network, demarcated by posts poking out of snowbanks.

To link the subsea cable to its land fiber, Quintillion had to drill a mile-long channel 80 feet underground, from this snow-buried manhole to the ocean, and splice the cables. At a nearby cable-landing station, they show me the wires where data enters and exits through its underwater and terrestrial cables to Alaska customers.

Tronsrue, who has silvery hair and a Jeff Bridges drawl, tells me he spent months after the unraveling of Pierce's scandal salvaging Quintillion's relationships with customers. He was able to recover some agreements; others fell apart. In a sign of progress, Jens Laipenieks, CEO of Arctic Slope Telephone, joins us at the cable station to praise Quintillion. "We were at dial-up speeds years ago, but now our subscribers can do things like stream Netflix, play Xbox online, and process Square payments," he says.

Ultimately, Alaska got its subsea cable network, stretching around the tips of its coast. Quintillion estimates it's connecting some 10,000 residents, in addition to local schools, hospitals, and other business customers, to a usable contemporary internet. Crawford Patkotak, a whaleboat captain and chairman of the Arctic Slope Regional Corp., a native-owned business group and a minority shareholder in Quintillion, similarly credits the cable company with bringing Utqiagvik into the digital age. "There's even ocean service now," he says over reindeer Bolognese at the Top of the

goal of constructing an Asia-to-Europe internet cable via the Northwest Passage. Tronsrue insists that objective hasn't changed, though he acknowledges it will take $800 million to fund. Meanwhile, the Matanuska Telephone Association recently announced a cable from the North Pole to the contiguous U.S., and a Finnish company is developing its own $600 million Arctic fiber. Pierce appears to have proved there's potential in this market, even if her vision of a Northwest Passage for the internet remains a dream.

On Sept. 30, after more than a year of court proceedings, Pierce surrendered to a federal penitentiary in Texas. Prosecutors from the Southern District of New York, which handled the case because Quintillion's majority investor, CIP, is based in Manhattan, argued that

World Hotel restaurant. "My friend gets mad at his crew: 'Get off your damn phone! We're out here whaling!' "

Later we drive past the kinds of places that Tronsrue says represent the future of Quintillion's business, including Cold War-era military installations and fields sprinkled with mammoth satellite dishes. He says the company is considering building a data center and also sees potential in government contracts.

she acted alone. They claimed Pierce placed her "ruthless ambition and greed" above the law. Yet the judge expressed confusion. Given Pierce's successful career and lack of criminal history, he said, the former CEO's motivations remained a "mystery."

During her sentencing, Pierce and her lawyer said she didn't gain much personally from the scam and otherwise spent CIP's funds on Quintillion. "I am financially,

"I was devastated, crushed—to this day, it's still mind-numbing what Elizabeth did"

During my Alaska visit, Quintillion execs never mention Pierce, but that doesn't stop her name from coming up. At Utqiagvik's Arctic Research Center, which many government agencies use for climate-change studies, our guide grumbles that the internet hasn't improved. "We were promised all this stuff by that lady, Elizabeth," he says. At the town's Iḷisaġvik College, Chief Operating Officer Brian Plessinger complains to Tronsrue that, since switching to Quintillion fiber, the new service "hasn't made a difference. We pay $9,500 per month for just 10 megabits, but with 2,000 students, it slows to a halt."

Immediately after, Tronsrue is on his phone figuring out if there's a way to help Plessinger. It turns out that the college's bandwidth had improved from its old internet connection, while its cost per megabit fell roughly 70%. But there's no doubt the service hadn't lived up to what Pierce pledged. In the ensuing months, Tronsrue worked to quintuple the college's speed at no extra cost. "Nothing changes overnight," he says. "You either adapt or you get kicked in the teeth."

It's unclear whether Quintillion will complete its loftier

professionally, and socially ruined," Pierce said in a plea to the judge to reduce her jail time. She stressed she's not an "evil manipulator."

It's true that CIP didn't lose everything. Court documents indicate that while Quintillion's telecom contracts will generate $480 million less than what Pierce projected, annual earnings could reach their promised 2018 numbers by 2023.

Other Quintillion backers aren't so fortunate. Blair has struggled to make up with her family over her lost $40,000 investment. "I was devastated, crushed—to this day, it's still mind-numbing what Elizabeth did," Blair says. "Alaska really needed this system, and I worked really hard for Elizabeth."

And yet, Pierce somehow still has fans. Desiree Pfeffer was Quintillion's chief business relations officer and says she's now a board member. She was close with Pierce—never catching a whiff of her duplicity, she swears—and mostly remembers the ex-CEO for her tenacity. "This is going to sound weird. Elizabeth gave everything to this project," she says. "I got burned like everyone, but frankly, I would work with her again." B


move fas
and
vape
things

JUUL's wildly successful, very silicon valley business has a serious bug

by lauren etter, ben elgin, and ellen huet
photographs by mark abramson

In 2004, Stanford grad students Adam Bowen and James Monsees set out to reinvent the tobacco industry. In 2015 their company, Juul Labs Inc., began selling e-cigarettes and flavored nicotine pods that were twice as potent as many competing vape rigs. By the following winter, "Juuling" was a verb. The two men, former smokers, said their goal was to save millions of lives a year by helping smokers switch. "Fifty years from now, nobody's going to be smoking cigarettes," Bowen said in a promotional video. "They're going to look back and think, Oh, my God, I can't believe people used to do that."

He may be right, but the question today is what happens to Juul. It's facing investigations by the U.S. Food and Drug Administration and the Federal Trade Commission, a congressional inquiry, dozens of lawsuits, and, reportedly, a criminal probe by the Department of Justice. San Francisco has banned the sale and distribution of e-cigs. On Oct. 7, Kroger Co. announced it would stop selling them, joining Walmart Inc. and other retailers. Regulators are investigating whether Juul illegally marketed its products as healthier than cigarettes, and to minors.

Juul's USB-drive-looking vaporizers and sweetened flavors, with names like mango, cucumber, and creme, may well help longtime smokers give up a cancer-causing habit. But they've also attracted millions of nonsmokers, including—as America's parents and assistant principals know all too well—a lot of kids. Researchers warn that Juul's high-nicotine pods and Instagram marketing could be undoing decades of antismoking gains. For many teens, Juul has become a fact of life, as have memes such as a bathroom-wall sign that reads, "Absolutely no peeing in the Juul room."

The company said in an emailed statement that its objectives haven't changed. "We do not want, we do not need and we do not try and get non-nicotine users to use Juul," it said. "More than 70% of smokers want to quit. Offering adult smokers a real alternative to cigarettes is a commercial opportunity of historic proportions."

Achieving verb status is a hallmark of next-level success for any Silicon Valley company, and Juul has reached other such milestones as it became the world's third-most-valuable startup, worth $38 billion after raising $12.8 billion last December. That deal made Bowen and Monsees paper billionaires, and they made sure their 1,500 employees were richly rewarded, too. But the biggest chunk of the money

didn't come from Silicon Valley venture capitalists; it came from Altria Group Inc., the Marlboro maker formerly known as Philip Morris, which received a 35% stake. Bowen and Monsees' Big Tobacco replacement project was beginning to look like a standard tobacco company.

Juul said on Sept. 25 that it would end all U.S. digital, TV, and print advertising, and that it was replacing Chief Executive Officer Kevin Burns, a longtime private equity investor who'd previously helped run yogurt maker Chobani LLC. Any relief employees or public-health advocates might have felt at the news of his ouster was short-lived. The company replaced him with K.C. Crosthwaite, Altria's "chief growth officer."

The new CEO has another cloud to clear. Since April more than 1,000 cases of lung injury associated with vaping have been reported to the U.S. Centers for Disease Control and Prevention from 48 states, and at least 20 people have died, including a minor. None of those cases, many of which share pneumonia-like symptoms and signs of chemical burns, have been tied to Juul or its pods; many of the victims reported using pods containing oils from THC, the active ingredient in marijuana, but some said they vaped only nicotine. The anxiety about mysterious killer vapes has helped catalyze the opposition against Juul, the most prominent e-cigarette brand, with more than $1 billion in annual revenue and 70% of the U.S. vape market, according to market researcher IRI. (With a big asterisk: IRI doesn't track online sales.)

Interviews with former Juul executives, employees, and advisers suggest that management's drive to outpace the company's rivals led them to sidestep several internal and external appeals for caution, including warnings from public-health officials that Juuls were rapidly addicting children and from employees concerned that they were being sold without adequate quality controls. The company said in its statement that it meets internationally accepted manufacturing standards and that none of its products currently on the market were in any way rushed. Former employees remember things differently. "They were in such a hurry to get product in the marketplace,"

says one who, like others, spoke on condition of anonymity for fear of retaliation. “It was just, get it out there, get it out there, get it out there.”

Tobacco companies initially started talking about “safer” cigarettes in the 1950s, and research intensified around the time government safety warnings first appeared on packs of smokes. In 1988, R.J. Reynolds Tobacco Co. released a smokeless product called Premier, which flopped. As Reynolds’s own CEO later said, Premier tasted “like shit.” A Chinese pharmacist released an electronic cigarette in 2003, but its battery life and nicotine kick were weak.

So there wasn’t much competition when Bowen and Monsees presented their 2005 Stanford thesis, which dubbed their prototype e-cigarette “the rational future of smoking.” They clicked through some slides detailing the psychological reasons people use cigarettes—oral fixation, marketing, sense of belonging. Then came a slide with a picture of a deconstructed cigarette: a piece of paper, a filter, shreds of tobacco. “This is the current solution—it satisfies all these basic human needs,” Monsees said, getting the desired laugh from the audience. “In reality,” he added, “a cigarette is actually a carefully engineered product for nicotine delivery and addiction.”

During the presentation, he and Bowen unveiled their first prototype, called Ploom. It mimicked the round, slender profile of a cigarette and used little tufts of loose-leaf tobacco that were heated and vaporized. In 2007, Bowen and Monsees formed a company called Pax Labs Inc. and eventually began selling the Ploom with tobacco pods that came in flavors like “rocket” and “kick-ass mint.” After struggling to attract investors from the Silicon Valley set, they invited executives from several tobacco companies to San Francisco to check out the product in late 2009, according to two people familiar with the meetings, which haven’t previously been reported.

With cigarette sales steadily falling about 3% a year, the tobacco companies were interested—but unimpressed by the Ploom. “I kept coughing the whole ▶

BOWEN AND MONSEES: WINNI WINTERMEYER/REDUX. PLOOM DEVICES: NATHANAEL TURNER. JUUL: REUTERS. XING: PHOTOGRAPH BY KELSEY MCCLELLAN FOR BLOOMBERG BUSINESSWEEK

a JUUL pod architect says her new stuff is better

xing

Juul’s vape liquid was developed for mature adult smokers, says Chenyue Xing. “It shouldn’t have gotten into the eyesight of juveniles,” she says. Xing, a former top scientist at Juul, says she started Myst Labs to correct the vaping industry’s mistakes.

Myst’s first target is the world’s biggest smoker nation, China, where Xing and her co-founders grew up. They face a market crowded with dozens of well-capitalized rivals and a groundswell of worry caused by vaping sickness.

At Myst’s research lab in San Jose, Xing says the recent deaths are distressing, but the diagnoses are inconclusive. A billion smokers could benefit from switching to vapes, she says. “But there’s always going to be controversy around new products.”

Public-health advocates say the controversies facing vape companies can’t be waved off, and Myst has work to do to prove it can keep nonsmokers away. They’ve expressed particular worry about Myst’s one-time disposable e-cigs, priced at about $7 to attract first-time vapers. Xing says Myst’s smoking alternatives are designed to appeal to the middle-aged.

She’s picked a brutal time to force a new brand into the vaping market, says Marc Scheineson, a former associate commissioner of the U.S. Food and Drug Administration who now runs the food and drug practice for the law firm Alston & Bird. “Regulatory uncertainty is creating high entry barriers that she’s going to have to jump through,” he says.

When a recruiter from Juul’s original corporate parent cold-called Xing in 2013, she was working for a pharmaceutical company to develop inhalable drugs to treat migraines and other diseases. A lifelong nonsmoker, she says she signed on to help create an alternative to cigarettes that was more effective than nicotine patches.

Within two years, Xing had co-created Juul’s nicotine-salt technology. Now stunned by the scale of Juul’s success, she says she left because she disagreed with her bosses’ plans to pursue marijuana products along with tobacco. She returned to the pharmaceutical industry in 2016 but grew convinced she could build a better vape company.

Myst’s vapes don’t look as fun as Juul’s. Their colors run to dark gray instead of, say, turquoise. The pods, too, are limited to more staid options (tobacco, mint) instead of sweeter fruit flavors. Myst, which employs most of its 60 workers in Shenzhen, China, says it’s working with retail chains, as well as Alibaba Group Holding Ltd. and Tencent Holdings Ltd., to use facial recognition to ensure people buying their products are 18 or older.

The nicotine formula, however, is the same where it counts—a 5% concentration, like the Juul standard—and a sample Myst P series tastes and feels like a Juul. When Xing switches the vape on, a sleeve around the mouthpiece clicks open like a camera lens. She says it makes vaping feel more like lighting a cigarette, and it’s easy to imagine the cues priming a user for nicotine just as striking a match does.

Myst also offers 3% nicotine pods (as does Juul) and says it intends to distinguish itself with even lower-concentration vapes that give the same buzz but are less addictive. It’s working on an app to help people taper off their vapes and eventually quit. Asked if that would one day put her company out of business, Xing shrugs and says she’s not too worried. “There are enough smokers out there.” —*Shelly Banjo, with Ellen Huet and Aki Ito*

employees at JUUL's headquarters in san francisco

◀ time," recalls a former executive from one major tobacco company. "Clearly it wasn't a finished product." After a day of meetings, Monsees and Bowen invited the executives to a San Francisco bar to see the Ploom in action. At the bar, there were lots of people exhaling big puffs of Ploom vape while they sipped drinks. Outside, however, the tobacco executive found people smoking old-school cigarettes and talking about the vapers, whom they said either worked for Bowen and Monsees or had been given free samples that night. (A Juul spokesman said in a statement that the company regularly sponsored tasting events.) "I was embarrassed for them," the former executive says. On the flight home, "our marketing guy shrugged his shoulders and said let's just do it ourselves."

Every major tobacco company—Philip Morris, R.J. Reynolds, Lorillard Tobacco—would eventually begin work on its own e-cigarettes. Suddenly, Bowen and Monsees found themselves in a race. They hired chemists who reverse-engineered the tobacco plant, and Pax's 20-person research team derived a powerful vape formula from the nicotine salts that form on the plant's leaves. Despite this eureka moment, the process of developing the nicotine liquid remained pretty shoestring. One former Pax employee says the scientists tested the prototype vape liquids themselves and occasionally wound up with their heads in the office toilets.

Nonetheless, Pax's no-guardrails approach got results. Eventually, the company filed for a patent for a vape liquid that Bowen told *Inc.* magazine had 10 times the nicotine concentration of rival products.

One more thing gave vaping an advantage. The cigarette industry's record-setting $206 billion settlement in the 1990s severely curbed its ability to market to children and requires the companies to help cover state Medicaid costs for smoking-related illnesses. In 2009, Congress gave the FDA authority to regulate tobacco products to prevent kids and young adults from becoming addicts, which mostly meant banning flavored cigarettes and further restricting marketing. Companies would also have to get approval to introduce a new tobacco product. But at the time, the government didn't consider e-cigarettes a tobacco product.

Health concerns about the lack of long-term vaping studies prompted the FDA in 2014 to add e-cigarettes to its antismoking purview starting in August 2016, giving vape makers a couple years' notice to put their products on the market before that deadline to be grandfathered in. R.J. Reynolds created the Vuse in 2013. Altria released the MarkTen in 2014. And the next year, Pax Labs unveiled the first product from its new subsidiary, Juul Labs.

On June 4, 2015, about 400 people packed into Jack Studios, a Manhattan event hall, to celebrate the commercial release of the first Juul. The guests puffed on Juuls, sipped cocktails, and, under glowing blue lights, danced to electronic music with a smattering of hired models: young women wearing cropped T-shirts and muscular men wearing no shirts at all. In Juul's first year on the market, the company sponsored hundreds of similar such "activation" events. Soon, Juul ads were plastered on billboards in Times Square.

Aggressive viral marketing accounted for a significant part of Juul's early sales. So did the hardware's iPhone-esque design. Each Juul looked sleek, conspicuously inconspicuous, and the fashion-conscious could find them in limited-run colors such as blush gold. They came with a USB charger. The snap-in pods initially featured a much wider range of tasty flavors, including coco mint and apple orchard. Most important, Juul's 5% nicotine concentration pods were among the strongest on the market, the rough equivalent of a pack of cigarettes. And, especially when vaping was still a new phenomenon, a Juul could be used virtually anywhere, anytime. In less than a year, the company cranked out 11 vape colors and dozens of pod flavors.

Juul received more than $46 million in venture funding from the likes of Fidelity Investments and Sivia Capital Partners LLC after the product had been on the market for a week. By the end of 2016, Juul claimed to be one of the fastest-growing vape brands in the U.S. and was prepping moves into Europe and Israel. The San Francisco headquarters was rapidly filling with staffers and the huge vape clouds they were exhaling, like a scene from the 50th season of *Mad Men*.

"We knew that it would be a successful product, but honestly we didn't expect it to be that successful," says Chenyue Xing, who led the development of the Juul pod liquids and now runs a competing vape company, Myst Labs. She says that Juul's high nicotine concentration was meant to make the product satisfying enough to get veteran smokers to switch, but that the team also tried to make sure it wasn't more addictive than paper and tar.

Juul's early success came with hiccups. In late 2015 the company began receiving reports that some of its pods were leaking. The pods also function as mouthpieces, so people mostly figured this out when the highly concentrated nicotine juice seeped directly into their mouth, which some complained caused a burning sensation on their lips. Then the company started receiving complaints about the flavor in some tobacco and menthol pods. Juul scrambled to figure out the cause—an off-spec ingredient in a batch of e-liquid, according to two people familiar with the incident. The company eventually halted production of the e-liquid, but much of the product had already made it to store shelves. Juul didn't issue a recall

or disclose the issue, according to one of the people familiar with the matter. "It was a wake-up moment, like, Oh, my God, we have no repeatable processes or procedures in place," this person says. "It was always learning by accident." A Juul spokesman said in a statement that the company has always had sophisticated equipment and proper labs that exceed industry standards. He said the company investigated the pods and determined the leaks "did not constitute a significant health hazard." Regarding the e-liquid, the spokesman confirmed that the company stopped production and sales of a batch of e-liquid with "flavor profile variance." He didn't address why customers were never notified.

Three former employees say they pressed Juul to strengthen quality controls but were consistently rebuffed, because the measures they suggested would have slowed the company's growth. Instead, they say, Juul did what one does in Silicon Valley: Ship now, worry about bugs later. Last year, Juul executives considered a risk management plan that would have elevated the company's manufacturing standards and added a department to manage and investigate consumer complaints. "They gutted it," says a person who worked with the company at the time. A Juul spokesman said in a statement that the company rejects these assertions and has set up a program to handle consumer complaints, and that it's implementing a quality-control system akin to those used by manufacturers of other FDA-regulated products.

"Oh, God, look how young they all are"

Juul also sent representatives into high schools. Ostensibly, the reps were there to deliver presentations about avoiding addiction. The FDA is investigating multiple complaints that the company used these visits to effectively pitch kids on Juuling. "Juul went after our kids," Meredith Berkman, co-founder of the advocacy group Parents Against Vaping e-Cigarettes, told a hearing of a House subcommittee on consumer policy this summer. Berkman told the congressional panel that a Juul rep told her son's ninth grade classroom that Juul was for adults, not for kids. But after the session, the rep pulled out a Juul and talked it up to the boy, comparing it to an iPhone. Berkman said her son has Juuled but no longer does.

From the beginning, Juul's official stance has been that its prime targets are smokers age 25 to 45. But some former insiders say they soon realized its products and marketing events appealed to a younger crowd. Scott Dunlap, who was chief marketing officer of Pax Labs when the first Juul was released, says the crowd for one of the early Juul launch events clearly wasn't in the 25-to-45 demo. He recalls thinking, "Oh, God, look how young they all are."

Last year the FDA asked Juul to turn over documents related to its marketing practices. The agency also began conducting sting operations to catch retailers selling Juuls to minors. By then, Juuls were everywhere. The 2018 National Youth Tobacco Survey showed that an estimated 3.6 million middle and high school students used e-cigarettes, an increase of more than 70% from the previous year. "These data shock my conscience," the FDA's then-commissioner, Scott Gottlieb, said at a press conference last fall. There was, he said, an "epidemic use of electronic cigarettes and nicotine addiction among kids."

One in nine U.S. high school seniors say they now vape almost daily, according to a study published last month in the *New England Journal of Medicine*. That's one reason this year's spate of vaping sickness has freaked out health authorities. Another is that it's laid bare just how little is known about the fine-particle substances people are inhaling deep into their lungs. Juul and other e-cigarette makers now have to submit applications to the FDA by May for approval to keep selling their products.

And while research shows that e-cigarettes are likely safer than the regular kind, because they don't appear to produce many of the carcinogens that burning tobacco does, vaping simply hasn't been around long enough for researchers to conduct conclusive long-term trials. In July a CNBC reporter asked Juul's then-CEO Burns about the impact of chronic vaping. "Frankly, we don't know," he said.

For some former Juul insiders, this is the ethical quandary. The product can cut into sales of combustible cigarettes and obviate their woeful health impacts, but it's less clear how or whether users are supposed to quit using their Juuls, which gets tougher if they've signed up for the automatic-refill program to get pods shipped directly to their door. The former employees grimace at the prospect of hooking millions more teenagers on nicotine.

Dunlap, Juul's former marketing chief, says his nieces sometimes reverently introduce him to their friends as the guy who helped launch Juul, which makes him cringe. "I'll tell them nicotine is a chemically addictive substance, and it's illegal for teenagers for good reason," he says. "Unfortunately, sometimes the next response I get from those same teens is, 'Wait, there's nicotine in this?'" Ⓑ —*With Shelly Banjo*

JUUL HQ: JASON HENRY/THE NEW YORK TIMES/REDUX


Experience the
PERFECT MIX
of business and leisure
FLY BETTER
After sending your last work email at 40,000 feet, unwind in the relaxing atmosphere of our onboard lounge. Network with fellow passengers as you enjoy gourmet canapés with handpicked wines, signature cocktails, and more. Find out more at emirates.com/us
EMIRATES FIRST AND BUSINESS
Emirates®

Players on a frozen lake in St. Moritz

SNOW SPECIAL 2019

Winter's Wild Ride

The annual Snow Polo brings the global jet set to St. Moritz for a weekend of sport and swagger

By Benedikt Kammel

Photographs by Andrea Frazzetta

October 14, 2019

Edited by Chris Rovzar

Businessweek.com

The hills are alive with the sound of private jets. The aircraft glisten in the sun as they thread their flight path into the Engadin valley toward St. Moritz, flanked by snow-coated slopes. Photographers hoping to score a celebrity shot mill around on the edge of the runway, where a vintage Rolls-Royce and a racing-green Porsche Macan await their masters. Passengers in cashmere shawls and cascading furs are swiftly reunited with their Gucci weekend bags, then whisked down the hill for one of the glitziest gatherings on Switzerland's social calendar: the Snow Polo World Cup St. Moritz.

On the last weekend in January, the ski resort becomes the icy diadem of the elite polo circuit. The three-day tournament features four teams of globe-trotting players in white jeans and knee-high leather boots atop artfully groomed horses, chasing a cantaloupe-size red plastic ball across a frozen, snow-covered lake as they swing willowy mallets. Equally impressive is the display on the VIP grandstand: Spectators, who've paid 680 Swiss francs ($684) each for a day pass, are stacked eight rows deep, holding glasses of Champagne and puffing on cigars. Not to be outdone, their canine companions also arrive in style: Pugs are pimped out in lacquer-shiny Moncler puffers, papillons peep from Hermès handbags, and dachshunds don cashmere cozies.

The tournament is the brainchild of Reto Gaudenzi, who hatched the outlandish idea in 1983 and has watched the event become so big that it requires military-style planning coupled with renowned Swiss technical know-how. An army of workers spends three weeks setting up the infrastructure on the lake. The horses wear protective braces and special hoof studs for extra grip. The outlay to pull off the extravaganza is about 2.5 million francs for the organizers, and the tournament rakes in more than 12 million francs in additional revenue for the Engadin. "It's a unique blend of nature, sport, the mountains, parties—you just can't find this cocktail anywhere else," Gaudenzi says. "And the moment the bell tolls for the last match, we start working on next year's event. It's a huge undertaking."

This is the only polo competition anywhere in the world played on ice, which in January is about 60 centimeters (24 inches) thick. That's strong enough to carry almost 3,000 tons of tents, stands, and fences, plus thousands of spectators, who follow the four teams and their bursts of 7½-minute matches, called chukkas. The 100 horses involved are brought in from Spain, France, and the U.K. several days before the matches; they're cared for in state-of-the-art stables on the banks of the lake.

The field for the tournament is smaller than the grass equivalent, giving spectators more immediate access to the action. Each player has four horses to substitute between chukkas, and the play is fast and furious: The red ball flies, sticks whir, and riders shout. The occasional player dismounts or is forced out of the game only because of an injury, almost always minor. (Major ones, like a hit from a mallet, are uncommon—and the horses rarely slip.) After each goal, *The Final Countdown* blares from the speakers. The crowd roars, the commentator unloads a verbal salvo, and the teams realign their steaming horses for the next attack.

Gaudenzi is quick to point out that the matches don't cater only to the well-heeled. Rather, everyone's welcome, and like the denizens of first, business, and economy class on a plane, they all mingle on the ice in between the chukkas. Access to the lake and a big section of the grandstands is free of charge, and whether you wait in line for bratwurst or a blob of caviar spooned directly onto your clenched fist is a matter of personal preference. "We want to bring the game into a much wider audience," says Malcolm Borwick, a professional polo player from England whose grandmother was on the first U.K. women's polo team in the 1920s. "We're trying to get to the beer and Coca-Cola audience, to show them that it's the sum of all sports: It's adrenaline, teammates, horses, physicality—the most technical sport you'll ever play."


One of many fur-draped spectators

For the weekend, a glass of Perrier-Jouët served in a lime-green flute (the color is more Instagrammable, owner Pernod Ricard SA says) costs 18 francs; a bottle of its Belle Epoque 2011 vintage runs a cool 360 francs. Soda and water are a manageable fiver.

Bratwursts notwithstanding, polo has always attracted a crowd with more financial firepower than, say, soccer or baseball. Britain's Prince Charles and his offspring are keen patrons. Brands from La Martina to Hackett to Polo Ralph Lauren have built their pedigree on it; and major sponsors such as Deutsche Bank, Cartier, Maserati, and NetJets eagerly line up each year to host lavish dinners for loyal or prospective customers in St. Moritz.

Maserati, which organizes driving-skill experiences and test runs on the snow, closes about a

A hundred horses are brought in from Spain, France, and the U.K. for the event

dozen deals during the event, estimates Piergiorgio Cecco, general manager for Central Europe and Germany. Calling the tournament the perfect blend of "opulence and discretion," he says it complements the brand. For NetJets Inc., the event is a welcome extension of the business ferrying clients to the World Economic Forum, which takes place in nearby Davos earlier in the week. About 20 flights come into St. Moritz for the polo, the company says, a tenth of its annual traffic to the airport. "It's an important event for us, and it helps bring in a younger crowd," says Mario Pacifico, chief executive officer of NetJets in Europe.

For last January's event, NetJets flew in celebrity chef Jason Atherton from London to cook for about 50 guests at Badrutt's Palace Hotel. He served lobster tea alongside oscietra caviar, langoustines buried under Périgord truffle shavings, and poached pear wrapped in gold leaf. Downstairs at King's Social House, he fed VIPs at a Cartier event spiced confit duck leg and flaming baked Alaska. Up at the Kulm Hotel, Pernod Ricard hosted an "olfactory studio dinner," where drinks were paired with fragrances.

"The timing to be here was perfect for me," says Mike Khalesi, a spectator in January. The CEO of luxury real estate broker Beverly Hills One had spent a week mingling at the World Economic Forum before hopping over to St. Moritz for the polo. "It's a unique opportunity if you're professionally moving around in a luxury network. And as somebody from California, the snow added a nice touch."

As the chukkas got under way on Friday, Gaudenzi observed the proceedings in a box above the stands. From here, polo commentator Jan-Erik Franck whipped up the crowd with a blend of sharp analysis of the action, delivered in the rapid-fire narration of a livestock auctioneer, and trashy jokes. ("They say there are no canaries on the Canary Islands. The same can be said of the Virgin Islands. There are no canaries.")

"It's not just a weekend of sports, it's more about lifestyle and glamour," said Roberta Ruiu, who followed the polo from the grandstand in a full-length coat with silver-feathered fur trim and white flared pants while toting a cream Ferragamo handbag to match. "Whether you're a fan or not, you just have to be here, because it's Snow Polo St. Moritz."

Badrutt's Palace, perched above the shores of the lake, had its own team in the competition. For the tournament, the hotel became the beating heart of St. Moritz. General Manager Richard Leuenberger said the first thing he does in the morning is check his phone for arrivals at the Samedan private airfield, where guests are picked up by a fleet of Rolls-Royce limousines. The hotel is half Hogwarts castle, half cathedral, and by early afternoon, an eclectic mix of fur-dripping polo enthusiasts, generations of returning families, and locals have transformed the black-and-white-tiled main atrium into a procession of prosperity that ranges from discreet to ostentatious.

Badrutt's hosted the annual black-tie gala on Saturday ahead of the grand finale. Once the bow ties were loosened, guests filed into King's Social House, a basement restaurant-cum-disco that is Switzerland's oldest nightclub. Revelers ordered bottles of Dom Perignon at north of $400, and women with hair as elaborate as their jewelry held court at the horseshoe tables.

Later, the party moved up the hillside to the St. Moritz bobsleigh clubhouse, a members-only wood-paneled watering hole that transformed after nightfall into the Dracula's Ghost Rider's Club. Generations have gyrated under its disco ball shaped like a garlic glove.

Come Sunday, bleary-eyed spectators snaked their way down to the lake for the finals. After two days of blinding sunshine, snow had set in, powdering the fur coats, horses, and grandstands. Badrutt's team pulled off a major upset, beating the favorite, Maserati, and bringing home the trophy in the hands of Melissa Ganzi, the first woman to captain a winning team there in the 35 years of the tournament. The crowd applauded one last time and drank up whatever was left of the Champagne before filing back up the hill to their limousines and private jets.

"What's unique in St. Moritz is that you are so close to the field that you can practically smell the action," said Adrian Laplacette Jr., a player from Argentina who rode for the team from Azerbaijan. On the first day of the match, Laplacette came a little too close to the action when a mallet struck his left ear, and he required multiple stitches. But he was back on the horse the next day. "The intensity is on another level. The horses actually adapt to the game faster than the players."

Laplacette's appetite has even been whetted for more grand-scale versions of the sport. "Still on my bucket list: elephant polo," he said. Ⓑ

No More Michelin Man

Puffer coats scale back to a more tailored size

By Alexis Parente

For 60 years, the puffer has remained true to the coat that George Finch, an Australian chemist and mountaineer, designed for Edmund Hillary's ascent of Mount Everest in 1953. Sometimes called quilted jackets, they're filled with down insulation between rows of stitching that give them the look—and, crucially, the warmth—of sleeping bags with arms.

But today the winter staple can be just as fashionable as a tailored suit. This season, Moncler collaborated with the Queen of England's favorite designer, Richard Quinn, on a lively collection with leopard and daisy prints. Perfect Moment, a ski brand born in Chamonix, France, adds a chic houndstooth pattern to its colorful, retro-inspired lineup.

Even labels not usually affiliated with ski season are jumping on board. Tory Burch has introduced reversible options covered with paisley, while Saint Laurent has one for men that looks more like a varsity jacket.

Casey Cadwallader, creative director of Mugler and head of design for skiwear upstart Aztech Mountain, says these slimmer coats are "easier to layer with and to pack." The Aztech Mountain client is a "discerning skier who wants the best garment performance on the slopes," he says, "and appreciates that a refined design can also work in the city." Ⓑ

This army-green men's puffer from **Saint Laurent** has a cupro and cotton lining and hides a hood inside its high collar. The ribbed wrists and waistband give it a slim, varsity-jacket feel. *$2,590*

Mammut's IN Anorak combines a shiny surface in gold or silver with a 90-10 ratio of down to feathers. Its sleeve cuffs have a rubber band on the inside to stay snug. *$800*

The Mary, a women's jacket from the **O Moncler Richard Quinn** line, pays tribute to exuberant femininity. The combination of prints—leopard outside and floral inside—embodies the playfulness Quinn is known for. *$2,165*

The 20-year-old Canadian outerwear brand **Mackage** this year debuted its women's Elita-NF (no fur) jacket in red. It comes with a generous hood and a belt that cinches at the waist. *$950*

The Elk Mountain puffer from **Aztech Mountain**, co-owned by skiing legend Bode Miller, is made with 420 grams of goose down and stays warm to −10F. A three-way adjustable hood and extendable storm visor further protect against wintry elements. *$750*

For almost 25 years, the **Perfect Moment** has been creating clothing for the most extreme skiers with a focus on performance and design. This houndstooth jacket will be available on Oct. 21. *$490*

COURTESY BRANDS

Icy Hot

Buzzy new hotels are heating up some of the world's most fashionable ski resorts. *By James Gaddy*

THE DOLOMITES, ITALY The rooms at **Adler Lodge Ritten** were modeled after rural Alpine dwellings, but these come with private saunas and balconies that overlook the majestic Rosengarten and the Latemar mountains. Nestled a short cable-car ride from the medieval town of Bolzano near the Austrian border, the resort's main building has a wood-lined bar, restaurant, and spa. Two other structures have 10 junior suites each; separate one- and two-story chalets are also available. *From €240 ($264) per person per night*

NISEKO, JAPAN High-end hotels are making their presence felt in this booming powder paradise, consistently ranked the best ski destination in Asia. When the 100-room **Park Hyatt Niseko** opens in early 2020, it'll have ski-in, ski-out facilities, oversize guest rooms with views of Mount Yotei, and a central location in Hanazono, the most recently developed part of the Niseko United area. There's also a 5,600-square-foot ski valet in the lobby and five drinking and dining venues. *From 115,000 yen ($1,075) per night*

PARK CITY, UTAH Auberge Resorts Collection, the brand behind favorites such as Hotel Jerome in Aspen, Colo., and Napa Valley's Auberge du Soleil, has opened the **Lodge at Blue Sky**, a 46-room oasis on a 3,500-acre former ranch. Its Earth Suites, built into the hillside with grass roofs, have outdoor fireplaces that overlook Alexander Canyon. A heli-skiing program offers exclusive access to three private ski zones in the Uinta and Wasatch mountains consisting of more than 200,000 acres of bowls and chutes. *From $700 per night*

ASPEN, COLO. The Little Nell, still the only ski-in, ski-out property in town, celebrates its 30th anniversary with a top-to-bottom renovation of its rooms as well as its beloved restaurant, Element 47. A more hoppin' option is the **W Aspen**, which opened in August with 88 rooms and 11 residences. On the top floor is the Wet Deck, the only year-round, all-weather public rooftop in town. It has panoramic views of Aspen Mountain along with a heated pool, a hot tub, fire pits, cabanas, and a dance floor busy well after après ski. *From $279 per night*

COURTESY HOTELS

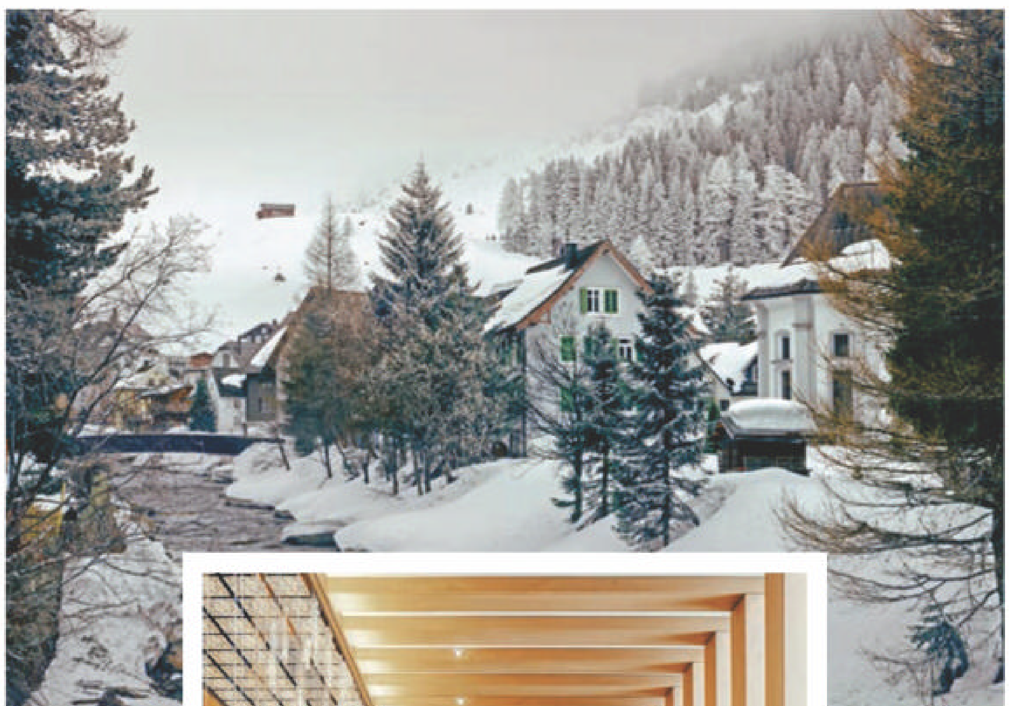
The New Zermatt

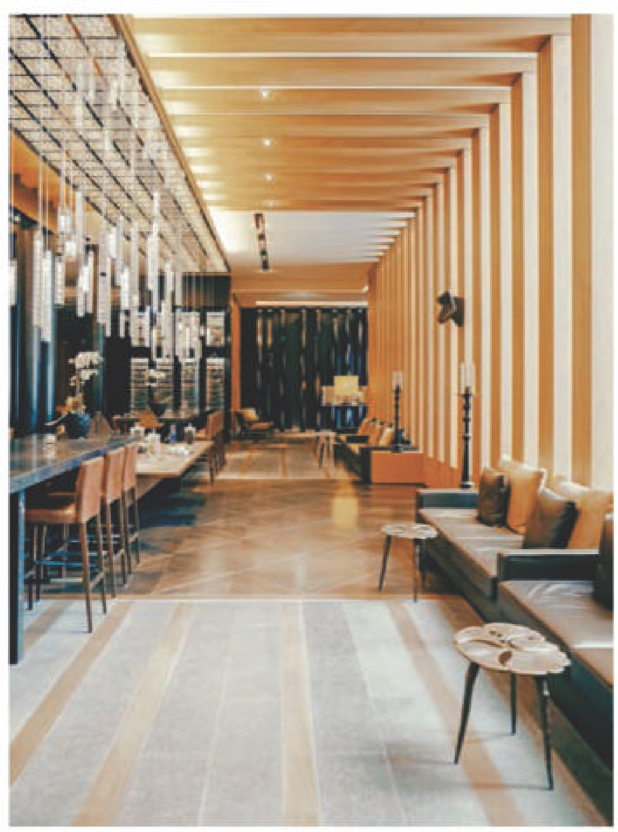
Backed by Egyptian billionaire Samih Sawiris, Switzerland's Andermatt is a new skiers' paradise that's been around for years. *By James Jung*
Photographs by Catherine Hyland

The view from the top of the ski lift on the Gemsstock

The first time Egyptian real estate mogul Samih Sawiris took a helicopter ride over the sleepy Swiss ski village of Andermatt, 14 years ago, he was struck by its remote wildness. The resort was only a 90-minute drive from Zurich, yet it felt like a secret hidden in the mountains of Uri, arguably the rugged country's least discovered canton.

What the silver-haired chairman of Orascom Development Holding AG must have also seen was a blank slate. The appeal of European ski resorts, unlike that of their purpose-built American counterparts, is their sense of history. Think skiing into farming villages steeped in tradition, where the slopes and hotels and restaurants have been attracting winter tourists for—in some cases—well over a century.





The town, nestled in the Urseren valley along branches of the Reuss River (top); the sprawling Chedi Hotel

Andermatt offered exactly the opposite. This was a resort that, after two boom-and-bust cycles, felt virtually empty, a veritable ghost town notched high up in a secluded pocket of the Alps. History hadn't been kind to the valley. First the Gotthard Tunnel rerouted the railway tourists who'd once stopped here during the belle epoque. Then the Swiss military, who'd made Andermatt a big base of operations, pulled out in the 1990s, leaving the resort a husk of its former self. All that remained was a picturesque main street flanked by timber chalets and old hotels and a few antiquated lifts ferrying skiers to the tops of the towering mountains that encircle the town. No-frills free riders came for the plentiful powder and off-*piste* faces lining the Gemsstock, the highest lift-serviced peak in the area, but they didn't do much for the local economy when it came to spending money in town.

To Sawiris—whose holdings include El Gouna, an Egyptian resort town along the Red Sea with some 20,000 residents—the underdeveloped resort's lack of infrastructure marked its appeal.

"Mr. Sawiris doesn't only create tourism destinations, he creates towns," says Stefan Kern, a spokesman for Andermatt Swiss Alps AG, the company Sawiris founded to transform Andermatt from a down-on-its-luck Alpine hamlet into a destination resort capable of rivaling Zermatt, St. Moritz, and Verbier.

In 2007, Sawiris proposed an audacious three-pronged resuscitation plan, one that would see more than $1 billion go toward an opulent luxury hotel and 18-hole Scottish-style golf course, a revamped and expanded ski area, and an ambitious development of holiday apartments and private chalets. To succeed at that third component—the one most critical to his bottom line—Sawiris had to find a way around a Swiss law that restricted foreigners from purchasing second homes. He did just that, getting the government to grant Andermatt an exemption as a special economic development zone. Once the town voted in favor of his plan, almost unanimously, Sawiris was off and running.

Spread out across nine peaked-roof chalets, the five-star 169-room Chedi opened its doors in 2013 and now forms the heart of the new Andermatt. The hotel has become a destination in and of itself for moneyed travelers—some skiers, some not—who want to unplug amid blissed-out luxury in the seclusion of the Swiss Alps. During a visit in early April, as the snow still dumped outside, an international array of guests milled about the sleek black-stone and timber lobby, ate farm-fresh breakfasts in the 250-person dining room beside an open kitchen, and floated downstairs to spa appointments. There's a 6,000-bottle wine cellar, plus a Michelin-starred Japanese restaurant (a 10-course *kaiseki* menu is recommended) and, for those who can afford further seclusion, the two-floor Furka suite, which comes replete with a private spa and rents for $15,000 a night.

Still, despite its sheer size and over-the-top amenities, the Chedi doesn't dominate Andermatt. Nor does Sawiris's residential development on the north side of town, Andermatt Reuss, which is home to the recently opened four-star Radisson Blu hotel, a 650-seat classical music concert hall, and apartment buildings surrounding a central piazza. (Eighty percent of finished apartments have already been sold.) Instead, as you drive up the circuitous bends and through a crack in the mountains and into town, you're greeted by the broad valley's open snowfields, a few remaining military barracks, perhaps a red train trundling along on your right-hand side, and serrated peaks in every direction.

"Some people driving into the village don't even realize ▶

the Chedi is there," says Mari Russi, co-owner of Art 87 Andermatt, a contemporary gallery located just off the cobblestones of Gotthardstrasse. The hotel's entrance "is very discreet. There's no big sign–you really have to look for it."

Russi hails from Sweden, but it was her Swiss husband, Bernhard Russi–Andermatt Swiss Alps board member and winner of the 1972 Olympic downhill–who introduced her to his hometown more than 30 years ago. A lot has changed since then, but like most locals she takes an all-ships-rise attitude toward Sawiris's development. Now her clients are the type of people who won't bat an eye at the $50,000 price tags of her gallery's most expensive pieces.

"Everyone is happy the Chedi is here," says Louie Gougouth, assistant manager at the Hotel Sonne, a 150-year-old family-owned institution that remains perhaps the most picturesque building in town. Originally from Morocco, Gougouth came to Switzerland to study at a hotel school, then wound up in Andermatt because of a job offer at a now-defunct hotel. He stayed because of the clean air, the unspoiled mountains, and the people who say "*Uela*!" to you–the local greeting–on the street every morning.

Outside one of the town's cozy, half-timbered dining spots (top); the PfarrKirche St. Peter und Paul

In April the atmospheric wood-paneled dining room at the 20-room Sonne was still busy, as it had been all season, with a mix of German and British families huddled around piping hot pots of fondue. "In the beginning it was just military," Gougouth says, reflecting on his first years in Andermatt. "We were just seeing green, green, green, because of the uniforms. But now we see people from around the world. Even celebrities. Singers from the USA, golf players. This year we saw 50% growth over last year," he says.

Making good on his plan to expand the ski area, Sawiris pumped $140 million into on-mountain infrastructure in only three years. Last season a gleaming eight-person gondola replaced a couple of old chairs; it now whisks skiers to the top of the Gütsch peak, from which they can ski a network of gentle and intermediate slopes before taking another new 10-person gondola into the neighboring resort of Sedrun, in the canton of Graubünden.

The most seasoned of skiers still lap off-piste runs from the Gemsstock's cable car, but the multigenerational clans who now come to Andermatt make their migration east each morning toward Sedrun, skiing far above the tree line in the high alpine, partaking in that grand, stress-free European ski experience of lazily schussing from village to village.

All told, the interconnected ski area will boast 112 miles of slopes and 33 lifts. That's two lifts more than Vail, Colo. A further lift connection will open during the 2019-20 winter season, allowing guests to ski all the way to the rolling, family-friendly slopes of Disentis.

Sawiris's "if you build it, they will come" attitude appears to be working. Last season, Andermatt almost doubled its single-day skier record, attracting 12,000 guests. (Given the size of the expanded resort, that means the slopes were still relatively uncrowded.) But this growth isn't necessarily what all locals want.

"The core atmosphere of the town is gone, it's dead, it doesn't exist anymore," says Kevin Obschlager, who along with his wife owns the River House, a red-shingled boutique hotel and whiskey bar that opened more than a decade ago and catered to the hardcore skiers who flocked to Andermatt for its soulful atmosphere. Obschlager likens Andermatt's genesis–or perhaps downfall–to that of Telluride, which went from funky hippie hideaway to posh enclave, attracting Tom Cruise, Ralph Lauren, Oprah Winfrey, and other celebrities: "Now it's luxury, luxury, luxury. Before, this place would be packed with smiling faces after powder days. People would come every weekend." He shrugs. "Now people come once, and then they're gone–they go to the Caribbean the next weekend."

During the visit in April at least, Andermatt still felt undiscovered and refreshingly unpretentious. Snow fell at night, a ghostly mist hung among the narrow cobbled lanes cutting through town, and the few remaining military cadets filed into bars or shared cigarettes under the milky glow of streetlights. The slopes were equally uncrowded, and from the summit of the Gemsstock, with 3 feet of fresh snow blanketing the 5,000 feet of vertical leading to the valley, and the rugged mountains of Uri standing like sentinels keeping the rest of the world at bay, one thing was certain: The time to book your trip is most certainly now. Ⓑ

Weather Or Not

Giro Contact goggles come with lenses for any conditions

Photograph by Hannah Whitaker

No matter how much advanced technology brands pack into their masks, ski goggles tend to get foggy and limit peripheral vision. Giro's $250 Contact goggles, with interchangeable lenses, tend not to do either. The Scotts Valley, Calif.-based brand started in cycling helmets but has gained a following for its patented Vivid lenses, developed with camera outfitter Zeiss, and a semiframeless design that offers an expansive panoramic view.

THE COMPETITION

• The $220 Cyrius goggles from Julbo also boast an expanded field of vision, thanks to a frameless construction.

• Oakley's popular Prizm line of ski masks (from $150) has lenses that tailor tints to specific environments and conditions.

• A pair of $130 Opsin Clarity goggles from POC have three lenses—for sunny, partly sunny, and cloudy conditions—and fit best on medium- or smaller-size faces.

THE CASE

Giro's lens-swapping system, which the brand calls Snapshot, is an effortless exercise. Press the shutter button down, and the lens pops out quickly; magnets help guide you to click the new one into place. Meanwhile, the Zeiss lenses manipulate blue light to enhance contrast and definition, and air vents around the edge minimize the chance of fogging. *$250; giro.com*

Another Industrial Giant May Break Up

By Brooke Sutherland

What do garbage disposals have in common with factory automation tools? Not much, but Emerson Electric Co. will gladly sell you both, at least for now.

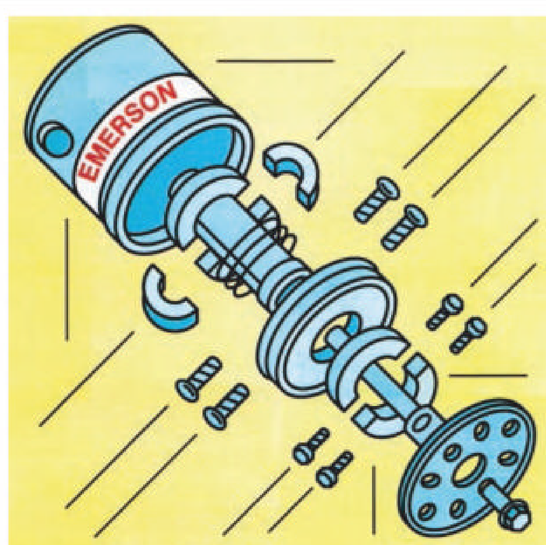


ILLUSTRATION BY GEORGE WYLESOL

Chief Executive Officer David Farr announced at the beginning of October that the company would conduct a comprehensive review of its businesses as it adapts to "a challenging geopolitical and economic landscape." It was perhaps no coincidence that this announcement came close on the heels of reports that activist investor D.E. Shaw & Co. has built a stake in Emerson and will push for a breakup. The company's structure—it has an automation unit that sells valves and measurement systems and a commercial and residential division that sells air conditioner controls, garbage disposals, and heavy-duty vacuums—feels obsolete in an age when industrial conglomerates are systematically dismantling themselves in the name of greater focus.

$73

● SUM OF ITS PARTS
Emerson's stock should be worth 14% more than the $64 it traded for before the breakup talk, if its main units are valued comparably to peers.

● MIDDLING RETURNS
That potential payoff, an average of three analyst estimates, isn't that attractive stacked against the cost and time entailed in executing a split.

After 19 years at the helm, Farr is one of the longest-tenured industrial CEOs. According to analysts, he's signaled his intention to retire in fiscal 2021 or 2022 and would prefer to leave any decision on a breakup to his successor. But the manufacturing economy has softened, dragging down Emerson's growth and imperiling its earnings targets. The company warned in August that customers had pushed $350 million of projects planned for 2019 to next year and delayed $450 million of 2020 projects until 2021. With that backdrop and an activist investor knocking, Farr may no longer be in a position to prolong a decision on a split, even if the eventual payoff for investors doesn't look that compelling on paper.

People familiar with the matter told Bloomberg News that D.E. Shaw believes each piece of Emerson could find a buyer, which could boost the ultimate returns. With speculation of consolidation in the heating and air conditioning market rampant of late, there's likely to be ample interest in Emerson's assets in the industry. The myriad other businesses that get lumped into the commercial division could find a home with private equity. Meanwhile, should the automation business become unencumbered and potentially in need of a CEO in the near term, it could pique the interest of Rockwell Automation Inc. head Blake Moret. Rockwell rebuffed an Emerson takeover approach in 2017.

Emerson has seen some significant overhauls in its 129-year history. For better or worse, it seems headed toward another. Ⓑ —*Sutherland is a deals columnist for Bloomberg Opinion*

Bloomberg Businessweek (USPS 080 900) October 14, 2019 (ISSN 0007-7135) H Issue no. 4633 Published weekly, except one week in February, April, June, July, September, and two weeks in December by Bloomberg L.P. Periodicals postage paid at New York, N.Y., and at additional mailing offices. Executive, Editorial, Circulation, and Advertising Offices: Bloomberg Businessweek, 731 Lexington Avenue, New York, NY 10022. POSTMASTER: Send address changes to Bloomberg Businessweek, P.O. Box 37528, Boone, IA 50037-0528. Canada Post Publication Mail Agreement Number 41989020. Return undeliverable Canadian addresses to DHL Global Mail, 355 Admiral Blvd., Unit 4, Mississauga, ON L5T 2N1. Email: bwkcustserv@cdsfulfillment.com. QST#1008327064. Registered for GST as Bloomberg L.P. GST #12829 9898 RT0001. Single Copy Sales: Call 800 298-9867 or email: busweek@nrmsinc.com. Educational Permissions: Copyright Clearance Center at info@copyright.com. Printed in the U.S.A. CPPAP NUMBER 0414N68830