Bloomberg Businessweek

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The Big Hack

How China used a tiny chip to infiltrate America's top companies

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At a Crossroads

Reforming the WTO is imperative, but consensus will be necessary

By Xu Feibiao

The author is an associate researcher with China Institutes of Contemporary International Relations.

To be, or not to be: That is the question facing the World Trade Organization (WTO) as it observes its 70th anniversary this year. Founded in 1948 as the General Agreement on Tariffs and Trade, the WTO, together with the World Bank, the International Monetary Fund and other international organizations built on the ruins of World War II, was once an important pillar of the international economic order dominated by the United States. However, the WTO is currently facing unprecedented challenges that, ironically, are largely posed by the U.S. itself.

Heated debate

A product of globalization and a model for international governance, the WTO has 164 members, which comprise 95 percent of the world's trade volume. It was the first international organization to employ a dispute settlement mechanism, and it has successfully resolved hundreds of international trade disagreements. Over the decades, the WTO has also contributed greatly in the defense of the international free-trade system.

Yet criticism of the WTO has never quite gone away, and has become fiercer than ever in the 21st century, as seen in the breakdown of the Doha Development Round of trade negotiations that began in 2001 and the subsequent failure of revival attempts ever since. The lengthy bureaucratic process of dispute settlement and the principle of consensus have led to the inefficiency of the organization.

Moreover, the rapid development of the new global economy and the flourishing of new business models in the information age have left the WTO behind, its current rules outdated and ill-suited to the realms of e-commerce, data flow, environmental protection, competition policy, investment facilitation and other contemporary international economic and trade issues. This obsolescence, coupled with the growing trend of regional and trans-regional free-trade agreements, especially among developed countries, has relegated the WTO to the margins.

In recent years, the organization has faced more severe and direct challenges, following the election of U.S. President Donald Trump, Britain's exit from the EU and the surge of protectionism and anti-globalization worldwide.

The Trump administration's trade measures have unleashed a string of damaging blows to the WTO. Proclaiming the policy of America First, Trump flouted WTO rules by unilaterally imposing tariffs on America's trade partners under the pretext of national economic security. More recently, the U.S. initiated a trade war with China and the EU, unprecedented in scale, by slapping tariffs on thousands of commodities worth tens of billions of dollars, while the WTO could only stand by and watch.

The U.S. has even threatened to withdraw from the organization, and has doggedly disrupted the judge nomination process for the WTO Appellate Body. In May, Ricardo Ramirez-Hernandez, a former Appellate Body judge, said that the organization is being gradually strangled "through asphyxiation" by the U.S.

Different arguments

The WTO has reached a crossroads, and its members now face the choice of whether to restore or abandon it. It is impossible for the WTO to return to the past, and its future now depends on the decisions of the countries involved.

This predicament has been brought about by two major factors. Firstly, the international economic structure has been undergoing a major transformation. Globalization, following its rapid uptake, has slowed as the negative side effects of unfettered integration become more apparent. Secondly, the willingness of traditional hegemonic powers to share global responsibility has declined, and these nations now want to reshape the international economic and trade order to cope with competition from emerging powers.

The U.S. has long been vocal about its dissatisfaction with the WTO. During Barack Obama's tenure as president, the White House sent repeated signals about WTO reform, and blocked the nomination of new judges to the WTO Appellate Body. The U.S. also excluded China from regional trade negotiations on the Trans-Pacific Partnership and the Transatlantic Trade and Investment Partnership, in an attempt to rewrite international economic and trade rules in its favor.

Trump, who considers the WTO a disaster for his country, has taken this line of thinking several steps further. The president has rattled the saber of unilateralism and protectionism, and his administration has initiated bilateral and regional trade negotiations in an attempt to reshape the international order according to his America First policy.

Although the two presidents have employed different methods, their aims are consistent. By signing a new generation of bilateral and regional trade and economic treaties, the U.S. is attempting to bring China and certain other countries to heel, and to finally reshape the WTO based on its own interests.

In July 2017, the U.S. issued reform proposals to the WTO, which would require that the organization make new rules on trade and improve its dispute settlement mechanism. It specifically advocated discussion of whether to retain the policy on the special and differential treatment of developing countries.

European Council President Donald Tusk and French President Emmanuel Macron have also called for WTO reform to respond to the current chaos of international trade, and to prevent the

XINHUA

An exhibitor promotes beer from the Czech Republic at the 20th China International Fair for Investment and Trade in Xiamen, in southeast China's Fujian Province, on Sept. 8.

proliferation of trade wars in the future.

WTO Director General Roberto Azevedo agrees that a reformed WTO could better solve the current challenges of world trade. Thus, the organization is set to accelerate its restructuring by honing its rules and improving its governance and decision-making mechanisms, so as to more quickly respond to the new realities of the information age and to the development of emerging powers.

The way out

The expense of totally abandoning the WTO would be massive, not to mention impractical, and reform of the organization has widespread support worldwide. Macron has proposed that the EU, the U.S., China and Japan, along with other countries, make efforts to build consensus on a common reform plan before the G20 Summit in November.

But the question of how to reach agreement on a common reform plan remains. Both developing and developed countries naturally wish to pursue their own interests, and have divergent ideas on what form any reform should take.

Developed countries have already strengthened coordination to reach joint consensus and take the initiative in pursuit of change. Following the WTO ministerial-level conference in December 2017, the U.S., the EU and Japan issued a declaration announcing that they would strengthen cooperation to eliminate unfair trade practices caused by problems such as excess capacity. In May 2018, the three parties reaffirmed their agreement on regulating technology transfer and industrial subsidies, and revealed plans to take internal action before the end of 2018 with the aim of starting negotiations shortly thereafter, with all major trading partners to be included in these negotiations.

Japan and the EU signed a free-trade agreement on July 17, and the U.S. and the EU reached an agreement on July 25 to reform intellectual property rights policy and to crack down on forced technology transfers, industrial subsidies and overcapacity, among other things, leaving little doubt that China is the main target of the reform plan of these developed countries.

Communication between the North and the South has progressed. In July, Canada's new minister of international trade, Jim Carr, invited a dozen trade ministers to meet in late October to discuss how to fix the WTO. Australia, Brazil, Chile, the EU, Japan, Kenya, Mexico, New Zealand, Norway, Singapore, South Korea and Switzerland are on the guest list.

Negotiations between developing countries are also in full swing. During the BRICS Summit in July, the representatives of 22 countries acknowledged that the WTO now faces unprecedented challenges, and called for the world to defend the rule-based economic order and build a more open world economy.

China is a firm supporter of the WTO's core status in international trade and the global economy, and has strived to strengthen cooperation with other countries through ongoing negotiations and agreements, such as the China-EU Investment Agreement, the China-Japan-South Korea Free Trade Agreement and the Regional Comprehensive Economic Partnership.

There is still a divergence of opinions on matters such as industrial subsidies, developing-nation status and state-owned enterprises, among other issues. Reform of the WTO is bound to be complicated—but it ultimately needs to be successful. Without coordination and concerted effort, any attempt to change the WTO will likely die on the vine, and the world economy could regress to the law of the jungle which predominated before the organization's inception 70 years ago. ■

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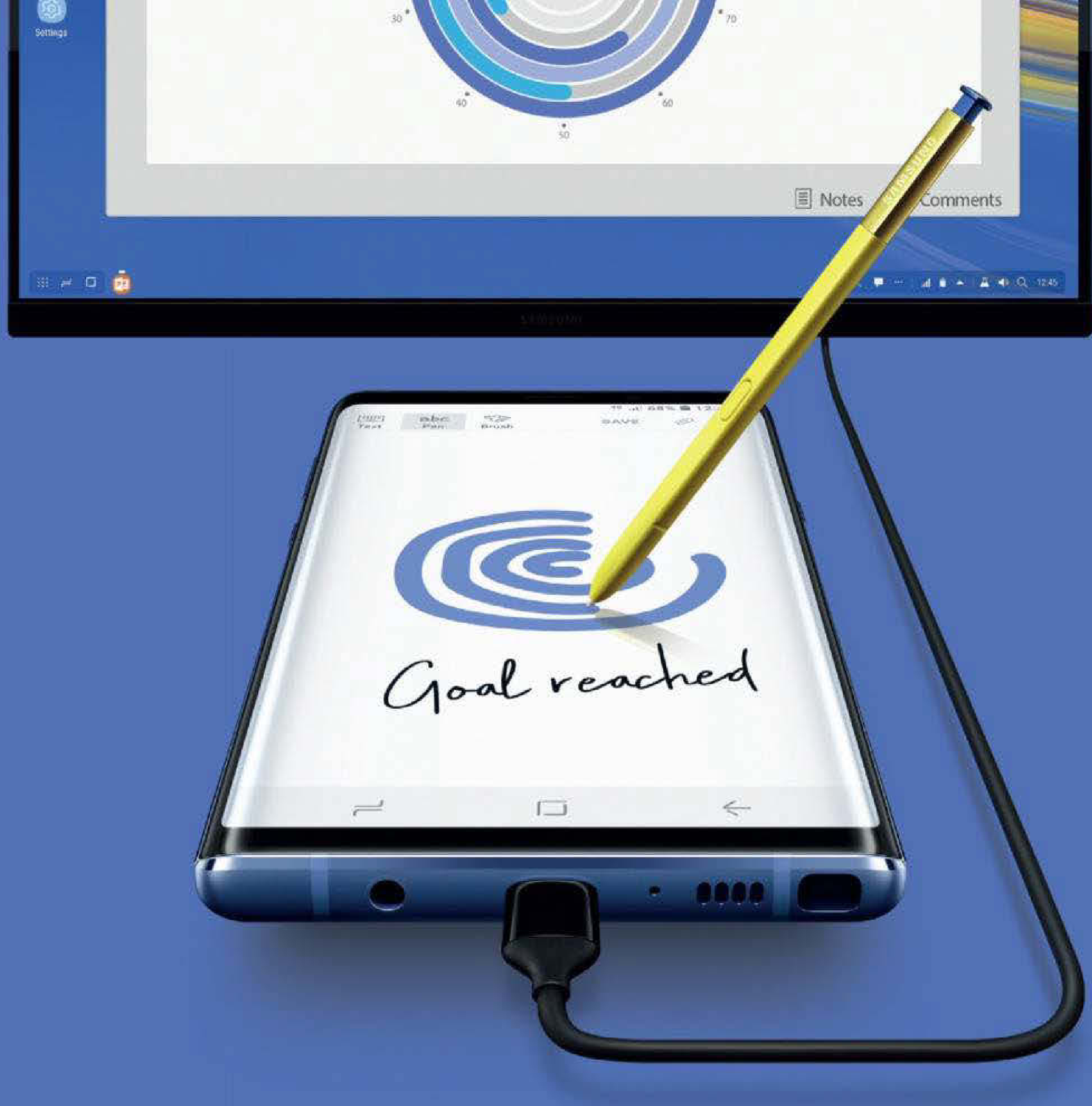
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◀ Citizen Strong's John Burton left a job in banking after Trump's 2016 election win

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▲ Microchips found on altered motherboards in some cases looked like signal conditioning couplers

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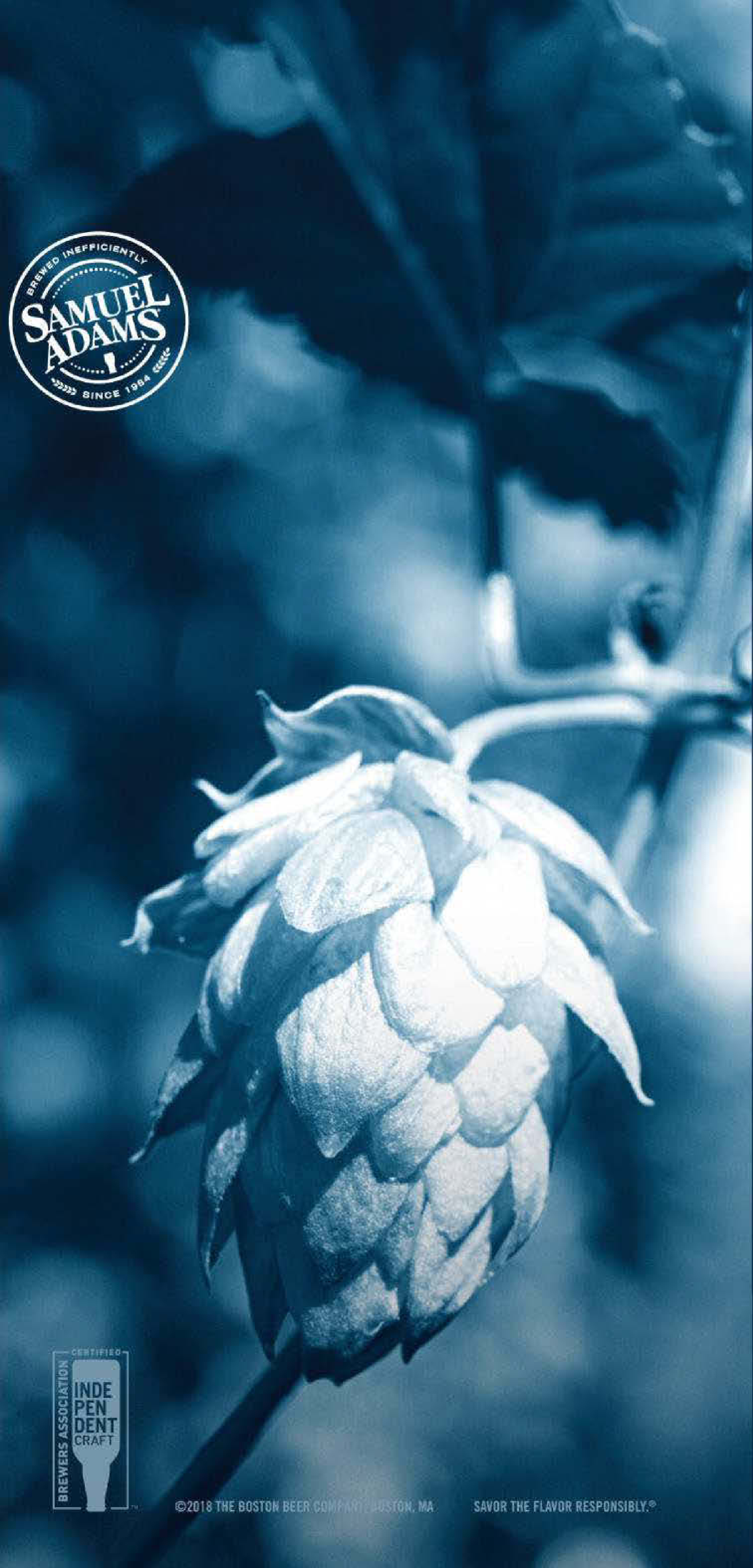

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IN BRIEF

By Kyle Stock

● Just after Tesla CEO Elon Musk settled a suit with the SEC, sales figures released on Oct. 2 showed the Model 3 is one of the best-selling sedans in the U.S. That doesn't mean all is well for the struggling automaker. A short list of its lingering challenges:

- A U.S. Department of Justice investigation into Musk's tweet about taking the company private
- Looming debt payments, including $230 million due in November and $920 million due in March
- The expiration of the $7,500 federal tax credit for EV buyers at the end of this year
- Headhunting for a chairman, two board members, and a few key executives
- Replacing assembly-line tents with actual factories
- Updating the Models S and X, which are six and three years old, respectively
- Growing EV competition from Audi, Jaguar, and Mercedes-Benz

● India seized control of Infrastructure Leasing & Financial Services, a shadow banker whose defaults on $12 billion of debt are sending ripples through the country's finance sector.

● "If you don't find the solution, it's because you didn't see the real problem."

Renault CEO Carlos Ghosn shared leadership lessons in an interview with Bloomberg TV's Francine Lacqua at the Paris Auto Show.

● Amazon.com raised its minimum wage in the U.S. to

$15

an hour, a nod to consumer pressure and the tightening labor market. It also said it's eliminating stock awards and monthly bonuses for some hourly employees but maintains that workers will still see an increase in overall pay.

● Following a *New York Times* investigation, tax authorities in New York state opened a probe of President Trump and his siblings' handling of their father's real estate empire. A Trump lawyer said in a statement that the allegations are false.

● A near-collision between naval vessels in the South China Sea raised tensions between the U.S. and China. A spokesman for the U.S. Navy called China's conduct "unsafe and unprofessional," while Beijing accused the U.S. of violating China's "indisputable sovereignty."

● Aid workers shifted from rescue to relief efforts following the massive earthquake and tsunami that hit Indonesia on Sept. 28, devastating the island of Sulawesi. At least 1,400 people died in the disaster, a total that's likely to rise.

● Luigi Lavazza snapped up Mars's coffee unit—which makes Flavia tabletop brewers and the Klix vending system—for about

$650m

The deal gives the Italian roaster a new U.S. customer base and plants in North America and the U.K.

● The U.S. government sued California for crafting its own net neutrality law after the Federal Communications Commission announced in December 2017 that it would ditch the policy. Federal attorneys argue that broadband is interstate commerce and thus must be regulated at the federal level.

● Danish carrier Primera Air declared bankruptcy on Oct. 1, leaving some passengers and crew stranded in North America.

● Prime Minister Theresa May called for pragmatism at a Tory conference, as her party continued to quarrel about Brexit.

● Honda said it would invest $2.8 billion in General Motors' self-driving-vehicle unit, valuing the business at $14.6 billion.

● Beyoncé lost a trademark infringement lawsuit against the Feyoncé line of apparel and home goods.

GHOSN: MARLENE AWAAD/BLOOMBERG. 1040: DANIEL ACKER/BLOOMBERG. SULAWESI: DITA ALANGKARA/AP PHOTO

▶ A Country Is a Country Is a Country

Republic of Macedonia Prime Minister Zoran Zaev has vowed to call a snap election if he doesn't win parliamentary support immediately to change the country's name to North Macedonia. Without the name change, Greece will continue to block the country's accession to NATO and the EU.

▶ The International Monetary Fund releases its annual global growth outlook on Oct. 9. Early signs show reason for pessimism.

▶ American pastor Andrew Brunson is due in Turkish court on terror charges on Oct. 12. The U.S. has sought to have him released before that date.

▶ Moody's is set to review its credit rating for South Africa on Oct. 12, but it may delay until Finance Minister Nhlanhla Nene presents his budget on Oct. 24.

▶ Stockholders of Sky Plc have until Oct. 11 to tender their shares to Comcast at the takeover price of £17.28 ($22.43) per share.

▶ A panel of top climate scientists convened by the United Nations will publish a report on Oct. 8 that's expected to recommend drastic cuts in coal use.

▶ Singapore Airlines will revive a 19-hour Newark-Singapore route on Oct. 11—retaking the world's longest flight by besting Qantas's 18-hour Auckland-Doha trip.

THE BLOOMBERG VIEW

A Threat to the Internet

● It would be a big mistake for the EU's highest court to establish a "right to be forgotten"

Early next year, the European Union's highest court is expected to rule on one of the internet's most controversial topics: the right to be forgotten. The judges should curb their ambition, lest they open a global can of worms.

The right, enshrined in privacy law, allows Europeans to demand that information about them be removed from online search results if it's outdated, irrelevant, or "excessive." The case in question involves a dispute between Google and French regulators, who in 2015 ordered the company to respect this right on all its sites—not just google.fr.

Google naturally objects. So does much of the tech industry, a wide swath of civil society, and the EU itself. Rightly so: Extending the right to be forgotten globally threatens free speech, burdens private companies, intrudes on sovereignty, and is fraught with risks.

Censoring lawful and factual information is dubious on principle and flawed as a way to protect privacy. It's also a substantial imposition: Since 2014, Google has had to adjudicate more than 727,000 delisting requests, spanning some 2.8 million web addresses. Each must be evaluated by humans.

Google has no obvious aptitude for making such judgment calls. And countries naturally have varying preferences about how to balance free speech and privacy. Just three places—France, Germany, and the U.K.—generate 51 percent of all delisting requests, for instance, while Greeks barely assert the right at all. In the U.S., enforcing the right could well be unconstitutional. Confronting such a complicated and nuanced challenge is a matter for legislatures, not private companies.

A related worry is that this idea could spread. Authoritarian governments would like to control information beyond their borders. Will Google respect similar demands from Turkey? Or enforce Thailand's lèse-majesté law? An apt phrase is "race to the bottom": Countries with the most severe restrictions would effectively determine policy worldwide. Although that would benefit no one, it's a fully logical outcome of this case.

Yet a ruling against Google won't do much for privacy. France's regulator asserts the right is meaningless if information still turns up on searches conducted through a VPN or by manually using overseas versions of Google. But fewer than 1 percent of searches in France evade Google's measures this way. This global decree would accomplish nearly nothing.

This case is useful in one regard: It's magnifying a worsening global tension. A growing number of jurisdictions are attempting to exploit tech companies to export their own laws and values. Europe's new privacy regime, for instance, applies to all companies worldwide that touch the data of European citizens. No good can come of this. The internet works so splendidly precisely because it's borderless; commandeering platforms to enforce national priorities will jeopardize that openness for everyone. Ⓑ

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ILLUSTRATION BY CHRISTINA DAURA

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To inspire a community of leaders from across the globe.
From business and government.
To solve the world's biggest challenges.

The Tyranny Of the U.S. Dollar

● The incumbent international currency has been American for decades. Is it time for regime change?

● By Peter Coy

There's a paradox at the heart of global finance. The U.S. share of the world economy has drifted lower for decades, and now President Trump is retreating from the American chief executive's traditional role as Leader of the Free World. Yet the U.S. dollar remains, as the saying goes, almighty. "American exceptionalism has never been this stark," Ruchir Sharma, head of emerging markets and chief global strategist for Morgan Stanley Investment Management, said at a Council on Foreign Relations symposium on Sept. 24.

By the latest tally of the European Central Bank, America's currency makes up two-thirds of international debt and a like share of global reserve holdings. Oil and gold are priced in dollars, not euros or yen. When Somali pirates hold up ships at sea, it's dollars they demand. And threats to be cut off from the dollar-based global payments system strike terror into the likes of Iran, North Korea, and Russia. It's no exaggeration to say that the dollar's primacy is at least as valuable to the U.S. as a couple of aircraft carrier strike groups.

Now the dollar paradox shows signs of unraveling. Political leaders who once accepted the dollar's hegemony, grudgingly or otherwise, are pushing back. Jean-Claude Juncker, the president of the European Commission, said in September that it's "absurd" that European companies buy European planes in the American currency instead of their own. In March, China challenged the dollar's dominance in the global energy markets with a yuan-denominated crude oil futures contract. Russia slashed its dollar holdings this year, claiming (inaccurately) that the greenback is "becoming a risky instrument in international settlements." And French Finance Minister Bruno Le Maire told reporters in August that he wants financing instruments that are "totally independent" of the U.S., saying, "I want Europe to be a sovereign continent, not a vassal."

This disturbance in the force isn't good news for the U.S. The dollar's preeminent role in global finance is an "exorbitant privilege," as Valéry Giscard d'Estaing, then France's finance minister, said in 1965. If the dollar loses its central role—to be sure, not an imminent threat—the U.S. will be more vulnerable when there's a loss of investor confidence. The Federal Reserve might even have to do what other nations do when global investors panic: jack up interest rates to painful levels to keep speculative money from flowing out. As it is now, when trouble breaks out, investors flood into U.S. markets seeking refuge, oddly enough even when the U.S. itself is the source of the problem, as it was in last decade's global financial crisis.

A slippage in the dollar could also be viewed as a symptom of U.S. isolationism. "In a hypothetical scenario where the U.S. withdraws from the world," damage to the dollar's standing could cause average U.S. interest rates to rise by 0.8 percentage point, according

PHOTO ILLUSTRATION BY 731; PHOTO: GETTY IMAGES

to a December paper by Barry Eichengreen of the University of California at Berkeley and two researchers from the European Central Bank.

While any serious erosion of the dollar's status would take years, the U.S. can't take its preeminence for granted, says Eichengreen: "Being the incumbent international currency is an advantage, but it's not the only thing that matters."

The most immediate risk to the dollar is that the U.S. will overplay its hand on financial sanctions, particularly those against Iran and countries that do business with Iran. In May the Trump administration withdrew from the 2015 deal that eased sanctions on Iran in exchange for that country's promise to stop certain nuclear activities. The U.S. will reimpose sanctions on Nov. 4 and is successfully pressuring companies outside the U.S. not to do business with Tehran (page 42). European companies and banks could be punished by the U.S. if they inadvertently transact with sanctioned Iranian groups such as the Islamic Revolutionary Guard Corps.

European leaders, in response to what they perceive as an infringement on their sovereignty, are openly working on a payments system that would enable their companies to do business with Iran without getting snagged by the U.S. Treasury Department and its powerful Office of Foreign Assets Control. One idea is to set up a government-funded organization, which would be less vulnerable to U.S. actions than a private company or bank, to arrange exchanges of Iranian oil for products from Europe and possibly Russia and China as well. French officials say the transactions might be structured as barter to avoid involving banks. "We cannot accept as Europeans that others, even our closest allies and friends, determine who we can do business with," Federica Mogherini, the European Union's foreign policy chief, said at the Bloomberg Global Business Forum on Sept. 26.

The Europeans' progress has been slow, so there won't be anything ready in time to alleviate the sanctions taking effect in November, says Carsten Brzeski, a former European Commission official who's now chief economist of ING-DiBa, the German branch of the Dutch banking company ING Group. Indeed, U.S. national security adviser John Bolton dismissed the European plan from the sidelines of the United Nations General Assembly meeting in late September, calling the European Union "strong on rhetoric and weak on follow-through." He needled, "So we will be watching the development of this structure that doesn't exist yet and has no target date to be created."

Still, Bolton may come to regret his dismissiveness. Even if Europe's workaround isn't ready for prime time, it needs to be viewed as part of the widespread dissatisfaction with the dollar's dominance. That dissatisfaction is only mounting. In 2016, Jacob Lew, then-President Obama's secretary ▶

◀ of the Treasury, warned in a speech at the Carnegie Endowment for International Peace that "overuse of sanctions could undermine our leadership position within the global economy and the effectiveness of our sanctions themselves." Broad support is best, he said. He added that the U.S. "must be prepared to offer sanctions relief if we want countries to change their behavior." Trump's reinstitution of sanctions against the wishes of the coalition partners, without clear evidence that Iran has meaningfully broken its commitments, appears to violate both of Lew's principles. (A spokeswoman said Lew wasn't available for comment.) Even Mark Dubowitz, chief executive officer of the Foundation for Defense of Democracies, which favors action against Iran, says that "there's always risk of overuse of a single instrument.... You need covert action, military, a regional strategy, political and information warfare."

The best thing the dollar has going for it is that its challengers are weak. The euro represents a monetary union, but there's no central taxing and spending authority. Italy's recent woes are only the latest challenge to the euro zone's durability. China is another pretender to the throne. But China's undemocratic leadership is wary of the openness to global trade and capital flows that having a widely used currency requires. In a December interview with *Quartz* news site, Eichengreen said, "Every true global currency in the history of the world has been the currency of a democracy or a political republic, as far back as the republican city-states of Venice, Florence, and Genoa in the 14th and 15th centuries."

On the other hand, the U.S. is hardly alluring these days. "When does the rest of the world turn to the U.S. and say, 'What have you done for me lately?'" Beth Ann Bovino, chief U.S. economist of S&P Global Ratings, asked on Sept. 30 at the annual meeting of the National Association for Business Economics in Boston.

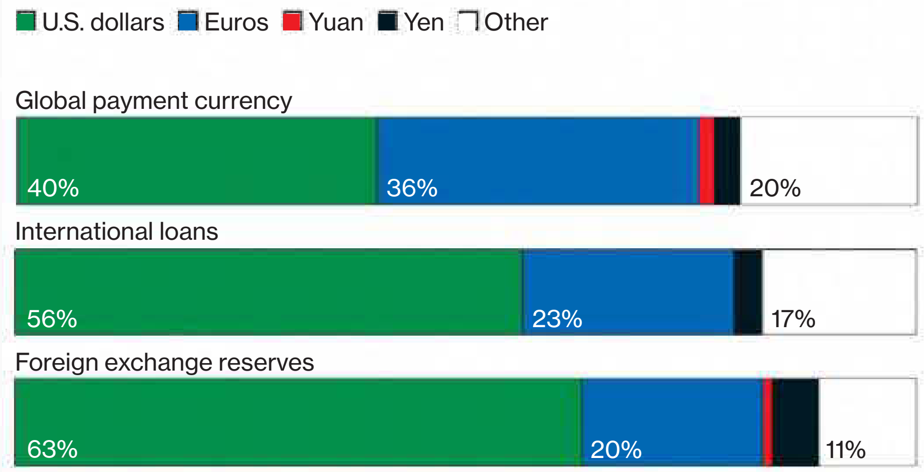
The biggest long-term challenge to the dollar's standing is what economists term the Triffin dilemma. Belgian-American economist Robert Triffin observed in 1959 that for the U.S. to supply dollars to the rest of the world, it must run trade deficits. Trading partners stash the dollars they earn from exports in their reserve accounts instead of spending them on American goods and services. Eventually, though, the chronic U.S. trade deficits undermine confidence in the dollar. This is what forced President Richard Nixon to abandon the dollar's convertibility to gold in 1971.

Harvard economist Carmen Reinhart cited the dollar's Triffin dilemma at the Boston business economists' meeting. "Now you say, well, that's not a problem, our debt is not backed by gold," she said. "But our debt, and anybody's debt, is ultimately backed by the goods and services that an economy produces." And, she noted, "our share of world [gross domestic product] is shrinking."

When Giscard d'Estaing coined the phrase "exorbitant privilege," he was referring to the fact that the U.S. gets what amounts to a permanent, interest-free loan from the rest of the world when dollars are held outside the U.S. As Eichengreen

How Much Is That in Dollars?

Each currency's share of the category in the international monetary system as of the 2017 fourth quarter or latest available



DATA: BANK FOR INTERNATIONAL SETTLEMENTS, INTERNATIONAL MONETARY FUND, SOCIETY FOR WORLDWIDE INTERBANK FINANCIAL TELECOMMUNICATION, AND EUROPEAN CENTRAL BANK CALCULATIONS

points out, it costs only a few cents for the U.S. Bureau of Engraving and Printing to produce a $100 bill, but other countries have to pony up $100 worth of actual goods and services to obtain one. Dollars that foreigners willingly accept and trade among themselves are like little green IOUs to the rest of the world. They allow Americans collectively to consume more than they produce—to live beyond their means.

The downside to America's privilege is that the foreign demand for dollars raises the exchange rate, making American products less competitive in world markets. Especially in slack times, American workers can be thrown out of work when the U.S. imports products that could have been made domestically. And the accumulation of dollars outside the U.S. represents a transfer of wealth to other countries. If other countries suddenly decide to use their dollars to buy American goods and services, the U.S. will suddenly have plenty of work to do—but consumers will have to switch from living beyond their means to living beneath their means.

On the whole, though, U.S. leadership benefits from having a currency that's in great demand. The issue is how to keep the dollar the favored currency of the world. Preserving diplomatic alliances is one way. Eichengreen's research finds that countries that rely on the U.S. nuclear umbrella (Japan, Germany) have a much bigger share of dollars in their foreign exchange reserves than countries that have their own nukes, such as France, apparently because they feel their dollar dependence tightens their military protector's ties to them. Another way is to make dollars freely available as needed to trading partners, as the Federal Reserve did via "swap lines" during the global financial crisis under Chairman Ben Bernanke. And yet another is to refrain from using the dollar's dominance as a cudgel against allies. As Lew said in 2016, "the more we condition use of the dollar and our financial system on adherence to U.S. foreign policy, the more the risk of migration to other currencies and other financial systems in the medium term grows." —*With Nick Wadhams, Gregory Viscusi, and Jeanna Smialek* Ⓑ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BUSINESS

● With a new chief and a lower-priced SUV, the once-dominant luxe brand reorganizes—again

For much of its 116-year history, Cadillac enjoyed an aura of luxury that made it the preferred car of celebrities from Clark Gable to Liberace to Elvis Presley and a real money spinner for parent General Motors Co. But in recent decades, as German and Japanese prestige brands have flourished, Cadillac's market share and reputation have faltered. That led GM this year—for at least the eighth time in two decades—to install a new brand chief vowing to revitalize the once-vaunted luxury name.

This time, GM says it's devoting $12 billion to develop a parade of new models. Perhaps most significant of those is the XT4, a smaller, cheaper sport-utility vehicle aimed at millennials that turns on its head everything Cadillac has historically stood for. To some GM watchers, the latest initiative is a now-or-never moment, perhaps the last window for venerable Cadillac to revive its marquee name before the very idea of auto brands starts to fade away in the ride-sharing era. That strikes Steve Carlisle, the new division president, as overly dramatic. But he's well aware that GM shareholders have seen this song-and-dance before. "We lost our mojo for a long period of time," Carlisle says. "This time it's different, and we will show you."

For GM, Cadillac's comeback effort represents more than just the resurrection of a famous brand. Globally, luxury cars make up about 10 percent of the 100 million cars bought every year but produce close to 50 percent of the profits. Cadillac's share of the U.S. premium-car market has dropped to less than 8 percent, from 10 percent in 2014. It remains a moneymaker for its parent, however, even though the brand's profits have fallen below those of many of its luxe competitors—something Carlisle intends to rectify. In China, despite weakening sales of GM's Chevrolet and Buick lines, Cadillac is making big gains: The brand sold more vehicles there—almost 180,000—than in the U.S. for the first time last year.

Cadillac's problems are both numerous and familiar. Premium buyers have flocked to SUVs, but the brand has only three, including the behemoth Escalade, which starts at $75,000. Most of its models are sedans, a style now out of favor with many consumers. Older people continue to be Cadillac's mainstay customers.

The brand's sleepy "Dare Greatly" advertising theme has hardly helped, according to Bob Lutz, ▶

Edited by James E. Ellis and David Rocks

PHOTO ILLUSTRATION BY 731; SOURCE: BLOOMBERG

◀ the retired GM vice chairman. In some video ads, viewers don't even see a Cadillac until halfway through the spot, he says. " 'Dare Greatly' has been a disaster from beginning to end," Lutz adds. "When you have product that is in many ways better than the competition, you tell people about it. You don't dare them to take a leap of faith on your cars."

Carlisle agrees the division needs to freshen its advertising. He and Deborah Wahl, Cadillac's new marketing boss, are working on ads that will emphasize features and new technologies. That's one reason Cadillac will soon move its headquarters back to Michigan after several years in New York: The marketers will be close to engineering.

A GM lifer, Carlisle most recently ran the company's Canadian business. He was named Cadillac division president in April, replacing Audi veteran Johan de Nysschen, who saw U.S. sales continue to falter during his four-year tenure before leaving amid differences over the direction of the brand.

The new XT4, geared to appeal to younger buyers, recently went on sale at around $35,000 but will cost almost $50,000 with options. (The least-expensive Caddy had been the ATS sedan, starting at $39,000.) Small Cadillacs have rarely gained traction in the marketplace. In the 1980s there was the widely panned Cimarron, a rebadged Chevrolet Cavalier that's now synonymous with the brand's decline. Another low: the midsize Catera from the late 1990s, which was little more than an Opel Omega family car. Even the ATS, a much better car which boasts good quality and a sporty ride, logs fewer than 1,000 sales a month in the U.S.

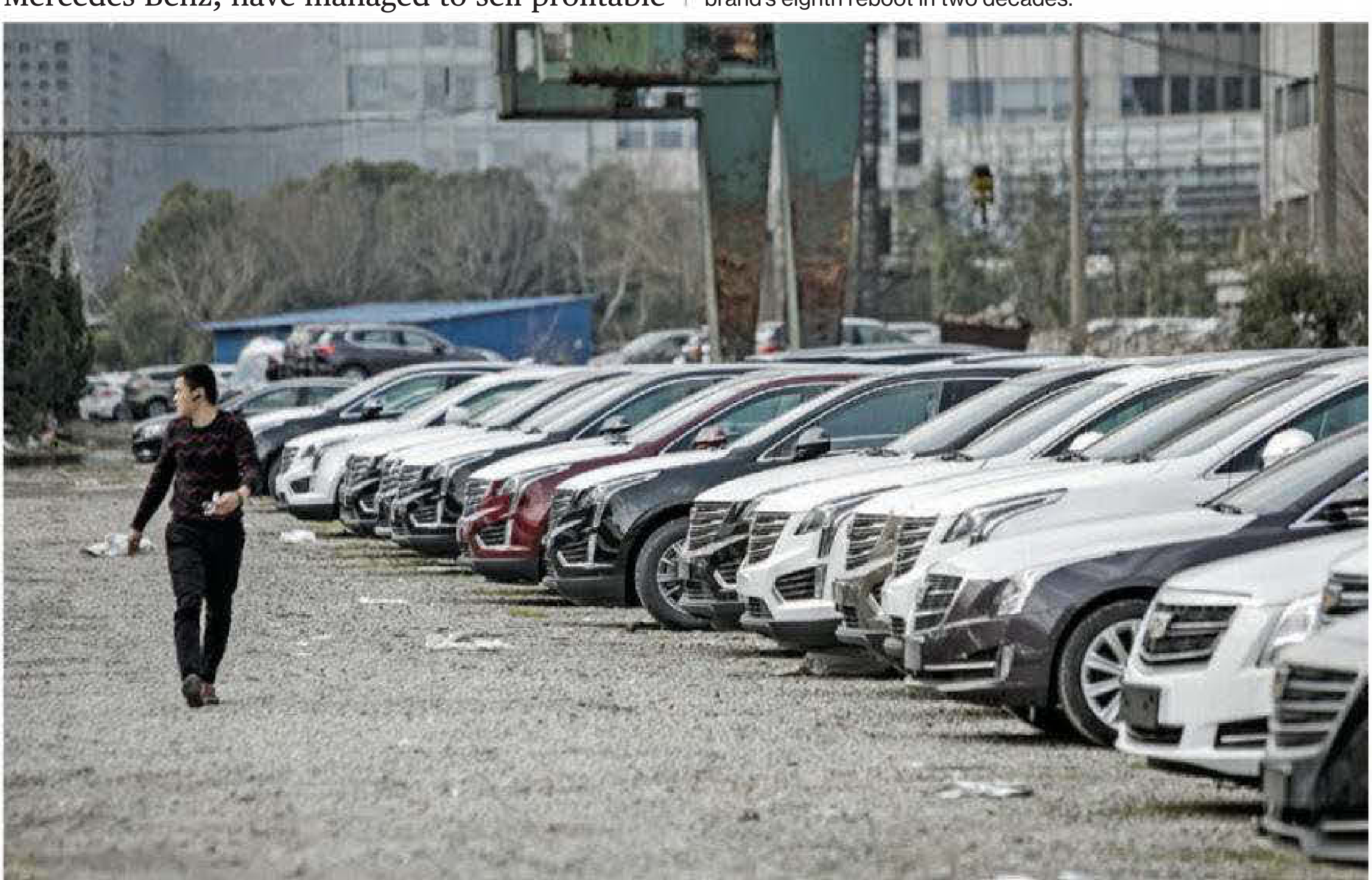
Other automakers, from Audi to BMW and Mercedes-Benz, have managed to sell profitable quantities of small SUVs. Mercedes-Benz has bejeweled its cabins, and Volvo has become a winner with artful, Scandinavian interior design, tweaks that make even a small SUV feel luxurious. With the XT4, Cadillac is paring down some of the touches premium buyers expect, says Eric Noble, president of consulting firm The CarLab. While the XT4 uses real wood in its interior, the wood trim is narrower than on many premium cars and its center control console isn't as blinged out as competitors', Noble says. "The first question that comes to mind is, where's the luxury?"

Phillip Kucera, the car's interior design manager, points to hand stitching on the dashboard leather and wood grain made from different timbers to give it a modern look. But he acknowledges that with a starting price of $35,000, Cadillac can spend only so much decorating the XT4.

Alexander Edwards, president of marketing consultant Strategic Vision Inc., says the XT4's technology and lower price have a good shot at attracting younger buyers to Cadillac. But all that may not matter, Lutz says. Restoring Cadillac's luxe reputation could take years, during which carmakers may be competing with ride-sharing companies offering autonomous transportation. If the interlopers succeed, he says, consumers would be more attracted to brands like Uber and Lyft than to a particular car manufacturer.

"I don't think there are enough decades left in the branded automobile business as we know it to achieve a comeback," Lutz says. —*David Welch*

THE BOTTOM LINE Starting at $35,000, Cadillac's new XT4 small SUV is intended to woo younger buyers. It's part of the vintage brand's eighth reboot in two decades.



◀ A Shanghai dealer lot stocked with Cadillacs

QILAI SHEN/BLOOMBERG

Poland's Airfield Of Dreams

● Flag carrier LOT wants to create Europe's busiest airport on the flatlands outside Warsaw

The village of Baranow, Poland, is a bucolic place, with little more than a general store, a school named after Pope John Paul II, and a church whose spire juts above groves of apple and pear trees. Rafal Milczarski wants to see it bulldozed and filled with screaming jetliners.

The chief executive officer of LOT Polish Airlines SA says his company and his country need a modern airline hub to serve Warsaw, 40 kilometers (25 miles) to the east. In place of modest farmhouses surrounded by flower beds, Milczarski envisions terminals, hangars, and runways—a 70 billion zloty ($19 billion) project after new rail links and highways are included—to handle 45 million passengers a year and rival Heathrow in London, Charles de Gaulle in Paris, and Schiphol in Amsterdam. "Central Europe needs a proper aviation hub," Milczarski says in his office at state-owned LOT's current home base, a cramped air facility named after composer Frederic Chopin that opened in 1934. "We are going to be part of planning it and building it."

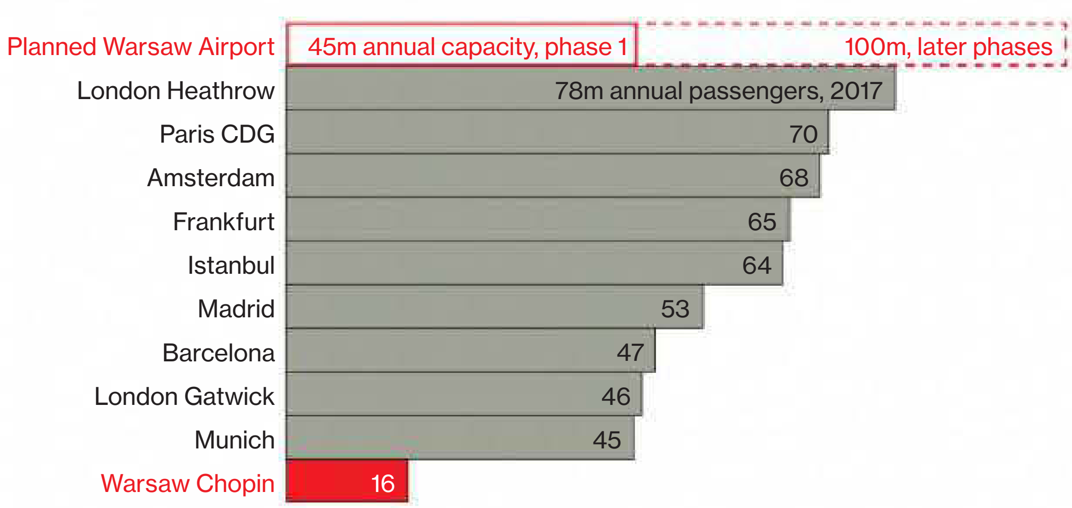
The new airport, which would be 15 minutes from Warsaw's central station by train, is key to LOT's ambitions to triple passenger traffic and boost long-haul service to Asia and the Americas. Construction is slated to begin in 2021, after the government acquires the land in Baranow and nearby towns, and flights will begin in 2027. Further phases would add more runways and terminals, increasing capacity to 100 million passengers a year—more than Heathrow, Europe's busiest airport.

Although Chopin was updated with a new train station and terminal in 2012, it will reach its annual capacity of 20 million passengers within four years. In 2017, 16 million people passed through the low-slung terminal's silver facade, more than double the traffic in 2005. With Poland's economy growing at an average of 3.3 percent annually in recent years, "the region is getting richer and richer," Milczarski says. "Our aspiration is to become the favorite network airline of central Europe."

The plan dovetails with the nationalist agenda of the ruling Law and Justice party. Poland is the sixth-most populous nation in the European Union, with the bloc's No. 8 economy, and the government says the airport can showcase the country as an emergent power. "It's the biggest undertaking in the modern history of Poland," says Deputy Infrastructure Minister Mikolaj Wild, who is overseeing the project. Given its location on Europe's eastern flank, the airport can be "the gateway from the EU to the east."

With a projected 9 million passengers this year, LOT is only Europe's 19th largest airline, but it has some distinct advantages. It's one of just a handful of independent flag carriers still operating in the region. Its home base is a country of 38 million that's seen millions emigrate over the past century, many with lasting ties to their homeland. LOT's fleet of 73 airplanes includes 11 Boeing Dreamliners it uses to serve Polish enclaves such as Chicago, New York,

How Warsaw Stacks Up Against Europe's Top Airports



DATA: COMPANY REPORTS

and Los Angeles, as well as routes to Asia. "Of all the Eastern European airlines, LOT has the greatest chance of succeeding," says John Grant, director of advisory firm JGAviation Consultants. "Family ties and bonds are still quite strong."

But LOT isn't even the biggest airline in its home market, with discounters Wizz Air Holdings Plc and Ryanair Holdings Plc both carrying more passengers to Poland. LOT's operating profit is on track to fall 22 percent this year, to 225 million zloty—mainly because of rising fuel and leasing costs—even as revenue is projected to rise 25 percent, to 6 billion zloty. And at about 2 million residents, its home city, Warsaw, is relatively small.

Skeptics say the money would be better spent on highways, rail lines, and updating Chopin and another airport 40km north of Warsaw that's ▶

◀ served by Ryanair. The first phase of the project will cost 35 billion zloty, or more than 10 percent of this year's national budget. Some part of that would come from the EU, but the government says it's also likely to take on debt.

Ryanair CEO Michael O'Leary calls the idea "stupid" and a "shiny cathedral in the middle of nowhere." And the residents of Baranow have voted against the plan. "I see more megalomaniacal self-aggrandizement than any realistic analysis in this project," says Marcin Swiecicki, a former Warsaw mayor and member of parliament from Civic Platform, the biggest opposition party.

The government insists the project is sound and is moving ahead. Officials say expanding Chopin makes little sense, because it's inside Warsaw's city limits, with hundreds of thousands of people living nearby. And for Milczarski and government leaders, building a new facility is the best way to ensure LOT's—and Poland's—role in the global economy. "We are Polish, and we are proud of that," Milczarski says. "But we define the scope of our activity more broadly." *—James M. Gomez and Maciej Martewicz*

THE BOTTOM LINE The Polish government is planning a $19 billion airport near Warsaw to showcase the country's growing economic clout, but skeptics say the project is unnecessary and too expensive.

Raising the Stakes In TV's Talent Wars

● Netflix's high-priced poaching is forcing Hollywood's television studios to fight back

Peter Roth knew it was time to take out his checkbook. Roth, the head of Warner Bros. Entertainment Inc.'s TV studio, had just watched Netflix Inc. lure top producers from several rivals by offering them more money than they'd ever made before. Ryan Murphy, the creator of *American Horror Story*, left 21st Century Fox Inc. for a deal worth at least $240 million. Shonda Rhimes, the showrunner of *Grey's Anatomy*, left Walt Disney Co. for at least $150 million. Roth was determined not to let Greg Berlanti, one of his own star producers, do the same.

The prolific Berlanti has 15 shows on the air, the most of any TV producer in history, including several adaptations of DC Comics franchises such as *Supergirl* and *Arrow* that appeal to tweens and young women. He's particularly valuable to Warner Bros., which owns DC as well as half of the CW Television Network, where many of its shows air. Of the 12 series that will run in prime time on the CW this fall, Berlanti is an executive producer of seven.

So with two years before Berlanti's contract was set to expire, Roth offered the 46-year-old a contract worth at least $400 million to stay at Warner Bros. through 2024. Berlanti and Roth both declined to comment on the deal, believed to be one of the most lucrative for a TV producer in the history of Hollywood, according to interviews with more than a dozen executives, agents, and producers. It's also a sign of how traditional studios, tired of losing their best people to Netflix, are fighting back. Warner Bros. bought out Berlanti's rights to future profits on all his current shows, what's known as the back end, a structure that allowed it to offer him more money up front than he would have otherwise received.

Roth has set a template others have followed. Lions Gate Entertainment Corp. is nearing an exclusive movie and TV deal with comedy producers Seth Rogen and Evan Goldberg—outmaneuvering Netflix and Amazon.com Inc.—using a similar approach. And Disney, once it concludes its acquisition of Fox, will turn its attention to securing soon-to-be free agents such as *Family Guy* producer Seth MacFarlane and *Modern Family* creator Steven Levitan.

"There is a lot of crazy stuff happening in the market today, and there is an aggressive dividing line between what is now considered old media companies and new media companies," says Joe Cohen, a talent representative at Creative Artists Agency who negotiated Murphy's deal with Netflix.

Netflix's Hollywood raid started with Rhimes, the creator of *Scandal* and *Grey's Anatomy*. The company offered her the biggest deal of her career to leave ABC and produce programs exclusively for the streaming service. Rhimes jumped at the chance to free herself from the limitations of broadcast TV—where overt politics, nudity, and swear words are all prohibited.

● Rhimes

FROM LEFT: ILLUSTRATION BY LIA KANTOWICZ; JON KOPALOFF/WIREIMAGE; COURTESY STARBUCKS; COURTESY GE

The deal upended the economics of the industry. Producers used to own a piece of their shows outright, potentially reaping hundreds of millions of dollars by selling the rights to reruns. Tom Werner, for instance, made enough money from *The Cosby Show* and *Roseanne* to buy the Boston Red Sox and Liverpool Football Club. There's no back end on Netflix, which releases shows all over the world at the same time, and runs the programs indefinitely. "You get more up front with less risk, but potentially less upside in success," says Chris Silbermann, Rhimes's agent at ICM Partners.

Still, deals such as Murphy's and Rhimes's are outliers, says Silbermann. There are only a handful of producers who can–or even want to–produce multiple shows at the same time. Rhimes has already announced eight different projects she's undertaking for Netflix, while Murphy has a half dozen shows in production. For creators who just want to do one at a time, Netflix may not be the best home, since it doesn't provide as much hand-holding for individual projects. While Netflix provides money and artistic freedom, networks such as Home Box Office Inc. claim to provide more support every step of the way–from notes on early scripts to fine-tuning for a pilot episode. That's a big reason why *Breaking Bad* creator Vince Gilligan stuck with Sony Pictures when his contract came up for renegotiation earlier this year, according to people familiar with his decision.

Rogen and Goldberg, producers of the movies *Neighbors* and *Sausage Party*, were wooed by Amazon and Netflix but wanted a studio that would give their movies a big push in theaters. Previously with Sony, they're now talking to Lions Gate and executives there who initially helped them get their business off the ground.

Many producers fear their programs can get lost amid all the clutter on Netflix and wonder if their shows might get a bigger boost from the weekly rollout of traditional TV. Actor and writer Jason Segel, who starred for nine seasons in the CBS hit comedy *How I Met Your Mother*, specifically wanted his new show, *Dispatches from Elsewhere*, to air on conventional TV so it could benefit from the added attention paid to new episodes each week.

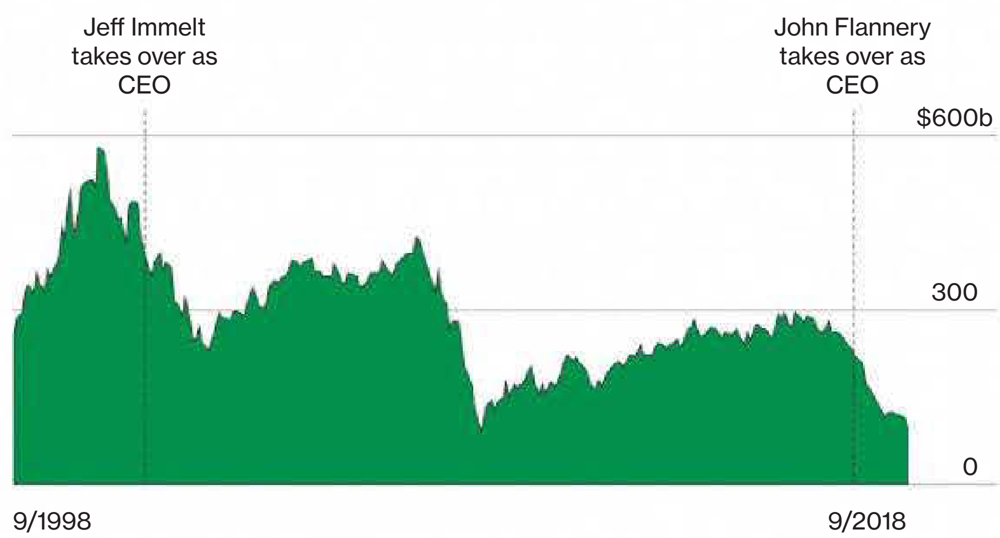
Some producers see HBO as the epitome of quality, where programs are treated more as art than commerce. *Buffy the Vampire Slayer* creator Joss Whedon recently signed with HBO over Netflix for his new TV series. "The increased volume at other places has worked in our favor," says Casey Bloys, the head of programming at HBO. —*Lucas Shaw*

THE BOTTOM LINE To keep talent from defecting to fast-growing streaming services, studios such as Sony, Warner Bros., and Lions Gate are making lucrative competing offers.

The Fallen | GE

General Electric Co. was once among America's most-respected corporations. Now it's earning a far different reputation. The ailing company, which on Oct. 1 dumped Chief Executive Officer John Flannery after only a year on the job, has lost about half a trillion dollars in market value since its 2000 peak.

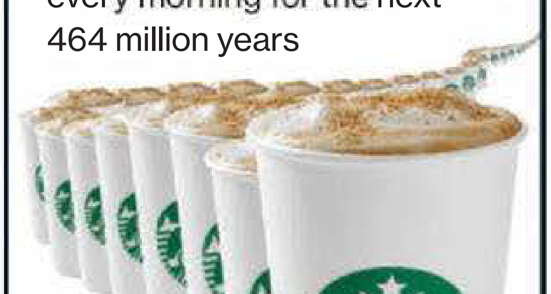
GE's market capitalization, monthly



Monster Math

Just how big is $500 billion?

- A top-of-the-line iPhone X for every person in the U.S.
- The GDP of Belgium
- A Tesla Model 3—and three years of garage parking—for every person in New York City
- Facebook's recent market capitalization
- A Starbucks caffe latte every morning for the next 464 million years

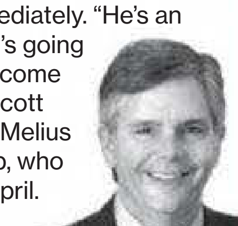


Power equipment, such as turbines for utility plants, was one of three industries (along with aviation and renewable energy) managers had targeted to revive GE. Former Chairman Jeff Immelt paid $10 billion for more power assets in 2015. But the business has been falling fast, and GE now says it will write down the value of its power assets by

$23b

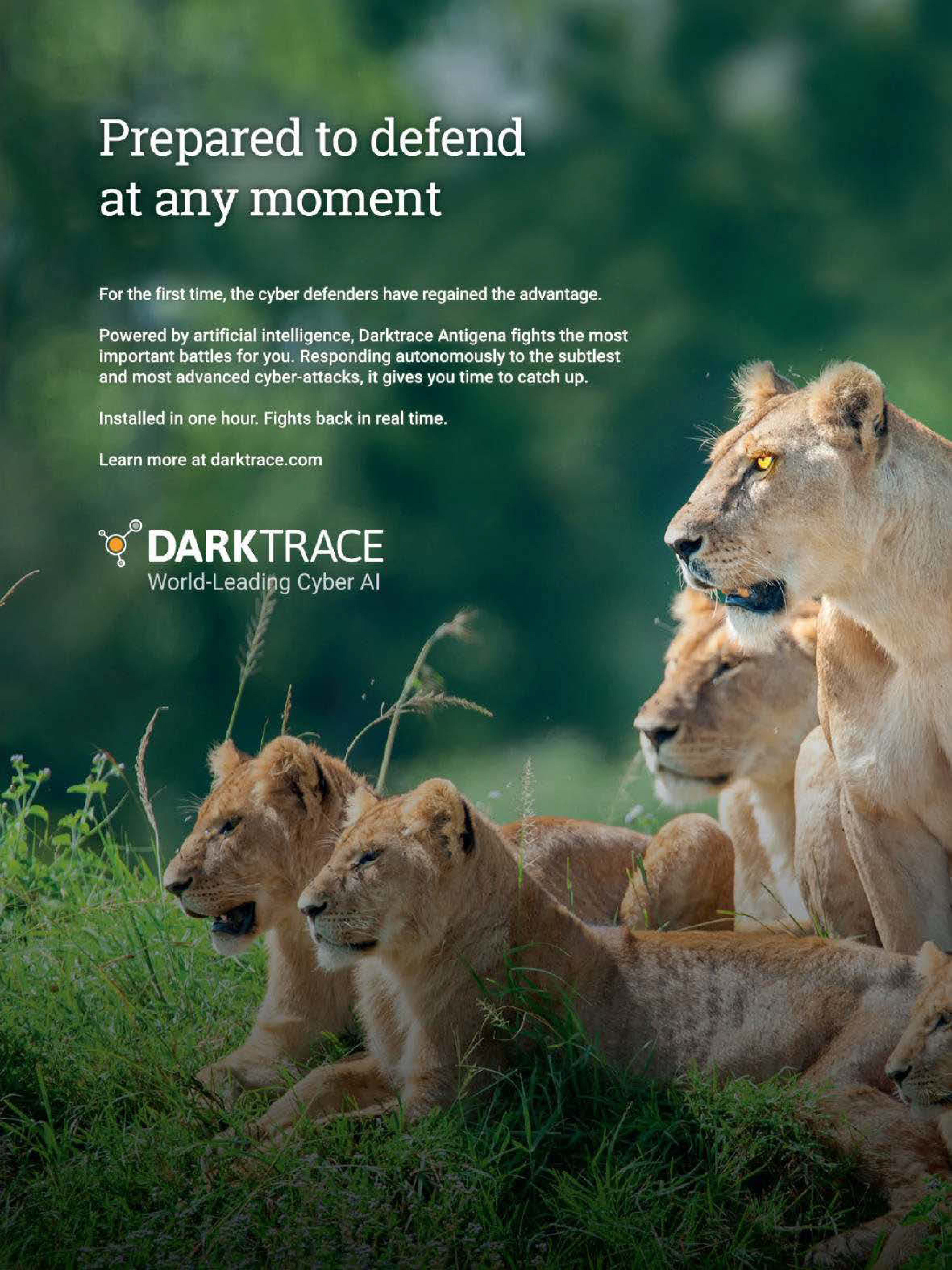
The New Guy

Larry Culp, who won Wall Street's praise for transforming manufacturer Danaher Corp., takes over immediately. "He's an outsider, and maybe it's going to take an outsider to come in and fix this thing," Scott Davis, an analyst with Melius Research, said of Culp, who joined GE's board in April.



Next Steps

Amid the carnage, GE is ditching some of its oldest units, including Thomas Edison's lightbulb operations. Flannery cut the dividend, a step Culp may have to consider, too. One thing seems certain: He'll keep pruning—but faster than Flannery did. —*Richard Clough*


Prepared to defend at any moment
For the first time, the cyber defenders have regained the advantage.
Powered by artificial intelligence, Darktrace Antigena fights the most important battles for you. Responding autonomously to the subtlest and most advanced cyber-attacks, it gives you time to catch up.
Installed in one hour. Fights back in real time.
Learn more at darktrace.com
DARKTRACE
World-Leading Cyber AI

Facebook Could Use Some New Stories

● A hack shows the company is exceptionally vulnerable to missteps as it tries to shift its focus and financial strategy

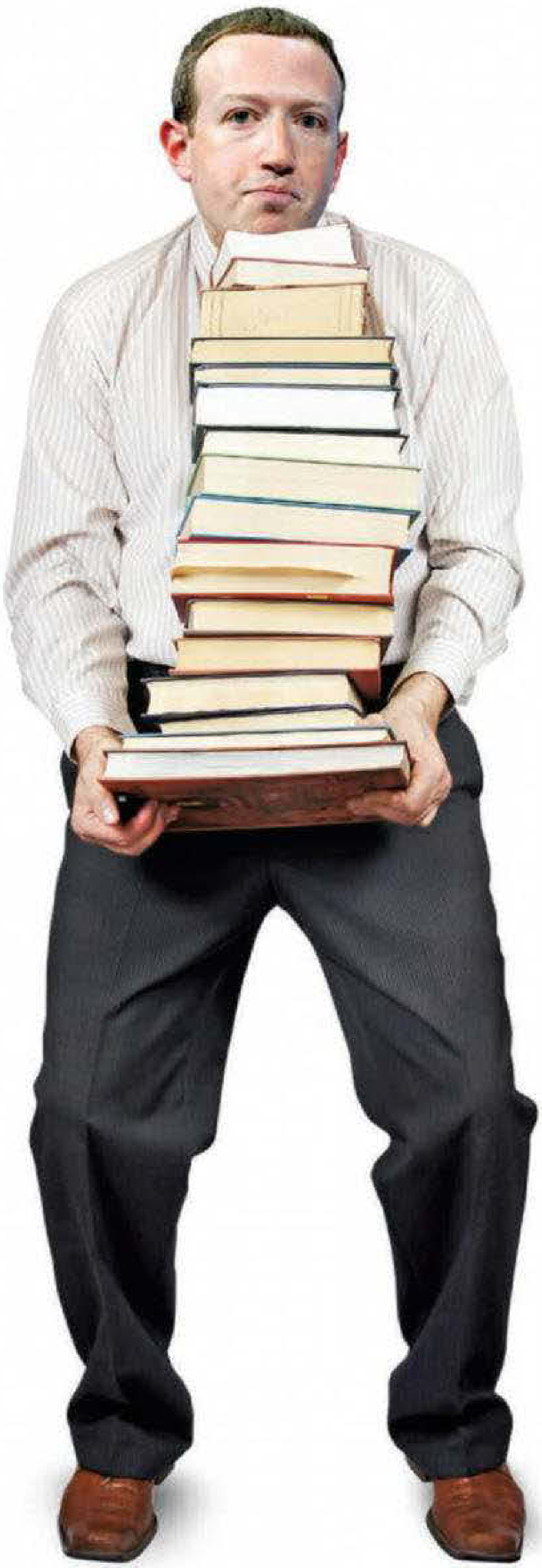


PHOTO ILLUSTRATION BY 731; SOURCE: GETTY IMAGES (2)

As in any relationship, once a company loses the trust of its customers, there's a long, lingering period of suspicion that it's bound to repeat its egregious behavior. That greedy banks will take on too much risk. That Chipotle will make customers sick. And that Facebook will demonstrate it's too creepy and irresponsible to be an unquestioned staple of daily life. Once trust is gone, it's incredibly hard to win back, and every misstep is magnified.

Facebook Inc. experienced a bit of this extra-harsh spotlight on Sept. 28 after it reported a security flaw that potentially let attackers hijack users' accounts. It wasn't a minor problem: The company said the flaw affected almost 50 million accounts, and it logged off 90 million users as a safety measure. It didn't say whether accounts had been hijacked as a result of the flaw. The Irish Data Protection Commission is investigating the breach and could fine Facebook as much as $1.6 billion if it concludes the company violated the European Union's General Data Protection Regulation.

Although Facebook has a habit of underestimating the number of people affected by its scandals, for now it seems the company acted quickly and responsibly once it discovered the technical vulnerability. The news of the hack reminded people of previous Facebook scandals involving Cambridge Analytica, Russian propaganda, and Myanmar violence. It also cost the company 3 percent of its market value. That was more money than Tesla Inc. lost on the same day, when the government sued the carmaker's chief executive officer for securities fraud. To people understandably wary of Facebook after two years of scandal, the combination of the words "Facebook" and "compromised data" are enough to bring up all the bad feelings about the company.

Facebook doesn't need any more distractions, because it's in the middle of a major shift in focus and financial strategy. Its big bet is on "stories," the short photo-and-video diaries that Snapchat pioneered and Instagram copied two years ago.

Stories are now everywhere at all four of Facebook's major properties. Instagram and Facebook put people's stories at the very top of the sites' apps so users can't help but click on them. On Sept. 26 the company opened its ▶

Edited by Jeff Muskus

◀ doors wide for advertising in Facebook stories. Messenger and WhatsApp have stories, too. Facebook is trying hard to persuade businesses to tailor their marketing pitches for stories and spread them across its flagship site and on Instagram.

But what if the company is wrong to make stories a top priority? What if people tire of the format? Or what if they work for Instagram but not for other properties? Mark Zuckerberg is making a big wager on stories, and if he's wrong, it won't be good. Story-formatted ads generate less revenue for the company than its more established news feed marketing slots, and executives in part blamed the gap for an expected slowdown in revenue growth.

Facebook has successfully predicted trends before—most notably when Zuckerberg upended the company's strategy with his bet that smartphones would be the dominant form of internet activity. He could be right about stories, too, which are fresh and more authentic than regular social media posts.

But the company has bet wrong before, too. A few years ago, Zuckerberg proclaimed that Facebook's future was video, and it pushed live video zealously. It wasn't the only company betting on the format, either. While hardly a flop, live video hasn't taken over the world, and Facebook stopped avidly urging people to record and broadcast their lives in real time online.

There are echoes of Facebook's live video playbook when it talks about stories. That should give company watchers a nervous twinge.

At a Sept. 26 press conference, Facebook executives touted rapid adoption of stories by people using Facebook, Instagram, and its other apps and the compelling early results companies were seeing from ads in story form. It was a strong pitch. Facebook said 300 million users see or make a story on Facebook or Messenger every day.

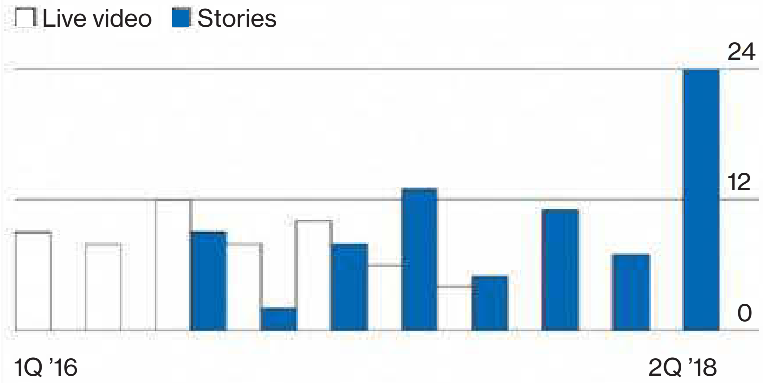
Of course, in Facebook's world, 300 million people aren't that many. An average of 1.5 billion use the original site or Messenger each day, and given how avidly the company is trying to steer people to stories, it's underwhelming that 20 percent of those daily users see or make one. Facebook said in July that 400 million people had some interaction with Instagram stories, a more impressive 40 percent or so of the service's daily users.

But popularity can, like the stories themselves, be ephemeral. There have been reports that Snap Inc. has experienced stagnation with its story format. And Facebook had similar positive messages about live video a couple of years ago. It stressed the format with advertisers and told them people were far more likely to watch a commercial message live than prerecorded. It trumpeted the booming use of live video by Facebook users. In early 2017 the company said 1 in 5 videos on Facebook was live. That's about the same share of Facebook or Messenger users now watching or making stories.

Just because the playbooks are similar doesn't mean stories will fall off Facebook's priorities list the way live video has. But the data security blowback from panicked investors is a useful warning: The company, which took years to start building a real business model, then more years to catch up on mobile devices, doesn't have the forgiving runway it used to. —*Shira Ovide, Bloomberg Opinion*

A Pivot From Video

Mentions by Facebook executives on quarterly earnings calls*



*NUMBER OF TIMES FACEBOOK CEO MARK ZUCKERBERG, COO SHERYL SANDBERG, OR CFO DAVID WEHNER SAID "LIVE," AS IT RELATED TO LIVE VIDEO, OR "STORIES" OR "STORY," AS IT RELATED TO THAT FORMAT, ON QUARTERLY EARNINGS CALLS; DATA: BLOOMBERG OPINION ANALYSIS OF EARNINGS CALL TRANSCRIPTS

● Facebook says the security flaw it disclosed on Sept. 28 affected almost

50m

user accounts

THE BOTTOM LINE Facebook's response to a recent hack seems to have been good by its standards, but the security flaw is a distraction in the company's efforts to work stories into its strategy.

Immigrants Welcome

● While Trump killed a visa program for startup founders, a dozen countries have widened their doors

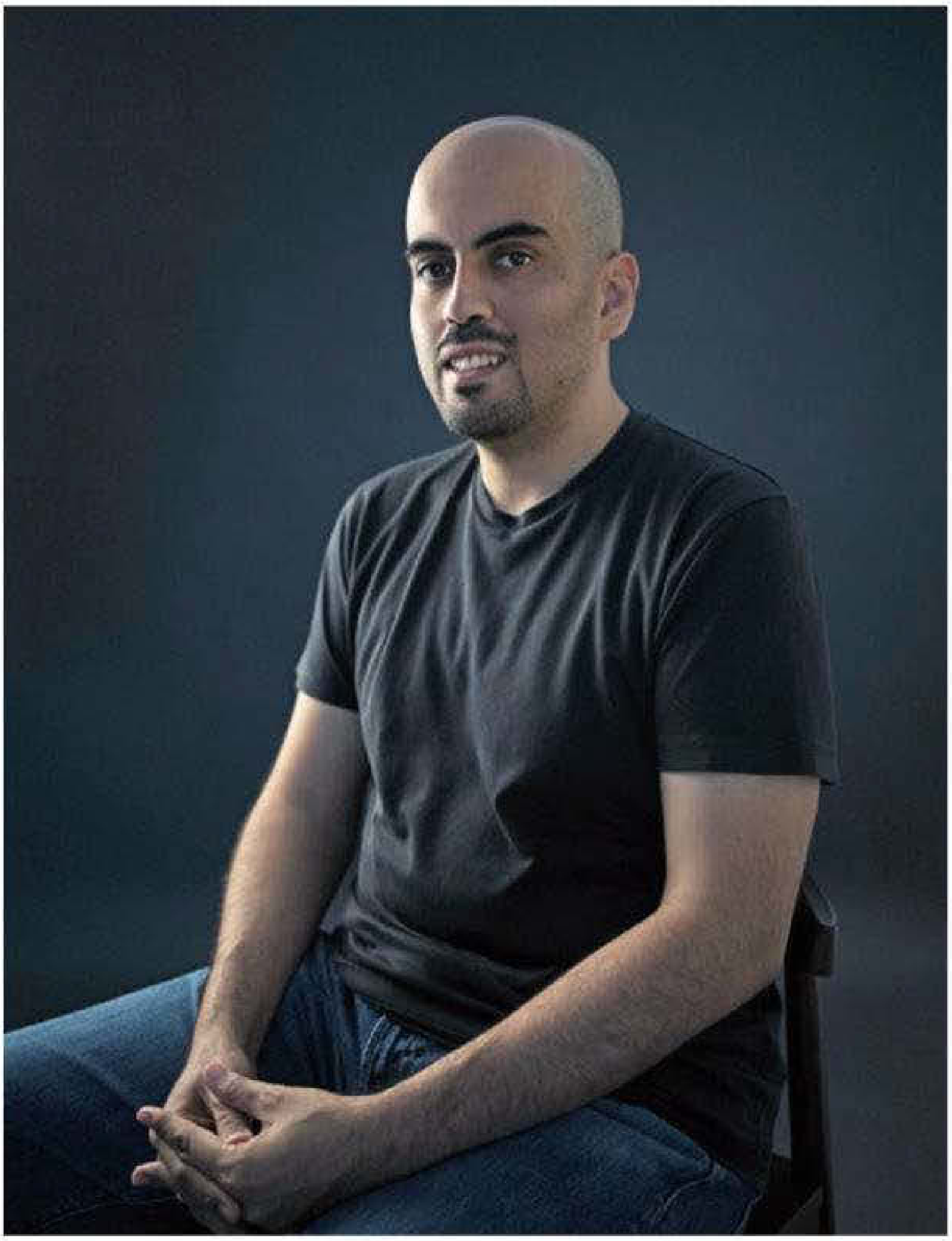
A master's degree from Yale and angel investments in his startup weren't enough to protect Mezyad AlMasoud from President Trump. A little more than a year ago, Trump moved to kill a nascent visa program meant specifically for company founders with capital in hand, such as AlMasoud. The Kuwaiti's immigration lawyer called his Wall Street office to tell him that without the startup visa, which could have been granted under a plan known as the International Entrepreneur Rule, he had two weeks to leave the U.S. That afternoon, AlMasoud spent hours sitting by the East River, looking out at the Brooklyn Bridge. The thought running through his mind: How do I tell my 5-year-old daughter I failed?

As it turned out, he didn't have to. Flair Inc., his financial technology startup, incorporated in June and is starting to hire engineers who can develop its money-management web services for pro athletes. It's just not in the U.S. Flair is hiring in Vancouver, where AlMasoud was one of the first people accepted to a startup visa program that looks a lot like the fast-track plan under Barack Obama that Trump blew up. In the past 18 months, similar programs with a range of perks have sprung up in at least a dozen countries, including the U.K., China, Japan, Israel, Germany, Estonia, Australia, and New Zealand. As with many of his peers, the first choice was always America, says AlMasoud, whose startup is among 130 created by people admitted to Canada's new visa program since February.

Immigrant founders and co-founders have a strong track record in Silicon Valley (see Google, Tesla, EBay, Stripe), as do the children of immigrants (Apple, Oracle, Amazon.com). But the Valley's fabled Sand Hill Road is no longer the center of the venture capital world, and as the Trump administration continues to increase restrictions on most forms of immigration, other locales are even more eager than usual to frame themselves as the next great innovation hub. Startups are doing a lot more venue shopping than they used to, says Merilin Lukk, who runs Estonia's recruiting program and has brought at least 160 founders to the country since last year, creating about 440 jobs.

Countries have been offering all kinds of perks to differentiate themselves. A new program in Israel throws in a $20,000 relocation bonus, a local accountant, Hebrew classes, a yearly flight home, and a paid-for cellphone. Other offers include low-interest loans, six-day visa processing, and, most important, the equivalent of a green card. "The fight over tech talent is not something that is coming in the future. It's happening right now," says Kate Mitchell, the founder of Scale Venture Partners in Foster City, Calif. "And we are losing."

That may be a bit of an overstatement for the time being, but the U.S. certainly isn't trying to match those offers. The Trump administration derailed the legacy Obama program a week before its planned rollout last year, and although a lawsuit by the National Venture Capital Association managed to force the feds to eyeball a preliminary handful of applications, a spokesman for U.S. Citizenship and Immigration Services says the program "does not adequately protect U.S. investors and U.S. workers" and that the agency intends to scrap the program as soon as it has finished reviewing public comments on the matter.



▲ AlMasoud joined Canada's visa program instead

PHOTOGRAPH BY DJINANE ALSUWAYEH FOR BLOOMBERG BUSINESSWEEK

The move is part of a broader set of moves to restrict immigration visas, including the H-1B visas that have historically gone overwhelmingly to tech workers. Critics of the program, including labor advocates as well as Trump-style nationalists, say the visas have too often been abused by outsourcers and companies that simply want to pay workers less. There may be some truth to that: More than 50 percent of the country's working science and engineering Ph.D.s are foreign-born. But another way to look at those numbers is that America needs immigrants.

Canada is one of many countries that seem less conflicted, says AlMasoud, who's enjoying his ▶

◀ weekend hikes in the Vancouver area without looking over his shoulder. The Canadian immigration agency says it's approved 200 applicants for permanent residency since February, and AlMasoud is hoping he'll be on that list soon, too. For now, he's trying to get Flair to a point where he can apply for approval from American financial regulators and start showing it off publicly. Only occasionally, as when he reminisces about NBA games or his bygone '67 Pontiac GTO, does he grow wistful about the opportunities he left behind. "It had always been my dream to start a business in the U.S.," he says. "Because of what Trump has done, now I have to hire Canadians." —*Olivia Carville*

THE BOTTOM LINE Fast-tracked permanent residency and five-figure relocation bonuses are among the perks some countries are offering immigrant startup founders as the U.S. shuts them out.

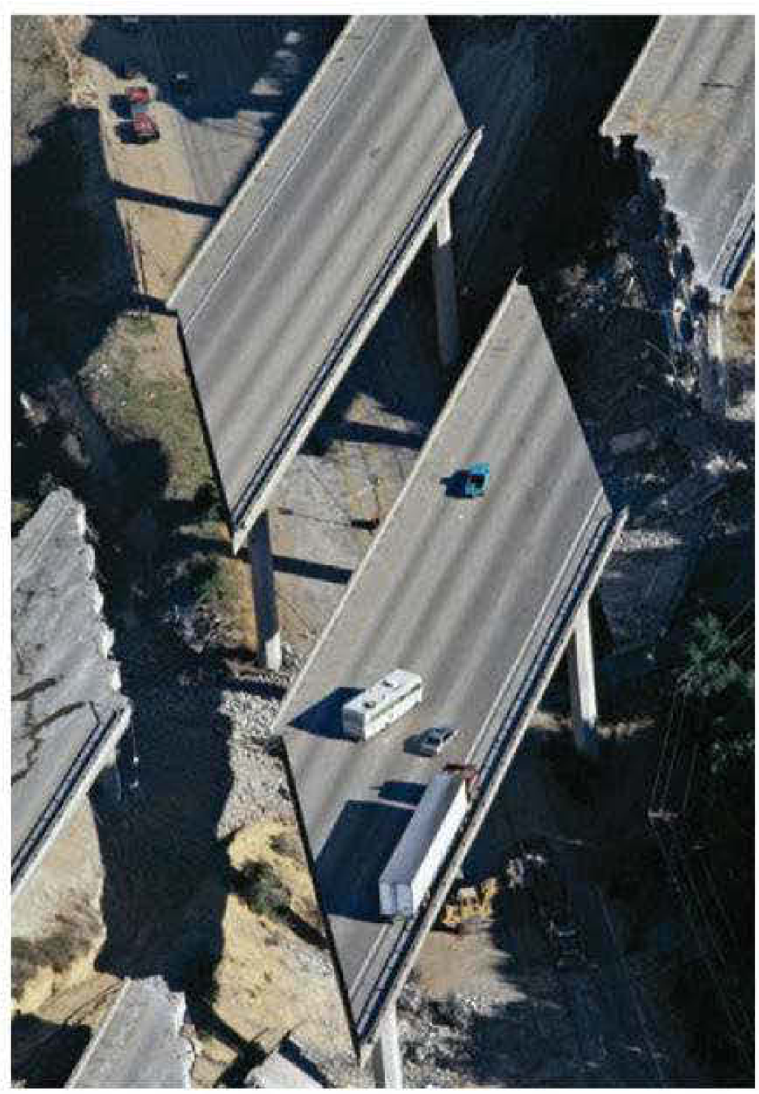
Getting a Jump On the Next Big One

● The U.S. finally has an earthquake alert system to buy the West Coast precious seconds. Now it needs faster delivery

This summer showed not only the promise of the patchwork of earthquake early warning systems popping up on America's West Coast, but also the challenges it faces. On Aug. 28, when a minor quake briefly rumbled the Los Angeles suburb of La Verne, hundreds of area residents got advance notice from an app on their phones. Farther from the quake, Angelenos got as many as 10 seconds to brace themselves. Less than a mile from the epicenter, David Loor, who lives in La Verne, got two. "Not much," he says. "But I still saw the alert before I felt the shaking."

That rumble was no Northridge—the magnitude 6.7 quake that killed 57 people, injured more than 9,000, and dealt the area more than $20 billion in property damage in 1994. But the U.S. Geological Survey says there's a 99.7 percent chance of a 6.7 or higher quake hitting somewhere on the Pacific coast before someone taking out a 30-year mortgage today has paid it off. In partnership with universities in California, Oregon, and Washington, the USGS has spent 12 years working on ShakeAlert, a network of 860 seismometers that will feed an early warning system comparable to those in other tectonically challenged locales.

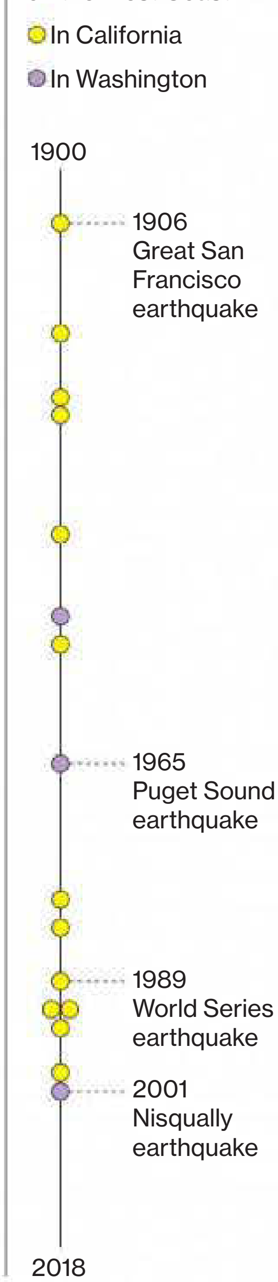
The feds spent $38 million to build ShakeAlert and are funding operating expenses of $16 million a year. The system is slated to go online in the next few months. In the meantime, the USGS has been relying on both government agencies and private companies to work out how to give people such as Loor more than two extra seconds. "If you know a major quake is coming, you can brace for impact," says Bob de Groot, who's heading ShakeAlert development at the USGS. "A lot of people won't die needlessly."



◀ The aftermath of the Northridge quake

The idea behind ShakeAlert is simple enough; Japan and Mexico have employed similar systems since the 1990s. As soon as ShakeAlert's seismometers detect a 5.0 or higher, the system determines the area that will be affected and sends a warning through the Federal Emergency Management Agency's wireless emergency alert system. (It's supposed to sound a bit like an Amber alert.) ShakeAlert generates the message to FEMA in five seconds, and then FEMA blasts it out in an additional

● Earthquakes of magnitude 6.7 or higher on the West Coast



DATA: U.S. GEOLOGICAL SURVEY

three to seven seconds. But that's already a lot of time during an earthquake, and the wireless carriers used to relay FEMA's alerts add 10 more seconds of delay, whether the message is transmitted via SMS or an app's push notification, according to De Groot.

To speed transmission, ShakeAlert is taking a kitchen-sink approach. More than two dozen public and private groups are involved in pilot programs up and down the coast, including the Bay Area Rapid Transit system, a handful of Los Angeles public schools, Northridge Hospital Medical Center, and NBCUniversal Media LLC. Where possible, they're cutting the wireless carriers out of the equation. RH2 Engineering Inc. is wiring Pacific Northwest water tank valves to close when they receive alerts through the FEMA system. Communications company Everbridge Inc. is working with the California Institute of Technology and other schools to send early warning calls, emails, and app notifications across their campuses.

Early Warning Labs LLC, the startup that made QuakeAlert, the app Loor uses, is retrofitting L.A.'s subways and rails so they shut down automatically when a major temblor is detected. It's also teamed with Johnson Controls, a maker of building equipment, to add alert systems to commercial buildings and begun equipping L.A.-area city halls, libraries, and condos with seismic warnings, including over PA systems. Early Warning founder Joshua Bashioum, a former volunteer FEMA search-and-rescue instructor, says his eight-person team is working on triggers to open gates and doors and halt elevators.

The city of Los Angeles has also hired AT&T Inc. to create an app that uses ShakeAlert data to send push notifications to all 48,000 city employees. The goal is to have all of them using that app by the end of the year. AT&T declined to comment on delays in relaying the alerts through its network but says it plans to expand the app into more cities. A fifth-generation wireless network might be able to solve the problem of carrier delays, but reliable 5G standards and service remain a ways off.

For now, the West Coast is relying on what it's got. All of California will have some form of messaging coverage by the time ShakeAlert is publicly available, De Groot says. In the near term, the assembled pilot programs should be able to reduce by more than half the lag added by wireless push notifications. So far, "nothing's fast enough" to efficiently warn an entire city at this point, De Groot says. "By the time you get an alert, you could be in the earthquake already." —*Adam Popescu*

THE BOTTOM LINE ShakeAlert seems well-equipped to detect the next Northridge-size earthquake before it hits. The communications technology it's relying on, less so.

DAVID HUME KENNERLY/GETTY IMAGES

Deal Snapshot ByteDance

FUNDER	EXPECTED VALUATION
SoftBank Group Corp. is said to be planning an investment of at least \$1.5b as part of a \$3b funding round	**\$75b**

With venture funding from SoftBank and others, ByteDance Ltd., the maker of China's most popular news-aggregation app and a popular Vine-like video service, will dethrone Uber Technologies Inc. as the world's most valuable startup, according to people familiar with the matter.

What it does

The money will give six-year-old ByteDance needed firepower as it tries to expand ad sales for its news app, Jinri Toutiao (which has roughly 200 million users), and video service, Tik Tok (500 million users). The effort to prove it can turn a profit will intensify the company's direct competition with Tencent Holdings Ltd.

How it got here

Founder Zhang Yiming, 35, is the first to build a Chinese startup with real scale without taking money from Tencent or Alibaba Group Holding Ltd. Jinri Toutiao outdid Tencent's news portals by tailoring users' feeds to match their reading habits. Tik Tok became such a hit that Tencent's WeChat blocked direct access to it.

Risks

One of Zhang's consistent problems has been government censorship. The algorithm-driven nature of Jinri Toutiao (think Facebook's news feed) gives ByteDance some cover when censors complain that its filters are too open, but the government briefly suspended the news app and Tik Tok in the spring. It also made ByteDance shutter a nascent joke-sharing app.

What's next

ByteDance is in the process of combining Tik Tok with Musical.ly, the popular lip-syncing app it bought for \$800 million last year. The company's acquisitions have been smart, expanding its vast reach and raising its ad rates. But it remains to be seen how much staying power \$3 billion can buy ByteDance in its battle with Tencent. —*Lulu Chen and Mark Bergen*

Women Aren't Play-It-Safe Investors

It's time to put away gender stereotypes about risk tolerance

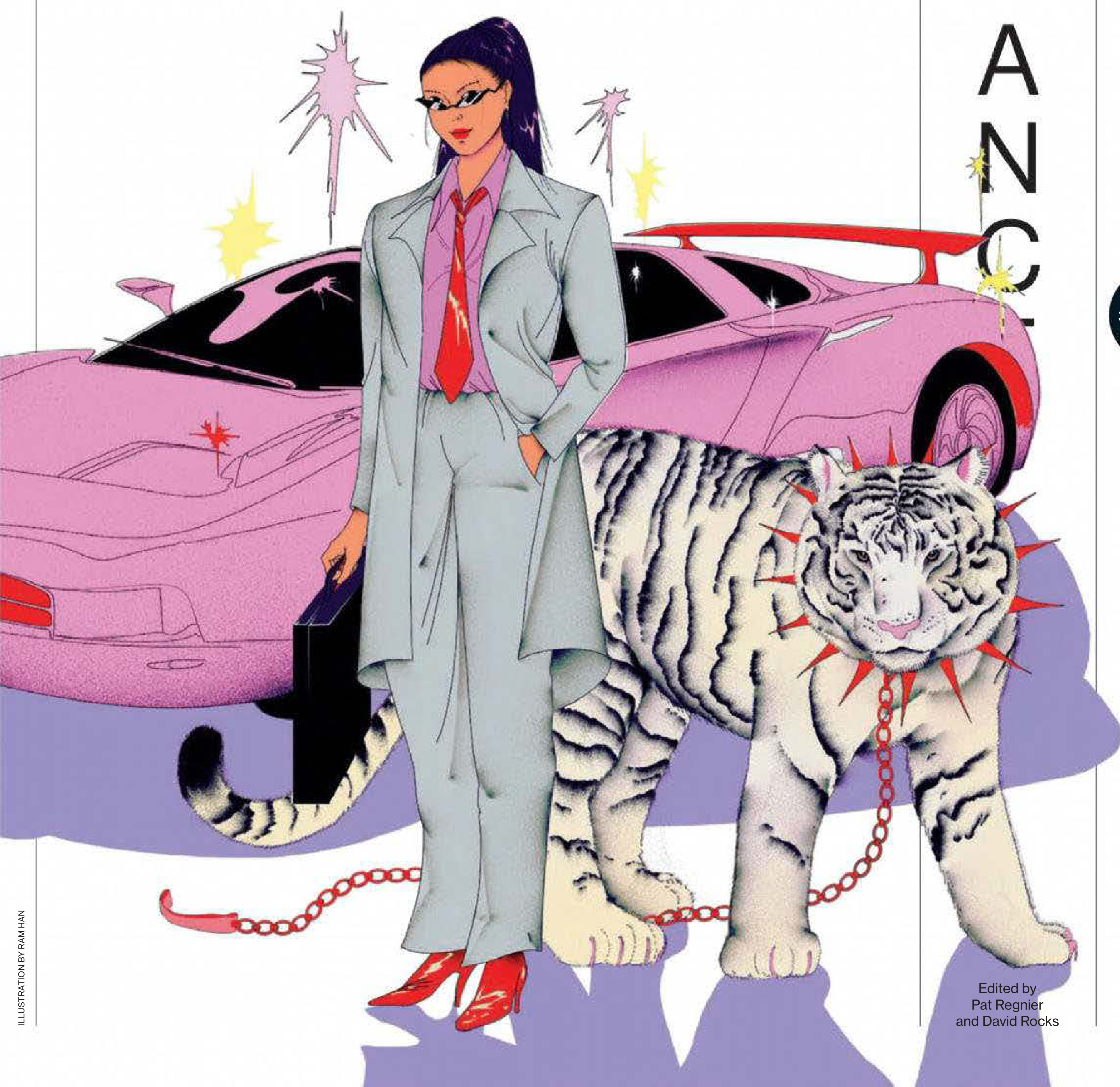


ILLUSTRATION BY RAM HAN

Edited by Pat Regnier and David Rocks

A couple came into Mike Giefer's Minneapolis office in late September for some financial planning advice. The woman presented herself as the risk-averse one and her husband as the financial maverick. Then Giefer had them take a test. "It turned out the exact opposite," he says. Giefer, an adviser at the Johnston Group, uses Riskalyze, an online tool that gauges clients' risk tolerance by walking them through various financial scenarios and then assigning them a "risk number." The woman scored a 70. Her husband, only a 52.

Women are often cast as conservative when it comes to investing, but the results for Giefer's clients should be no surprise. In a sampling of 5 million users over the last five years, women fell pretty evenly across the risk spectrum, Riskalyze found in data provided exclusively to Bloomberg. Only 37 percent of women have a below-average tolerance for risk, 25 percent have an average tolerance, and 38 percent have an above-average tolerance. "The data show that the stereotypical risk-averse woman is not a reality," says Aaron Klein, chief executive officer of Riskalyze.

Riskalyze did find that more men—about 51 percent—showed an above-average taste for risk. But when it comes to picking investments, women don't act particularly risk-averse, even compared with men. Another recent survey of 640,000 investors by Stash, an investing app, found that about 50 percent of women using the app have put money in higher-risk assets including equities or aggressive exchange-traded funds, such as an asset-allocation fund that favors stocks. Men and women devoted about the same percentage of their portfolios, on average, to stocks—the more volatile investment.

"It seems especially small-minded to believe that the genders think completely differently," says Carol Fabbri, an adviser in Denver with Fair Advisors. "I believe experiences with money shape people's risk aversion, not their hormones."

The idea that women are inherently less likely to take risks comes from confirmation bias, says Julie Nelson, an economics professor at the University of Massachusetts at Boston. In other words, people, including researchers, think of women as less aggressive, so they look for ways to prove it. In a book and two meta-analyses of the studies on the subject, Nelson has found this notion doesn't hold up. "It turns out the evidence is very mixed, and where a difference exists it is small," she says. Any differences in investing behavior between men and women have little to do with biology. "To the extent differences are found, it can be from investment advice, it can be from social pressure: Don't stick your neck out," Nelson says.

Sallie Krawcheck, co-founder and CEO of Ellevest Inc., an investing platform for women, has said that in addition to the gender pay gap, there's an investing gap. Only about half of women have started saving for retirement, compared with 65 percent of men, according to a 2015 survey of 27,500 investors by BlackRock Inc. Even those who've started saving have accumulated less than half the savings men have.

And there lies the real difference between male and female investors. Men tend to have more money than women, which colors their investing behavior. People with a bigger income have a higher risk tolerance, and that applies to women, too. A report from Spectrem Group found that 54 percent of women who earn more than $200,000 are willing to take "a significant investment risk" to earn higher returns, compared with 32 percent of the broader population of investors.

Kerri Kimball, a financial adviser in New York, confirms that her clients, who are primarily women executives and professionals, are "very competitive" investors. "They'll take risks, but they'll be calculated risks," she says. There's something to this. One famous study from the University of California at Davis did find a difference in how men and women traded. Due to overconfidence, men traded more often and had worse returns as a result. Many financial planners say their female clients tend to prepare more before making investment decisions.

Still, many women have internalized the message that they don't like to take chances with their savings. The Stash survey found that only 13 percent of women rated themselves as having a high risk tolerance; 35 percent of female users rated themselves as having a low risk tolerance. Those numbers don't line up with their behavior.

"There are many stereotypes that persist about women and money that are likely due to the fact that women have been left out of the financial-services industry for so long," says Alexandra Phelan, the data scientist who led the Stash study. "We're told that money is the man's world. It's not hard to believe that women perceive themselves as more risk-averse." That's a problem if it means women are guided by advisers to take less risk than they can handle. Because higher risk can mean higher returns over the long run, playing it too safe can make the investment gap even wider. —*Rebecca Greenfield*

THE BOTTOM LINE Women are less likely than men to describe themselves as high-risk investors. But the difference may have more to do with labels than actual behavior.

● Share of women with above-average risk tolerance, according to Riskalzye

38%

Are Germany's Savings Banks A Little Too Cozy?

● Germany's Sparkassen could pose a hidden threat to European financial stability

Regensburg has all the attributes typical of historic German cities: a 12th century bridge across the Danube, a 500-year-old bratwurst stand, a palace with a real-life princess—and a mayor who serves on the board of the local savings bank.

And as happens periodically in places across Germany, the relationship between the bank and City Hall stands at the center of a controversy. Mayor Joachim Wolbergs has been suspended pending the outcome of a trial for alleged corruption related in part to his side job as chairman of the bank's supervisory board. The accusations involve campaign donations from a real estate developer, rights to coveted land, and a low-interest, €4.5 million ($5.2 million) loan approved while the mayor headed the board.

The trial, which started on Sept. 24, highlights what many economists say are overly cozy ties between politicians and Germany's 385 public-sector savings banks, known as Sparkassen. Those close links are at the heart of concerns about hidden risks to the country's financial system, which has shown signs of strain as giants Deutsche Bank AG and Commerzbank AG struggle with low profitability and strategic missteps. "The largest banking system in Germany is predominantly controlled and monitored by people whose financial expertise is questionable," says Ralf Jasny, a business professor at the Frankfurt University of Applied Sciences.

Each Sparkasse is nominally independent, and they mostly lack the "too-big-to-fail" heft of the leading Frankfurt banks, falling below the radar of the European Central Bank and its oversight of top financial institutions. While a wave of mergers has reduced the number of Sparkassen by almost half since the 1990s, the system remains fragmented. The biggest is the Hamburg affiliate, with 130 offices, and several have just a single branch. But together they control €1.2 trillion in assets, which would make them the country's second-biggest lender, after Deutsche Bank. The logo they share—a stylized red "S"—is present in just about every neighborhood in Germany, they backstop one another in case of financial trouble, and they're barred from encroaching on one another's territory. "A rapid rise in interest rates could cause problems for all of them simultaneously," says Isabel Schnabel, finance professor at the University of Bonn and a member of Chancellor Angela Merkel's council of economic advisers. "We could get to a point where there are too many to fail."

● Wolbergs

Flush with deposits from Germany's famously thrifty citizenry, the Sparkassen are a dominant force in retail banking, especially in rural areas. About 60 percent of the population has a relationship with a Sparkasse, according to ratings company DBRS Ltd., and on the surface, the banks look like paragons of prudence. They face little pressure to maximize profits, and what money they do make gets reinvested or goes into public coffers. Their local focus means they prefer conservative, low-margin loans to riskier financial instruments, and no Sparkasse has defaulted since the 1970s, when a shared safety net was set up. But critics point to the example of Germany's Landesbanken, a network of wholesale banks that invest money from the Sparkassen on international markets. After disastrous bets on U.S. subprime loans and other blunders a decade ago, those institutions had to be bailed out, costing taxpayers more than €30 billion.

In March, Fitch Ratings Inc. cautioned that most of the Sparkassen's long-term assets are mortgages and other instruments that lock in today's low rates, but their deposits tend to be short-term savings accounts that would have to be repriced more quickly if rates were to rise. That would hit Sparkassen harder than bigger banks, which have more diverse portfolios. And their dependence on local business gives them nowhere to turn if Germany's economy falters. "A slump could lead to a chain reaction of savings bank insolvencies, which would be difficult or impossible for the Sparkasse system to absorb," says Reint Gropp, president of the Halle Institute for Economic Research. ▶

PHOTOGRAPH: ARMIN WEIGEL/BLOOMBERG

◀ France, Italy, and Austria once had comparable networks of local savings banks, but they've sought to reduce conflicts of interest and shore up the institutions by encouraging them to merge and bring in outside investors. The risks were exposed in Spain after the 2008 debt crisis, when many of the Cajas—state-linked savings banks—had to be taken over by the government or forced to merge to stabilize the country's financial system. "There is a reason why so many other EU countries that had similar systems have reformed them," says Nicolas Véron, a senior fellow at Bruegel, an economic think tank in Brussels. "Germany is basically the last one that hasn't."

Close political connections give the banks powerful allies, creating concerns about the financial dependence of political leaders on institutions they're supposed to supervise. Bruegel found that Sparkassen board positions can account for more than 10 percent of some politicians' income. And loan quality tends to deteriorate in election years as politicians boost lending in pursuit of votes, according to the Halle Institute. Meanwhile, more aggressive purchases of state bonds after elections suggest the banks seek to curry favor with newly elected officials, ECB researchers say. As a result of these ties, the Sparkassen cast a long shadow in European banking, with Merkel's government adopting friendly stances such as rejecting Europewide deposit insurance and opposing regulations that would hurt the lenders.

Despite periodic scandals like the one in Regensburg, there's no widespread call to overhaul the Sparkassen. The allegations against the popular Social Democratic mayor sent shock waves through the boardrooms and cobblestone streets of Regensburg as the scandal, which also involved financing the local professional soccer club, touched just about everyone. But after initial calls for Wolbergs's resignation, officials have taken a milder tone. The court in March reduced charges from bribery to abuse of office and isn't actively questioning the validity of the loan to the developer. Wolbergs, who declined to comment, is fighting the charges and has said he'll run for reelection in 2020.

Defenders of the system point to the banks' stability in past crises, their commitment to community development, and a deep well of local expertise that the likes of Deutsche Bank and Commerzbank can't match. Unlike their bigger brethren, they're widely seen as the good guys of banking, serving the needs of average Germans. "There's no reason to question the structure of the Sparkassen," says Jürgen Huber, a deputy mayor in Regensburg from the Green Party. "They're part of the community. That's a distinct advantage over big banks." —*Stephan Kahl, Piotr Skolimowski, and Boris Groendahl*

"There is a reason why so many other EU countries that had similar systems have reformed them"

THE BOTTOM LINE The corruption trial of the mayor of Regensburg highlights the risks endemic in Germany's network of 385 local savings banks, or Sparkassen.

China's Peer-to-Peer Lending Crash

● Many savers can't get their money back after hundreds of online platforms go under

"I am too small to fight them," a 31-year-old woman from Zhejiang province, China, wrote in a note to her parents in early September after losing almost $40,000 when an online peer-to-peer lending firm went bust. "A state-backed P2P just ran away, its shareholder unwilling to take any responsibility, investigators are dragging their feet. I am too tired and cannot see any hope." The woman then hanged herself. Her death and her letter were chronicled in chat group posts on the social media site Weibo.

Hundreds of others who say they were victims of the same company, PPMiao, came to Shanghai to protest in late August, only to be turned back by police and security guards outside the International Finance Centre, where a firm connected to the lender has an office. "We lost everything, and I have tuition coming due for my 3-year-old son's kindergarten next month," said one man, who gave his name only as Chen before being put on a police bus and sent home to his farm in Jiangxi province, 14 hours away by train.

As many as 4,000 people have lost as much as $117 million as a result of the failure of PPMiao, according to savers who say they were burned, and many of them have been coming to China's major cities seeking restitution. More than 400 peer-to-peer lending platforms collapsed from June through August, according to Shanghai-based researcher Yingcan Group. That still leaves about 1,800, a number Chinese investment bank China International Capital Corp. expects to contract to fewer than 200 after more dominoes fall. "It's amazing how quickly it's unraveling," says Zennon Kapron, managing director of Shanghai-based consulting firm Kapronasia. "We're just at the start of what could be a very messy reconciliation in the P2P industry."

Peer-to-peer lending in the U.S., by firms such as Prosper Marketplace Inc. and LendingClub Corp., is but a drop in the American investment ocean. In China, it has attracted 50 million savers—more than the populations of New York state and Texas combined—who have sought returns of 10 percent or more, double what they can get from a bank. The total investment amount outstanding soared to a record $200 billion in June.

The government has been seeking to increase control over what has been a largely unregulated business, one part of a vast collection of financial companies outside the traditional banking sector known as shadow banks. Earlier in the summer, the agency that regulates banking warned savers using P2P sites that they should be prepared to lose all of their money. Although not all troubled P2P platforms are accused of fraud, officials have said many failed sites needed cash coming in to pay money out; in other words, they were Ponzi schemes. Other sites attracted investors for only a few weeks before the owner ran away with the money.

Online lending became popular in China after a tightening of bank credit in 2010 followed two years of stimulus spending to counter the global financial crisis. In 2012, total loan volume was less than $1 billion. Then, you could easily find a young couple looking for others to invest in their wedding: Lend them money now for their banquet and honeymoon down payments, and they'll pay you back with interest after they collect wedding gifts of cash. Small businesses sought loans to buy new machinery, pledging to pay back when production increased.

These days, P2P sites offer investments in what are called commercial bills, or "bankers' acceptances," which are like short-term bonds issued by small businesses. Such bills, issued by companies and guaranteed by commercial banks, are usually part of business transactions, and a bill can be sold to another financial institution or to the central bank before it matures. In some cases involving allegedly fraudulent P2P platforms, investors have claimed that the underlying bills didn't exist and the money never went where it was intended. "The risks on a lot of these platforms were not adequately communicated to investors," says Kapron, who cites "guaranteed return plus principal" as the typical offer to investors. "It was unsustainable."

That was the case with Quark Finance, which collapsed on Aug. 25. Shanghai police said the founder turned himself in and confessed that he had been siphoning deposits illegally. The company had $556 million of outstanding unpaid loans as of July, while cumulative transactions on the platform totaled $2.3 billion. A statement on its website said the company has been cooperating with the investigation. Police said they were calling on victims to report to local authorities and to refrain from gathering in protest.

As PPMiao began to fail this summer, it changed its legal address from Hangzhou, a city near Shanghai, to a residential development in Nanning, 900 miles away, close to the Vietnam border. On Aug. 6, it stopped paying investors and announced it was closing because of a run on the platform. It said it planned to repay investors over the next three years. "We tried our best, to little avail," PPMiao said in the statement. "We promise we won't run away, we won't become unreachable, we will get our money back to repay investors batch by batch." Some investors who were owed less than $1,500 have since been reimbursed. Calls from Bloomberg to the contact numbers listed on the statement went directly to voicemail and weren't returned.

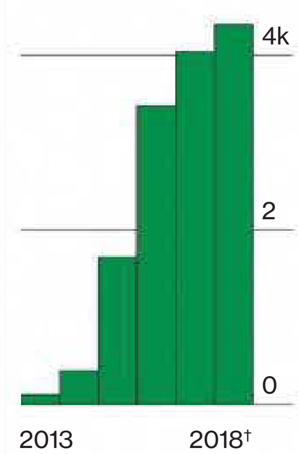
The Chens, who traveled to Shanghai that month to protest after investing a total of $23,000 of their and their families' money, had first gone to Hangzhou, where they were intercepted by police who told them the case was being investigated and they would have to wait. They then went to Shanghai to protest at the office of an asset management unit of HuaAn Fund Management Co., which they and other investors believed to be one of three companies that owned PPMiao. HuaAn is a private company, but some of its biggest shareholders are state-owned entities.

HuaAn issued a statement on the day of the would-be protest saying it had invested in the company that owned PPMiao on behalf of an asset management client. It also said later that neither this company nor the client had disclosed its links to the P2P lender. HuaAn "is deeply sympathetic of all the victims and will actively work with police on any investigation," the statement said.

For the woman from Zhejiang, whose family couldn't be reached to verify her name and details of her story, those promises were too little, too late. "Don't be sad," she wrote in her note to her parents. "I am leaving, but your lives need to continue. I just lost confidence in life in this society. I am not afraid of death, but I am afraid of living."
—*Bloomberg News*

THE BOTTOM LINE P2P lenders took off in China after it became more difficult to get bank loans. But the high rates they appeared to offer savers came with risk—including, in some cases, fraud.

● Cumulative failed* peer-to-peer lending platforms in China



*Includes platforms that have been unable to repay investors, come under police investigation, halted operations, transformed into other businesses, or had operators flee with client funds; †through June; data: Yingcan Group

NAFTA
[*naf*-tuh]
USMCA
[*naf*-tuh]

● Trump's hard-won new trade pact is more rebranding than rewrite

One of Donald Trump's most consistent economic promises has been to spark a revolution on behalf of those Americans forgotten by the new global order and to renegotiate trade deals that he says have given U.S. allies and adversaries alike a leg up on domestic workers.

The president and his aides consider his rewrite of the North American Free Trade Agreement a promise delivered—and a vindication of his tariffs-and-tweets form of trade negotiations. "Without tariffs, we wouldn't be talking about a deal," Trump crowed to reporters at a Rose Garden ceremony celebrating the U.S.-Mexico-Canada Agreement on Oct. 1. Calling it "the most important trade deal we've ever made by far," he predicted it would pass Congress "easily" once he signs it in late November and get "cash and jobs" flowing back to the U.S.

There's no doubt that the deal marks a significant political victory for Trump, yet viewed soberly, his new Nafta amounts mostly to a rebranding of the 1994 accord he labeled a "disaster" rather than a wholesale insurrection against it. Clinched just before a midnight Sept. 30 deadline, the agreement reads largely like an amalgam of the existing Nafta and the 12-nation Trans-Pacific Partnership that Trump pulled the U.S. out of on his first full working day in office.

Despite Trump's insistence that the unpronounceable USMCA is an improvement on its predecessor, some trade experts warn that some industries could be worse off. Mary Lovely, an economics professor at Syracuse University, argues that some of the new rules—particularly those governing trade in autos—could raise costs for American companies, denting their competitiveness vis-à-vis rivals in China and elsewhere. That could prompt them to move production out of North America. Rather than fix Nafta, the Trump administration "will have added bricks to 'Fortress America,'" she says.

Manuel Balmaseda, chief economist at Cemex, the Mexican cement giant, says it's appropriate that the words "free trade" have disappeared from the pact's name, because its tweaks do more to restrict trade than liberalize it. "There is no free trade in this new agreement," he says.

Still, for many in the U.S., Canadian, and Mexican business communities, an imperfect deal is better than no deal. Corporate executives had feared Trump might carry out his threat to pull out of Nafta and thus upend the region's highly integrated supply chains.

What's more, contrary to Trump's rhetoric, the changes aren't all that dramatic. U.S. dairy farmers will be allowed to sell more duty-free milk to Canada than they do now, though at a level largely in line with that negotiated in the TPP. In return, ▶

Edited by Cristina Lindblad

◀ Canada is able to retain a provision that allows it to challenge U.S. antidumping findings and punitive tariffs before a special panel.

There are some important additions and subtractions to the 1994 pact. The USMCA includes a chapter on digital trade, for example, and stricter labor provisions that Mexico will have to live up to. It strips away a controversial provision that allowed companies to take investment disputes with U.S. and Canadian national, state, and local governments to arbitration panels, though it remains in place for some sectors in Mexico, such as energy.

The pact also features some Trumpian innovations. Complicated regional content requirements for cars include one that 40 percent of the parts in a vehicle made in North America come from factories with a $16-an-hour average wage or higher. Given that the typical Mexican autoworker earns less than half that, the rule is guaranteed to benefit producers and workers in the U.S. or Canada.

In a move that echoes what economists such as Catherine Mann, global chief economist at Citigroup Inc., consider misguided efforts to restrain auto imports in the 1980s, the Trump administration claimed the right to impose tariffs on vehicles imported from Canada or Mexico once those shipments hit a 2.6 million-car threshold. Canada and Mexico together exported fewer than 2 million cars to the U.S. last year.

The Trump administration has already begun to sell the USMCA as part of a broader effort to build an alliance against China. To that end, the deal contains a provision that effectively bars any of the three members from negotiating a trade deal with a "nonmarket economy."

The USMCA was welcomed broadly if cautiously on Capitol Hill, where the political debate over whether to ratify it is unlikely to heat up before next year. Some important political constituencies, however, have aired their doubts. "We still don't know whether this new deal will reverse the outsourcing incentives present in the original Nafta," says Richard Trumka, president of the AFL-CIO, adding that there are "too many" details that still need to be worked out. That matters because the Trump administration has been courting the U.S.'s largest labor group to bring Democratic votes with it when the deal eventually goes before Congress in the months ahead.

For the trade skeptics on the left whose message Trump co-opted so effectively in 2016, the deal poses a dilemma. Dani Rodrik, a Harvard economist who frequently rails against globalization, has long advocated a new approach to trade agreements that does more to protect jobs. But he sees an elaborate illusion in the USMCA. "Trump is more interested in smoke and mirrors—the optics of striking a deal that seems advantageous to him—than in real changes in trade agreements," he says.

Above all, the USMCA is a reflection of how Trump's promise to deliver a trade revolution collided with economic and political realities. His threats to rip up Nafta—together with his escalating tariff war with China—ignited a Farm Belt rebellion that his own Republicans fear could hurt them in November's midterm elections. They also put him at odds with the GOP in Congress and powerful Establishment business bodies such as the U.S. Chamber of Commerce. "Vested interests in cross-border supply chains are very strong," says Gary Hufbauer, a recently retired trade expert at the Peterson Institute for International Economics. "Politicians interfere with them at their peril." —*Shawn Donnan, with Peter Coy*

THE BOTTOM LINE The new USMCA is mostly the old Nafta, with some TPP thrown in. Some economists worry that provisions designed to bring jobs back to the U.S. may erode competitiveness.

The Oil Recovery Skipped Canada

● A shortage of pipelines is weighing on prices for the country's crude

Alex Pourbaix, chief executive officer of Cenovus Energy Inc., was in his office in downtown Calgary in late August when he checked his phone and noticed his company's shares were plunging for no apparent reason.

That's when he learned that a federal appeals court in Ottawa had overturned the government's approval of an expansion of the Trans Mountain Pipeline, potentially stalling for a year a key project that would help energy companies in western Canada ship oil to new customers in Asia. For Pourbaix's company, one of the country's largest oil sands producers, the ruling threatened to prolong a shortage of pipeline capacity that's weighed on prices for Canadian crude and kept Cenovus and its peers dependent on U.S. refineries.

The court decision was only the latest in a string of failed or delayed pipeline projects that has stymied the Canadian oilpatch while competitors around the globe have enjoyed a steady recovery.

"It's a great tragedy that in this environment where the commodity demand continues to grow unabated, Canada is missing out," says Pourbaix.

The industry has waged a yearslong battle to add transport capacity with not much success. The most visible symbol of this struggle is Keystone XL: President Barack Obama rejected the $8 billion project, bowing to pressure from environmental groups and indigenous communities on the pipeline's path. TransCanada Corp. won approval from the Trump administration last year, but construction may not start until next year—about a decade after the project was first proposed.

Pipelines that don't stray outside Canada's borders—like Trans Mountain—have also run into opposition. The proposed Northern Gateway line, which, similar to Trans Mountain, would have carried crude to a shipping terminal on the Pacific coast, was halted by Prime Minister Justin Trudeau's government in 2016. And TransCanada pulled the plug on its proposed Energy East line last year after pushback from green groups in Quebec.

Strangled by the pipeline shortage, the price of Canadian crude has climbed less than 5 percent in the past two years, compared with 57 percent for the U.S. benchmark. The $39-a-barrel discount to the U.S. price on Oct. 1 is near the widest it's been in about five years. (It also reflects that Canada's heavy grade of crude costs more to process.)

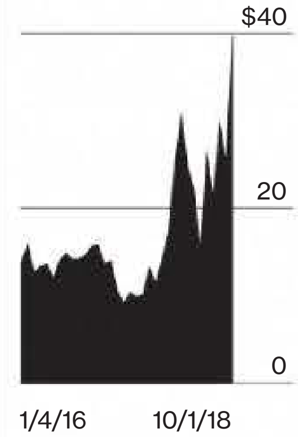
Lower prices represent a missed opportunity for Canada, whose economy depends heavily on the oil and gas industry. U.S. crude production has more than doubled in the past decade, from about 5 million barrels a day to more than 10 million this year. In Canada, output has climbed a more modest 64 percent, to 4.46 million barrels, over the same period.

Suncor Energy Inc. CEO Steve Williams, at a ceremony in early September to celebrate the opening of Suncor's Fort Hills oil sands mine, a C$17 billion ($13.3 billion) project in northern Alberta, said his company probably wouldn't attempt another large-scale undertaking in the next decade. "If you're coming to that point where you need to make a decision for the next growth phase, you need to have confidence that the next pipelines are coming," he said in an interview.

In previous oil downturns, the industry had to contend only with supply and demand fluctuations, says Brett Wilson, chairman of Prairie Merchant Corp., a private merchant bank, and Canoe Financial LP, an investment management firm. The current obstacles are deeper and more permanent. "We seem to be fighting structural issues now," he says. "Canada has been delinked from the global markets, and we are no longer participants in the normal cycle of energy."

Wilson blames the government for giving environmental concerns too much weight. ▶

● Price premium per barrel of benchmark U.S. crude oil over Canadian crude oil



▼ Operators of oil sands mines like Fort Hills in Alberta are eager for new outlets for their crude

BEN NELMS/BLOOMBERG; DATA: COMPILED BY BLOOMBERG

◀ Trudeau's administration typically counters such criticism by saying its environmental initiatives have allowed the industry to continue growing without jeopardizing the country's commitments to curb carbon emissions. Trudeau has also thrown the government's full backing behind the Trans Mountain project, spending $3.5 billion to buy the project from Kinder Morgan Inc. to ensure it gets built.

For its part, the government in Alberta has run ads promoting the pipeline in neighboring British Columbia, a stronghold of opposition to the project. Authorities there are also revamping regulations and making other changes to keep energy investment flowing in. "I think there is a confidence in Alberta," says Marg McCuaig-Boyd, the province's energy minister, pointing to the Fort Hills opening and China-owned Nexen's C$400 million expansion of an oil sands project.

Even Pourbaix sees cause for hope. Before taking the helm at Cenovus, he was chief operating officer at TransCanada, where he was in charge of the Keystone XL pipeline. That project has overcome its biggest regulatory hurdles, and another pipeline—Enbridge Inc.'s Line 3 expansion—is moving ahead as well.

In the meantime, Cenovus is shipping more of its crude via costlier rail and occasionally throttling back production when the Canadian oil discount gets too wide. "I refuse to believe that Canada as a country will not be able to get its act together and ultimately get these pipelines built," Pourbaix says. "We stand at risk of being shut out entirely on this global demand." —*Kevin Orland and Robert Tuttle, with Erik Hertzberg*

THE BOTTOM LINE A shortage in pipeline capacity is depressing prices for Canadian crude, which is trading at a $39-a-barrel discount to U.S. oil.

The Perils of Divergence

● The key question: Will U.S. economic growth dip, or will the rest of the world start to catch up?

An important issue facing the global economy and markets in the final quarter of the year is divergence—the widening economic and policy differences among advanced economies as U.S. growth outpaces that of Europe and Japan. The next few months will also shed light on a second crucial issue—how these divergences will ultimately be reconciled. Will the U.S. lose momentum, dragged down by slow global growth and/or a loss of domestic policy momentum at home? Or will Europe and Japan gain speed and converge with the U.S.?

These questions raise consequential issues well beyond financial markets, affecting the prospects for trade wars, currency turmoil in emerging economies, the path for orderly normalization of monetary policy in the advanced world, and, in the political realm, the future of anti-establishment movements and polarization.

Since the end of 2007, and including International Monetary Fund projections for 2018, gross domestic product in the U.S. has expanded a cumulative 17.1 percent, compared with 11.6 percent in Europe and 6.7 percent in Japan. The initial phase of U.S. outperformance resulted mainly from bigger problems in other parts of the advanced world, particularly in Europe, where the debt crisis dragged down economic activity. Then followed a short period of synchronized expansion and, most recently, a pickup in the U.S. as both consumption and business investment responded to tax cuts and deregulation—a policy-induced boost that the Federal Reserve expects to last for up to three years.

The robust U.S. labor market and an inflation rate consistent with the 2 percent objective have opened a bigger window for the Federal Reserve to continue to deliver, adapting a phrase Bridgewater Associates' Ray Dalio used in a different context a few years ago, "beautiful normalization" of monetary policy. That is, it could raise rates closer to their typical range and close the chapter on a protracted period of experimental and unconventional policies implemented to deal with the messy aftermath of the global financial crisis. Already, the central bank has stopped its program of large-scale asset purchases, hiked interest rates eight times, rolled out a program for the gradual contraction of its $4 trillion balance sheet, and gotten the market to price in an additional set of rate hikes for the next 12 months—all without causing economic and financial distress domestically. ▶

● Expansion of U.S. gross domestic product from 2007 to 2018

17.1%

◀ Because economies in Europe and Japan are less buoyant, the process of monetary policy normalization has been a lot slower. After a prolonged period of aggressive asset purchases and negative interest rates, the European Central Bank is finally reducing its monthly bond buying and has signaled both the likelihood of ending it this year and the initiation of rate hikes at the end of the summer next year. At the same time, it would explicitly keep on the table the option of reversing course should the economy lose steam and inflation fall away from its target. The Bank of Japan remains more cautious.

The Fed's rate increases, along with concerns about the contagion and the spillover of a possible trade war, have contributed to a significant downturn in currencies and stocks in emerging markets. U.S. stocks have continued to outperform those of other countries, with particularly large recent and cumulative differences vs. emerging markets, including some 20 percentage points so far this year.

This economic and policy divergence will become increasingly challenging for the global economic system. Here's how the timeline is likely to play out, through the fourth quarter and beyond. Higher growth and interest rates in the U.S. would fuel both capital inflows from abroad and the repatriation of some U.S. funds held there, thereby bolstering the dollar. That could also aggravate trade tensions, the intensity of which would likely depend largely on the degree to which U.S. trading partners (particularly China) are willing to make concessions.

This would threaten emerging countries with renewed currency turmoil, higher borrowing costs, and lower availability of private credit to roll over maturing debt. The longer these conditions persist, the higher the probability they would undermine economic growth, aggravate inflation, and expose an expanding set of financial vulnerabilities. Such spillovers would, in turn, increase the probability of spillbacks creating headwinds for the advanced economies.

Further economic and policy divergences in the next few months would also be planting the seeds for their own demise over the longer term. How this gap will close matters a great deal for both the global economy and financial markets.

Convergence from below—a pickup in European and Japanese growth—would lower financial tensions by reducing pressures on foreign exchange markets and interest rates, easing trade tensions, and opening a wider window for the gradual and orderly normalization of monetary policy. This would benefit both advanced and emerging countries, reducing the risk of destabilizing feedback loops.

Convergence from above, with U.S. growth rates falling closer to those of others, would be bad news. Lower income growth in the U.S. would likely weaken a critical global growth engine, intensify trade tensions, and further polarize the political landscape. Also, the likelihood of lower global income in this scenario would offset the relief that emerging economies would feel from lessened dollar and interest-rate pressures. It would also expose them to unsettling periods of strained market liquidity in the midst of waves of forced selling.

How should investors navigate this in both the short and longer term? With such large dispersion in asset prices between the U.S. and the rest of the world, it would be understandable for investors to position their portfolios in the fourth quarter for the "antidivergence" trade. Yet, as tempting as this may be, it could also be premature.

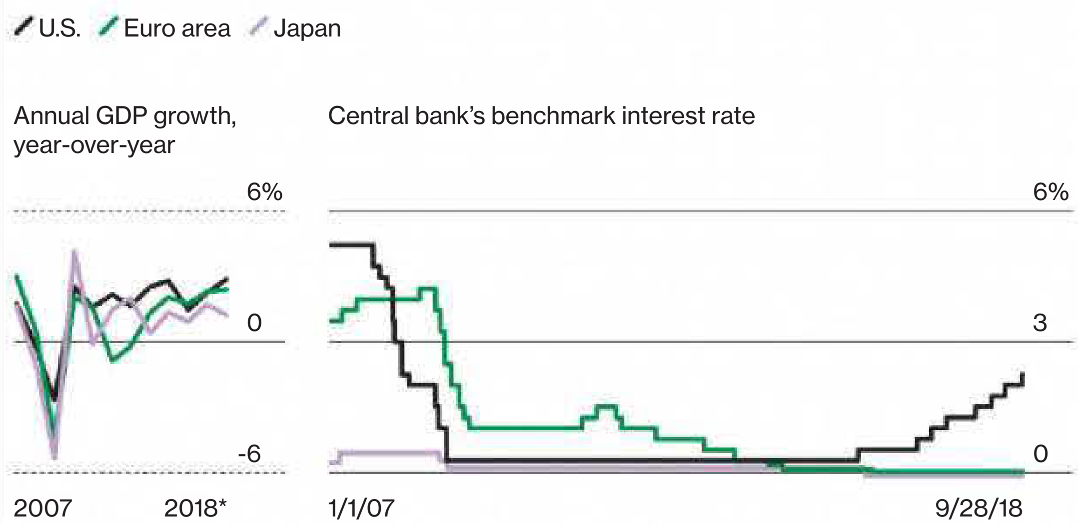
Over the next few weeks, we should expect the continuation—indeed, intensification—of the economic and policy divergences that favor U.S. assets in relative terms. It gets a lot more interesting over the longer term: The longer divergence persists, the higher the probability of a regime break in markets.

Should investors anticipate a pickup in the implementation of sound pro-growth measures in Europe and Japan, they would be well-advised to evolve into greater global diversification, and do so in the context of an overall increase in risk-taking. But if the expectation is for policy implementation to continue to underwhelm—the more likely outcome based on current indications—then continued favoring of U.S. assets would need to be accompanied by a reduction in overall risk exposures. —*Mohamed A. El-Erian*

THE BOTTOM LINE The divergence between the U.S. and other economies can't last. If Europe and Japan can't stimulate enough growth, the global economy will be much more vulnerable.

Growing Apart

The world's developed economies are moving further out of sync



*FORECAST; DATA: INTERNATIONAL MONETARY FUND, FEDERAL RESERVE, EUROPEAN CENTRAL BANK, BANK OF JAPAN

From the People Who Gave You *SPACE FORCE...*

IRAN ACTION GROUP

THE NEW SMASH HIT

● While Trump rails against Iran, a team of diplomats is ensuring his sanctions have bite

During a press conference at the United Nations General Assembly on Sept. 26, President Trump made clear how he feels about the criticism he's gotten from other countries over his decision to pull out of the Iran nuclear agreement and resurrect stifling sanctions in November. "It doesn't matter what world leaders think," he said. "Iran's going to come back to me and make a deal."

One reason he's so sure? An obscure but highly effective group with a name that sounds like it was pulled from the title of a 1980s action flick: the Iran Action Group.

As Trump, Secretary of State Michael Pompeo, and national security adviser John Bolton have lashed out against Iran's leaders and the European Union for trying to preserve the nuclear deal Trump quit in May, a handful of employees from the U.S. State and Treasury departments has quietly toured the globe, visiting world capitals and corporate headquarters to persuade foreign governments and companies to shun the Iranian market. The choice they present has been simple: Do business with America, the biggest economy in the world, or do business with Iran and face sanctions and banishment from the U.S. financial system.

"What we have now is a big game of chicken,"

Edited by Matthew Philips

says Anthony Rapa, a lawyer at Kirkland & Ellis who focuses on sanctions compliance. Rapa is impressed thus far with how effective Pompeo's team has been in isolating Iran. "Whatever you might say about the president and his rhetoric, the people running this file know what they're doing."

Members of the Iran Action Group have visited more than 30 countries so far, meeting with senior officials and company representatives. They lay out the U.S. view of Tehran's "malign behavior" in the Middle East and around the globe. But their real goal is to convey in detail just how far the U.S. is prepared to go to inflict economic pain—chiefly through secondary sanctions—on companies that expect to get a reprieve if they keep up business ties with Iran.

So far they've been persuasive. A so-called Divestment Tracker kept by the group lists 80 or so companies, ranging from Total and Munich Re Group to KLM Royal Dutch Airlines and Mazda Motor, that have backed out of the Iranian market over the past several months. More important for Iran, which derives 80 percent of its tax revenue from oil sales, exports of its oil products have fallen 40 percent from a high point of 2.8 million barrels a day in April, the month before Trump backed out of the nuclear accord.

That decline surpassed even the most bearish forecasts. "Iran exports are going to drop more than what the market expected only a couple of months ago," says Ben Luckock, co-head of oil trading at Trafigura Group, one of the world's largest commodities merchants. "When we add every country that we think will continue buying, we struggle to see exports much more above 1 million barrels a day."

The Iran Action Group's cast of characters includes a former explosives ordinance expert, Jason Shell; David Tessler, a mild-mannered sanctions expert with two tweets to his name; Michelle Giuda, who was once Newt Gingrich's spokeswoman and was also a national gymnastics champion at the University of California at Los Angeles; and a former New York ad man, Len Khodorkovsky, whose family fled the Soviet Union when he was a child and who now coordinates Pompeo's anti-Iran messaging campaign.

Their leader is Brian Hook, a foreign policy wonk who worked for the George W. Bush administration and advised Mitt Romney's 2012 presidential campaign. Hook wielded vast power under Pompeo's predecessor, Rex Tillerson, serving as his policy brain. While his current mandate isn't as expansive, he's been given valuable real estate, moving into an office along the State Department corridor known as Mahogany Row. Working a few doors down from Pompeo, he's essentially taken control of the department's policy toward Iran.

The group's effort is putting to the test the proposition that the U.S. economy and dollar are so central to the global economic system that American sanctions alone will isolate Iran's economy. That runs counter to the conventional wisdom that Obama-era sanctions against Iran were effective only because other nations participated, particularly U.S. allies in Europe. "I've felt for a long time that we've underestimated our ability to use U.S. tools when they're viewed as a leg to isolate financial and economic rogue behavior," says Juan Zarate, chairman of the Financial Integrity Network and a former deputy national security adviser to Bush. "The argument that our power was slipping away, our ability to maintain sanctions was fading, was a really inaccurate portrayal of where we were."

Trump is going further than any previous president in using American financial power as a weapon—in direct confrontation with his allies, daring them to keep doing business with Iran, even if that brings the threat of U.S. economic punishment and denial to the American market, which is 60 times the size of the Iranian economy. As far as Hook is concerned, the question is settled. "Very few companies are going to choose Iran over the United States," he said at a briefing in late September. "That's just the economic reality."

Hook and his crew have vowed to cut Iranian oil exports to zero, betting that other producers, such as Saudi Arabia and Kuwait, can make up for lost supplies and keep oil prices steady. But markets are already spooked. The price of Brent crude, the global oil benchmark, hit a four-year high of $85 a barrel in early October, up from $55 a year ago.

Rising oil prices could expose the Iran Action Group to what many regard as its biggest threat: Trump himself. With the midterm elections only a month away, the president may be concerned that higher oil prices will hurt Republicans at the polls. He inveighed against rising prices during his speech before the UN General Assembly on Sept. 25, saying, "We are not going to put up with it—these horrible prices—much longer." The risk is that the president will reverse course on Iran, as he did with North Korea, pivoting from belligerence to dealmaking. "Trump appears at first as though he'll never capitulate, but it's a negotiating tactic, and he ultimately wants to do a deal with Iran," says Scott Modell, a former CIA officer and managing director at Rapidan Energy Group. "He would be just fine freezing some aspects of Iran's bad behavior for now and entering into prolonged talks in search of a broader deal, particularly because it's his best chance of keeping U.S. gasoline prices under $3 per gallon." ▶

● Some of the companies that have agreed to stop doing business with Iran

Total

Munich Re

Airbus

Royal Dutch Shell

Adidas

Hyundai

Volkswagen

◀ What are the other threats to the strong-arm approach? Countries such as India and China pose the biggest challenge. Both are major importers of Iranian oil. While China may be willing to spurn the U.S., India is more inclined to cooperate. "The fallout from going alone is serious," says Wendy Sherman, the Obama administration's undersecretary of state who led the negotiating team for the Iran deal. "You take a country like India, which has an election coming up. They want good relations with the United States, no question. But they also don't need an energy crisis."

And no matter how successful the Iran Action Group's campaign is, there's no guarantee Iran will concede. The goal, the State Department says, is to inflict so much economic pain that Iran is compelled to come back to the negotiating table and agree to a deal that not only limits its nuclear program, but also curbs what the U.S. says is Iran's sponsorship of terrorism, its ballistic missile ambitions, and its overall power in the region.

The 12 demands Pompeo has laid out would amount to a wholesale reshaping of Iran and reorientation of its priorities. That's probably asking too much. Iranian leaders are "very astute and very savvy, and they are very tough negotiators," Sherman says. "It's a resistance culture." —*Nick Wadhams and Javier Blas*

THE BOTTOM LINE The Iran Action Group has exceeded expectations in its efforts to win global support for U.S. economic sanctions on Iran.

Who Will Watch the Election Watcher?

● In Georgia, Brian Kemp is running for governor. He'll also certify the results

When not in use, each of Georgia's 27,000 ballot-casting machines collapses to the size of a suitcase. For elections they unfold, storklike, onto spindly legs, with wings to shield their electronic screens. There's a flaw in their engineering, though. The digital memory cards that record votes produce no independent paper trail that can be audited. A citizen can't verify that the equipment has accurately recorded her vote.

Computer scientists have been demonstrating disastrous security issues in these kinds of machines for more than a decade—and Georgia election officials have been aware of the risks since at least 2008. In 2016 it became clear that the threats were neither imaginary nor theoretical and that Georgia's system was among the most exposed and vulnerable in the country. Meanwhile, the man charged with overseeing the state's elections for the past eight years has scoffed at cybersecurity concerns.

That would be Brian Kemp, Georgia's secretary of state, who's running for governor in November and refuses to step aside, unlike past secretaries of state who've become their party's nominee for a higher office. Ryan Mahoney, a spokesman for the campaign, says no one asked Kemp to resign when he ran for reelection in 2014. Why should he do so now?

The race, in which Kemp faces Democrat Stacey Abrams, a former Georgia House minority leader, epitomizes how the major parties diverge on election threats. Kemp has spent years pursuing alleged voting frauds. But they aren't Russian. His targets have included activists who helped elect a majority black school board in a rural area and a group—headed by Abrams—that led a large minority registration drive in 2014.

Kemp has remarkably little to show for his efforts; his critics suggest the real point was intimidation. Now he's a defendant in a suit accusing him and other officials of ignoring the security holes in Georgia's system and allowing elections to proceed, knowing they aren't safe from hackers. The plaintiffs, a group of voters and a nonprofit, sought an injunction to force the state to use paper ballots in the midterms. Kemp has demanded the case be thrown out. Judge Amy Totenberg has expressed frustration. "I'm concerned that we're here at this 11th hour," she said at a hearing in September. "Why are we just dealing with this now?"

"I'm concerned that we're here at this 11th hour. Why are we just dealing with this now?"

After a last-minute endorsement from Trump, Kemp came out on top in the Republican primary for governor in July, which was described by his main opponent, Lieutenant Governor Casey Cagle, as a battle over who could be craziest. In one ad, Kemp pointed a shotgun at his teenage daughter's suitor while lecturing him about respect. In another, he vowed to blow up government spending as an explosion took out a piece of his backyard and climbed into a giant pickup to say in an exaggerated drawl, "I got a big truck, just in case I gotta round up criminal illegals and take 'em home myself."

A former state senator, Kemp was appointed secretary of state in 2010 when Karen Handel stepped down to run for governor. Reelected since, he's focused on policing who is allowed to vote. The Georgia chapters of the American Civil Liberties Union and the NAACP successfully sued him in 2016


▲ Kemp

over a system that blocked more than 30,000 voter registrations when details such as a missing initial or stray hyphen didn't match other public records. Sixty percent of the blocked voters were black, according to Sean Young, legal director for the state ACLU. Under Kemp, Georgia removed 721,202 voters from the rolls from 2012 through 2016 and 668,691 last year. Civil rights groups are threatening to sue over the latest wave of removals, saying they targeted minority voters. Mahoney, the Kemp spokesman, called allegations of voter suppression baseless and says 1 million voters have been added to the rolls. "Thanks to Brian Kemp, it's easy to vote and hard to cheat in Georgia."

In 2016, amid evidence of Russian interference, Kemp called an offer by the U.S. Department of Homeland Security to test Georgia's election cybersecurity an Obama administration attempt "to achieve the goal of federalizing elections under the guise of security." In testimony to Congress that September, he called out "conspiracy theorists, campaigns, and members of the media" as election threats. He also accused DHS of trying to hack Georgia's system in 2016. The "hacks" turned out to be routine web searches for gun licenses.

Not long before that, a local cybersecurity researcher had discovered a far more serious threat. In August 2016, Logan Lamb was nosing around the website of the Center for Election Systems at Kennesaw State University (KSU), which had managed large chunks of the state's voting infrastructure for more than a decade. He says he was hoping to find information about how the center worked, using Google to search for PDF files. Instead, he turned up documents listing tens of thousands of voters, including driver's license numbers. Lamb found he could tap into the databases used to program voting-machine memory cards and tally, store, and report votes for some counties. "I'm not a nation-state adversary like Russia," he says. "I'm pretty sure I had the ability to compromise that server, modify that database, and then get the county workers themselves to put that manipulated file on the poll books."

Lamb immediately contacted Merle King, then the head of the election center, to warn him of the vulnerabilities. King asked him not to publicize what he'd found, saying Lamb would be "crushed" by politicians if he did, according to court filings. But the problems weren't fixed. In February 2017, Lamb and another researcher looked into the system again and found the same flaws. This time the center alerted the FBI—which investigated the incident as a hack. (It did not find that Lamb had broken the law.)

Kemp and state officials downplayed the episode, saying Lamb hadn't gained access to core systems. They focused instead on preparations for a House special election. In July came the lawsuit by the nonprofit Coalition for Good Governance and several state residents accusing Kemp and other officials of negligence for allowing the election to be run on a compromised voting system. They asked the court to declare the results void and stop Georgia from using its equipment.

Days after the suit was filed, KSU destroyed the servers Lamb had tapped into. There's been no accounting of whether anyone at the center or the FBI checked computer logs for malicious hacking. Kemp first expressed outrage but later said the wiping was routine. Last December, though, he ended the state's relationship with the center. He continues to insist elections are secure but concedes the machines should be replaced by 2020.

As for the lawsuit, Kemp's response in an August court filing was derisive: "There is no 'paper ballot fairy' who, with a magic wand at the ready, can save plaintiffs' half-baked 'plans' from devolving into a fiasco." But at a hearing on Sept. 12, Judge Totenberg warned that Georgia can't ignore the problem. "It affects the credibility of the system," she said.

A few days later, Totenberg handed Kemp a reprieve, ruling it was too late to switch to paper for Nov. 6. But she refused to throw out the case, warning election officials they had "buried their heads in the sand." Kemp and other defendants have appealed and filed a motion to stay the case during the process. That could stall things well into 2019. Kemp remains ready to certify the results, his own included. *—Margaret Newkirk and Dune Lawrence*

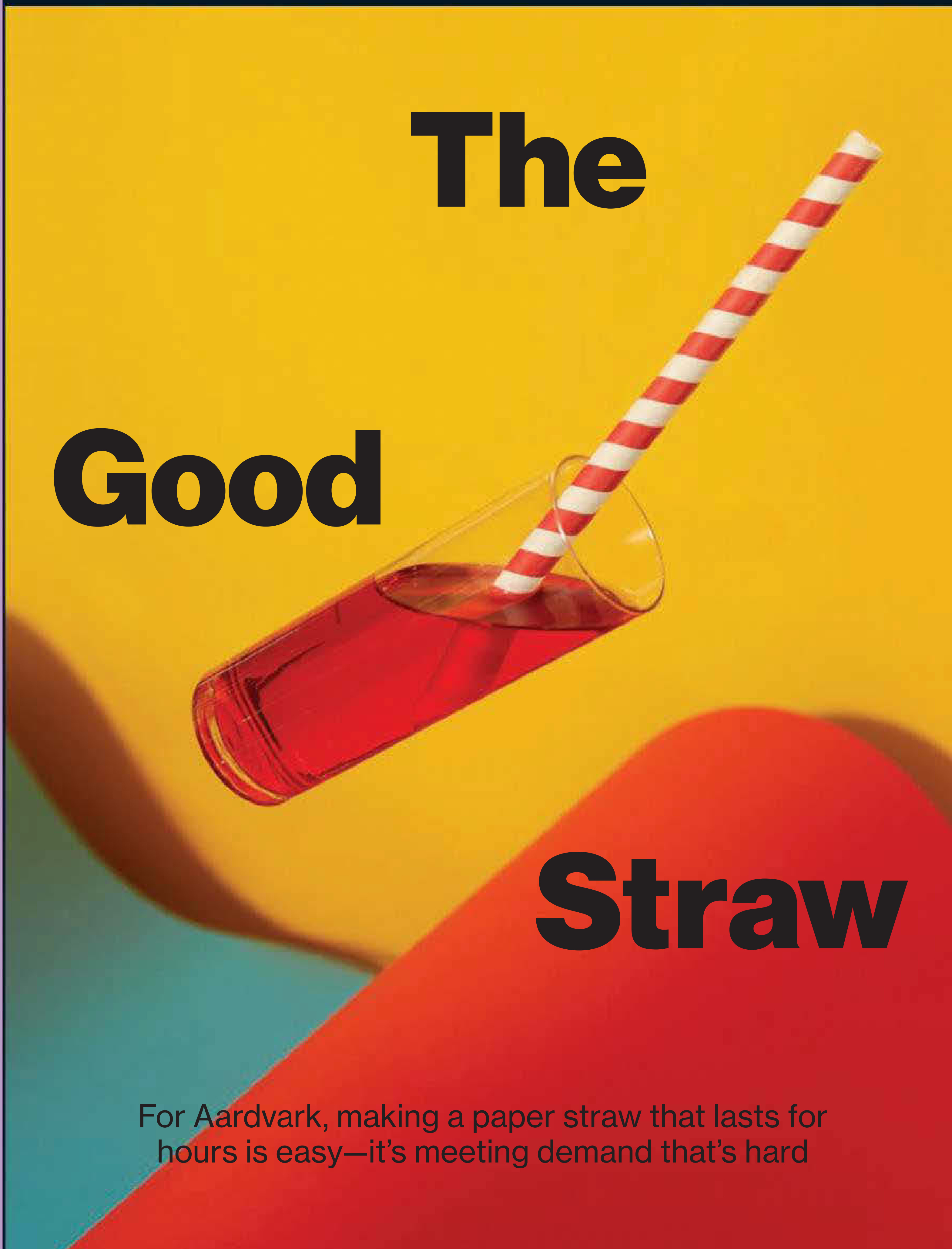
THE BOTTOM LINE In a case that displays the divergence of the major parties on election fraud, a federal court in Atlanta has put Georgia's flawed voting system under intense scrutiny.


▲ Abrams

KEMP: JOHN AMIS/AP PHOTO. ABRAMS: PRINCE WILLIAMS/WIREIMAGE/GETTY IMAGES

+ SOLUTIONS

Manufacturing



The Good Straw

For Aardvark, making a paper straw that lasts for hours is easy—it's meeting demand that's hard

PHOTOGRAPH BY CAROLINE TOMPKINS FOR BLOOMBERG BUSINESSWEEK

October 8, 2018

Edited by
Dimitra Kessenides

Last fall, Porchlight, a Southern-themed cocktail lounge in New York City operated by the Union Square Hospitality Group, decided to ditch plastic straws. So Mark Maynard, the bar's director of operations, decided his staff would test some eco-friendly alternatives. They placed 20 different paper straws in glasses of water. The one from Aardvark, the only company that makes paper straws commercially in the U.S., was the standout, he says. It held together better than the rest for well over an hour.

Offering Aardvark's straws at Porchlight took a little longer than expected. When the bar's procurement office contacted the Fort Wayne, Ind., company to place an order, it was told the wait time could be as long as three months. "They said, 'We're sorry. A lot of people have jumped on board recently,'" Maynard says.

Aardvark got back into the business of making straws in 2007—its roots are in a company dating to 1888 that invented the paper straw—largely because of a growing anti-plastic movement and increasing demand for eco-friendly products. Several companies, including Walt Disney Co. and the Ted's Montana Grill restaurants founded by Ted Turner, reached out to Aardvark that year, asking if it might again make the paper straws it was once known for, according to David Rhodes, the company's global business director. More than 30 years after the onslaught of plastic put an end to that part of its business, Aardvark reengineered its process, refined the paper and the glues used in manufacturing, and issued a basic white straw.

The business started doubling every year, according to Rhodes. Aardvark was making millions of the product annually—and introducing innovations along the way, such as different sizes and designs and safe colors. What the company hadn't foreseen was how fast demand would rise. "In 2017 to 2018, it went from double to 50 times the business," Rhodes says, "Most businesses would have a hard time reacting to that."

In the spring of this year, Aardvark decided to seek an investor to help it increase capacity. "We didn't have the resources to grow to the level that we needed to be," Rhodes says. After approaching several companies, it was acquired on Aug. 6 by Hoffmaster Group Inc., a 71-year-old Oshkosh, Wis.-based manufacturer of disposable kitchen goods. Hoffmaster had been an Aardvark customer and knew about its straws. "Over the past nine years, Aardvark developed the best blend of paper that would be compostable but hold up against liquid," says Andy Romjue, president of Hoffmaster's food service division. Hoffmaster also makes paper products, potentially a source of engineering know-how for Aardvark.

"Our short-term objective is, by January or February 2019, to have seven times the production capacity we had when we took over," says Romjue. Rhodes says the company produces millions of straws per day.

Making paper straws is relatively simple. Large sheets are slit to narrow widths, then wound in spirals around long, skinny tubes to create the shape. There are options for specialty straws, from custom designs to extra-wide ones for shakes. Aardvark's challenge is making more, faster, and of the same high quality. The Hoffmaster investment is mostly focused on equipment to boost output, as well as expanding facilities and hiring more workers. Aardvark had started ramping up production even before the deal because of the time it takes to have equipment running at full capacity. "It takes a few months to build a piece of equipment"—Aardvark makes its own—"and to train the operators, who function more as artisans," Rhodes says.

Most of the process is secret, and the company operates a closed plant. It's also a sustainable business, Rhodes says. The paper is sourced from trees Aardvark grows to avoid deforestation and to provide the greenest substitute for plastic. "If you're trying to eliminate single-use plastics that get into waterways and get into the ocean, the plastic straw to paper straw movement is the gateway," he says. "It's a sustainable option that's relatively easy and, at only a penny more than plastic per straw, economically viable." Plastic straws cost about half a cent each, Rhodes adds.

The company isn't too worried about competition, despite the threat of China. That country's paper straws are the ones that have given the drinking implement such a bad rap, he says. "Making a good paper straw isn't easy," Rhodes says. Also, building an operation to rival Aardvark's can't happen overnight. "It takes awhile to develop a sustainable and green business like this," he says. "You have to get compostability and biodegradability testing and then certification" from the Food and Drug Administration.

The company's biggest customers are theme parks and major restaurant chains, including McDonald's Corp. and Disney. "Everybody who has made claims about transitions—restaurants, coffee shops—we are in conversations about servicing them," says Romjue. "But as each new municipality puts laws in place, we shift to help folks in need. If you can't have plastic straws in Seattle, we'll prioritize that over Nebraska."

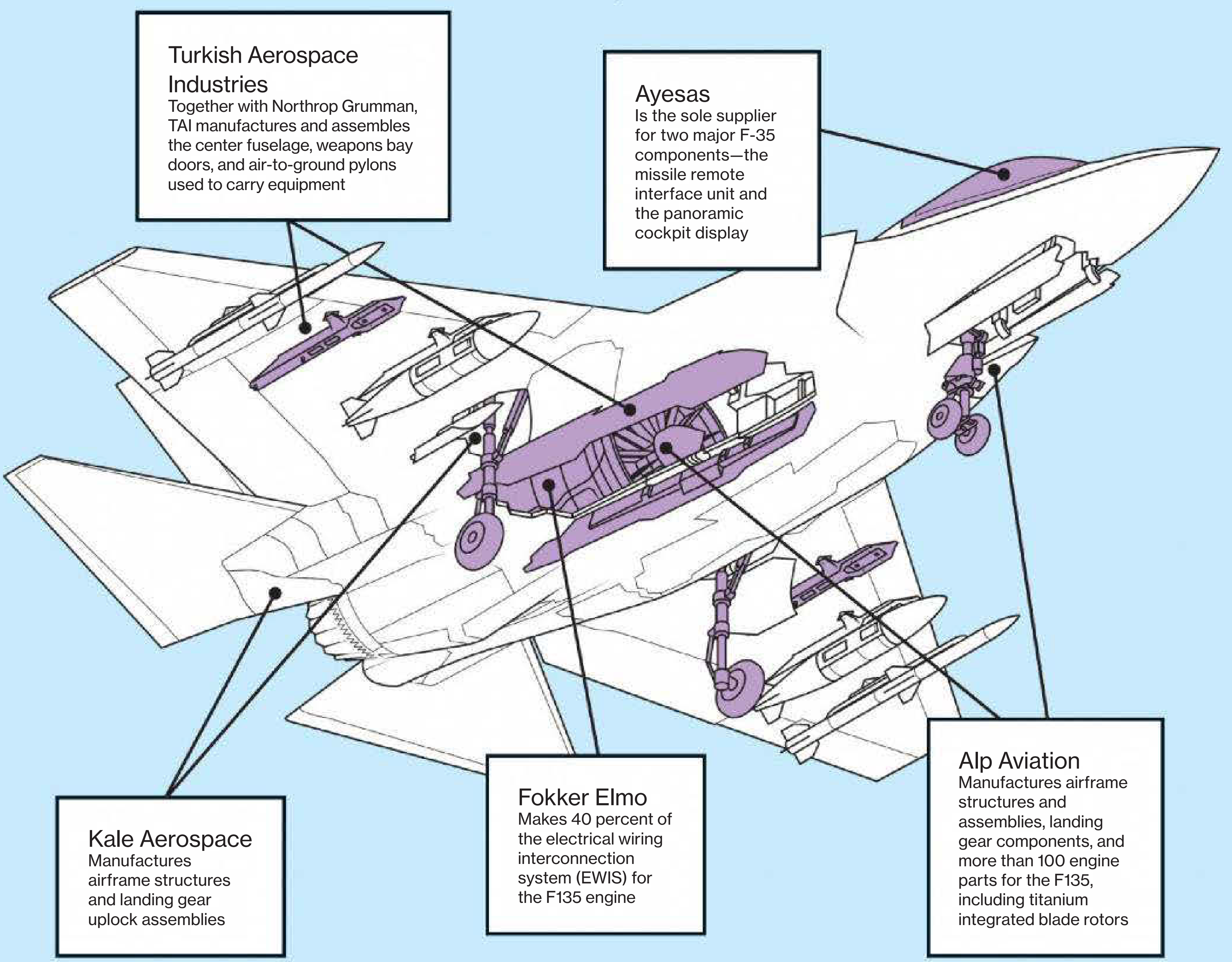
However much Aardvark increases its output, Rhodes cautions that the switch to paper takes more time than many businesses realize. "We try to work with new customers and prospective buyers and tell them to be mindful that they can't just turn this on," he says. "In the 1960s, when the plastics industry came in to the business, it took them almost a decade to build out the structure to move Americans away from paper straws."
—*Kate Krader*

THE BOTTOM LINE The sustainability movement has everyone clamoring for paper straws. The problem? Procuring good ones takes awhile, especially because there's only one company that makes them in the U.S.

Defense

Lockheed's Turkish Headache

In August, Congress passed legislation that could block the sale of 100 of Lockheed Martin Corp.'s F-35 fighter jets to Turkey because of an agreement the Turks have to buy a Russian air defense system. That's creating problems. Turkey is a global leader in aerospace manufacturing, and 10 Turkish companies will make about $12 billion worth of parts for the F-35, including key components such as the center fuselage and some landing gear. For certain items, like the cockpit display, Turkey is the only source in the world.



A Risk to Supplies?

If the U.S. blocks the jet deal, Turkish President Recep Tayyip Erdogan could cut off the flow of parts from his country. "If the Turkish supply chain was disrupted today, it would result in an aircraft production break, delaying delivery of 50-75 jets and would take approximately 18-24 months to re-source parts," U.S. Secretary of Defense Jim Mattis wrote in July in a letter to Congress. Erdogan has said little about how he might respond. Mattis must submit a report to Congress by mid-November on the potential impact of any change to Turkey's participation. Lockheed says for now the sale to the Turks is on track. —*Robert Levinson*

ILLUSTRATION BY CHRIS PHILPOT

Lidar Will Bring More Robots to Factories

Veo Robotics is using the laser technology to end safety fears in car manufacturing

Most automakers use robots to weld and paint the metal bodies of their cars. But the final assembly line, consisting of about 500 ever-changing tasks such as the installation of engines, dashboards, and seats, has defied most efforts to replace workers with robots. There's a good reason: Increasing automation requires robots to cooperate with humans on the factory floor, and that can be dangerous.

"Being with a robot in a tight space is like standing next to a horse," says Patrick Sobalvarro, co-founder of Veo Robotics Inc. of Waltham, Mass. "If the horse is calm and likes you, and knows where you are, you're perfectly safe. But you have to know it's not going to surprise you or step on you or crush you against the wall."

Veo has pioneered the use of three-dimensional flash lidar—which bounces lasers off objects to help determine what's nearby—to create real-time maps of robots, humans, and everything else inside a factory. Its proprietary software slows a robot down and stops it when a human gets too close. The system also shuts all nearby robots when it can't positively identify what's happening in a workstation.

Lidar, and its blend of sensing and computer analysis in real time, is making self-driving cars a reality. As costs drop, the technology is spreading. A Velodyne Lidar Inc. sensor that sold for $75,000 a decade ago can be had today for $99. Alphabet Inc.'s Waymo and General Motors Co.'s Cruise unit, front-runners in the autonomous vehicle race, rely on lidar sensors. Almost $1 billion has been invested in automotive lidar companies over the past four years, according to a report by Bloomberg NEF.

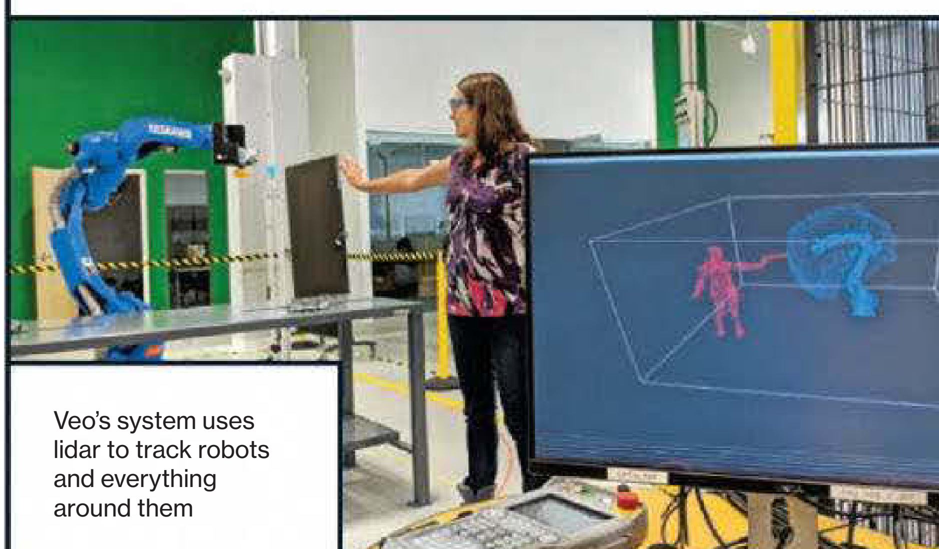
"Veo is the first to use lidar on the assembly line," says Joe Gemma, chief executive officer in the U.S. for Kuka Robotics Corp. Kuka, whose customers include Tesla Inc. and GM, is helping the startup test its system. "We think of final assembly as the holy grail of automation," he says. "We've really been lacking in our ability to use automation in this area because of the additional cost of protecting people working in close proximity. These new lidar technologies could change this."

Guided by Veo sensors, robots could install windshields and seats, Gemma says. Humans would still be around, using their dexterity and judgment to solve problems. That's not what happened in the 1980s, when a GM automation campaign led to robots that painted each other instead of cars, or earlier this year, when Tesla had to scrap a robotic conveyance system used to bring parts to the line.

Veo is also working with other big industrial robot manufacturers, including Fanuc Corp. and Yaskawa Electric Corp., to run experiments for aircraft manufacturers, oil and gas drillers, and appliance makers. Veo's potential annual revenue, Sobalvarro says, could top $1 billion in five years.

That's a bold claim for a company that so far has only $13 million in funding from Google Ventures, Lux Capital Management, and Next47, a venture firm started by Siemens AG. Veo might raise more this fall just as it starts shipping to customers.

In a video demonstration, Sobalvarro places lidar sensors around a 6-foot-tall Kuka robot that lifts a 15-pound suspension component onto a table so workers can attach other parts. Such human-machine interaction cuts the time to install rubber bushings, used to reduce noise and vibration, to 24 seconds from 43.



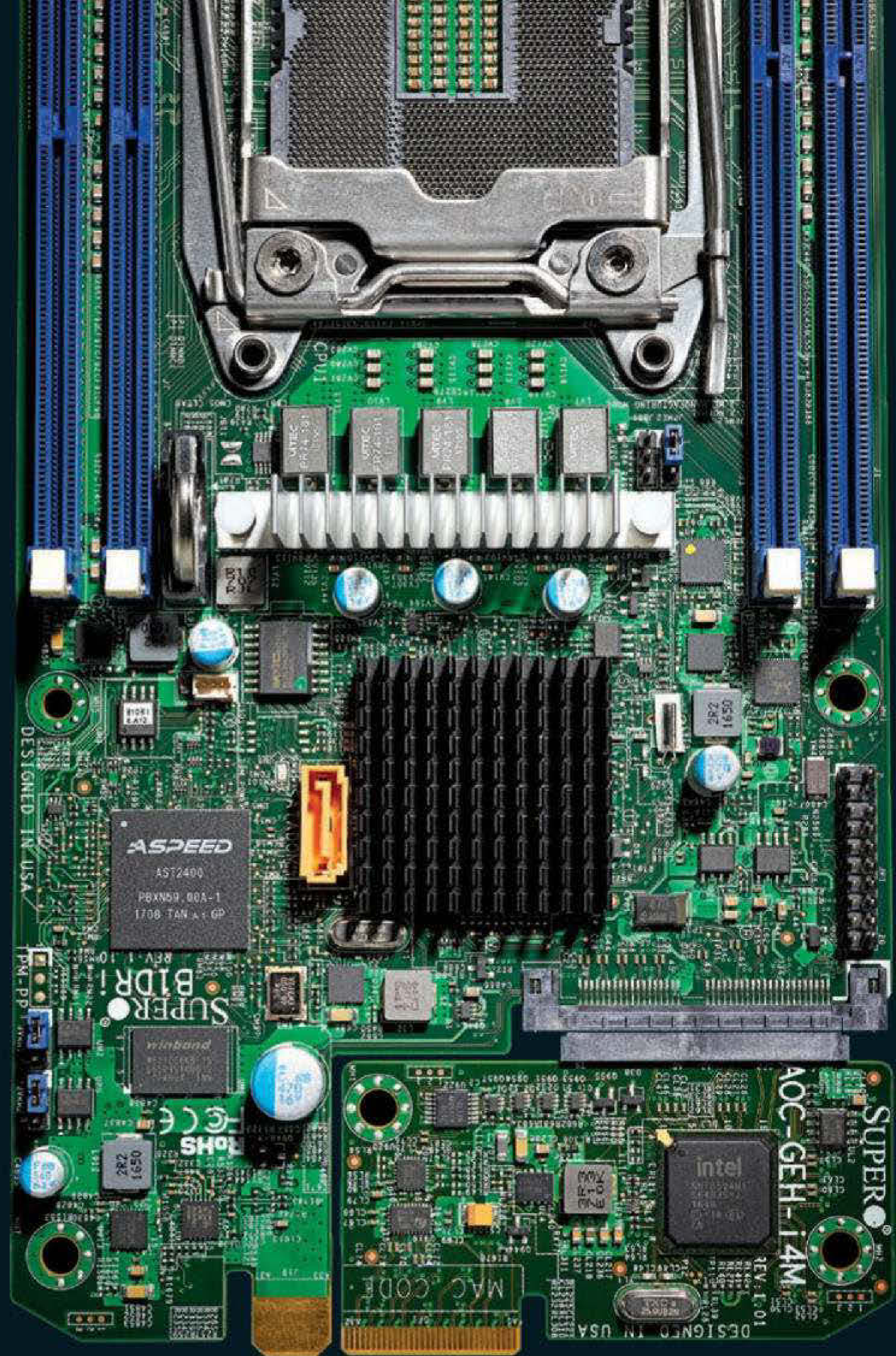
Veo's system uses lidar to track robots and everything around them

The safety constraints required for today's factory robots can make even routine maintenance tricky. The copper tips on robots that weld metal car bodies wear out constantly because of high temperature and voltage. Changing one takes less than two minutes but often requires more time because a supervisor has to authorize the padlocking of surrounding robots before anyone can climb inside the metal safety cage.

Veo's technology provides electronic assurance that the robots will stop when necessary. "Our dream is to walk into a factory and have any machine you approach go into a 'safe mode' until you leave," Sobalvarro says. "It's the end of fear." —*John Lippert*

THE BOTTOM LINE Veo, which has raised about $13 million from Google Ventures and Siemens's VC firm among others, says annual sales could top $1 billion in five years.

COURTESY VEO ROBOTICS



Everyone from Amazon to Apple to the U.S. military used this piece of equipment from a company in California.

China hacked it with one tiny chip

The Big Hack
An investigative report

By Jordan Robertson and Michael Riley

Photographs by Victor Prado
Illustrations by Scott Gelber

In 2015, Amazon.com Inc. began quietly evaluating a startup called Elemental Technologies, a potential acquisition to help with a major expansion of its streaming video service, known today as Amazon Prime Video. Based in Portland, Ore., Elemental made software for compressing massive video files and formatting them for different devices. Its technology had helped stream the Olympic Games online, communicate with the International Space Station, and funnel drone footage to the Central Intelligence Agency. Elemental's national security contracts weren't the main reason for the proposed acquisition, but they fit nicely with Amazon's government businesses, such as the highly secure cloud that Amazon Web Services (AWS) was building for the CIA.

To help with due diligence, AWS, which was overseeing the prospective acquisition, hired a third-party company to scrutinize Elemental's security, according to one person familiar with the process. The first pass uncovered troubling issues, prompting AWS to take a closer look at Elemental's main product: the expensive servers that customers installed in their networks to handle the video compression. These servers were assembled for Elemental by Super Micro Computer Inc., a San Jose-based company (commonly known as Supermicro) that's also one of the world's biggest suppliers of server motherboards, the fiberglass-mounted clusters of chips and capacitors that act as the neurons of data centers large and small. In late spring of 2015, Elemental's staff boxed up several servers and sent them to Ontario, Canada, for the third-party security company to test, the person says.

Nested on the servers' motherboards, the testers found a tiny microchip, not much bigger than a grain of rice, that wasn't part of the boards' original design. Amazon reported the discovery to U.S. authorities, sending a shudder through the intelligence community. Elemental's servers could be found in Department of Defense data centers, the CIA's drone operations, and the onboard networks of Navy warships. And Elemental was just one of hundreds of Supermicro customers.

During the ensuing top-secret probe, which remains open more than three years later, investigators determined that the chips allowed the attackers to create a stealth doorway into any network that included the altered machines. Multiple people familiar with the matter say investigators found that the chips had been inserted at factories run by manufacturing subcontractors in China.

This attack was something graver than the software-based incidents the world has grown accustomed to seeing. Hardware hacks are more difficult to pull off and potentially more devastating, promising the kind of long-term, stealth access that spy agencies are willing to invest millions of dollars and many years to get.

There are two ways for spies to alter the guts of computer equipment. One, known as interdiction, consists of manipulating devices as they're in transit from manufacturer to customer. This approach is favored by U.S. spy agencies, according to documents leaked by former National Security Agency contractor Edward Snowden. The other method involves seeding changes from the very beginning.

One country in particular has an advantage executing this kind of attack: China, which by some estimates makes 75 percent of the world's mobile phones and 90 percent of its PCs. Still, to actually accomplish a seeding attack would mean developing a deep understanding of a product's design, manipulating components at the factory, and ensuring that the doctored devices made it through the global logistics chain to the desired location—a feat akin to throwing a stick in the Yangtze River upstream from Shanghai and ensuring that it washes ashore in Seattle. "Having a well-done, nation-state-level hardware implant surface would be like witnessing a unicorn jumping over a rainbow," says Joe Grand, a hardware hacker and the founder of Grand Idea Studio Inc. "Hardware is just so far off the radar, it's almost treated like black magic."

But that's just what U.S. investigators found: The chips had been inserted during the manufacturing process, two officials say, by operatives from a unit of the People's Liberation Army. In Supermicro, China's spies appear to have found a perfect conduit for what U.S. officials now describe as the most significant supply chain attack known to have been carried out against American companies.

One official says investigators found that it eventually affected almost 30 companies, including a major bank, government contractors, and the world's most valuable company, Apple Inc. Apple was an important Supermicro customer and had planned to order more than 30,000 of its servers in two years for a new global network of data centers. Three senior insiders at Apple say that in the summer of 2015, it, too, found malicious chips on Supermicro motherboards. Apple severed ties with Supermicro the following year, for what it described as unrelated reasons.

In emailed statements, Amazon (which announced its acquisition of Elemental in September 2015), Apple, and Supermicro disputed summaries of *Bloomberg Businessweek*'s reporting. "It's untrue that AWS knew about a supply chain compromise, an issue with malicious chips, or hardware modifications when acquiring Elemental," Amazon wrote. "On this we can be very clear: Apple has never found malicious chips, 'hardware manipulations' or vulnerabilities purposely planted in any server," Apple wrote. "We remain unaware of any such investigation," wrote a spokesman for Supermicro, Perry Hayes. The Chinese government didn't directly address questions about manipulation of Supermicro servers, issuing a statement that read, in part, "Supply chain safety in cyberspace is an issue of common concern, and China is also a victim." (Full statements are published at the end of this story.) The FBI and the Office of the Director of National Intelligence, representing the CIA and NSA, declined to comment.

The companies' denials are countered by six current and former senior national security officials, who—in conversations that began during the Obama administration and continued under the Trump administration—detailed the discovery of the chips and the government's investigation. One of those officials and two people inside AWS provided extensive information on how the attack played out at Elemental and Amazon; the official and one of the insiders also described Amazon's cooperation with the government investigation. In addition to the three Apple insiders, four of the six U.S. officials confirmed that Apple was a victim. In all, 17 people confirmed the manipulation of Supermicro's hardware and other elements of the attacks. The sources were granted anonymity because of the sensitive, and in some cases classified, nature of the information.

One government official says China's goal was long-term access to high-value corporate secrets and sensitive government networks. No consumer data is known to have been stolen.

The ramifications of the attack continue to play out. The Trump administration has made computer and networking hardware, including motherboards, a focus of its latest round of trade sanctions against China, and White House officials have made it clear they think companies will begin shifting their supply chains to other countries as a result. Such a shift might assuage officials who have been warning for years about the security of the supply chain—even though they've never disclosed a major reason for their concerns.

> "Having a well-done, nation-state-level hardware implant surface would be like witnessing a unicorn jumping over a rainbow"

Back in 2006, three engineers in Oregon had a clever idea. Demand for mobile video was about to explode, and they predicted that broadcasters would be desperate to transform programs designed to fit TV screens into the various formats needed for viewing on smartphones, laptops, and other devices. To meet the anticipated demand, the engineers started Elemental Technologies, assembling what one former adviser to the company calls a genius team to write code that would adapt the superfast graphics chips being produced for high-end video-gaming machines. The resulting software dramatically reduced the time it took to process large video files. Elemental then loaded the software onto custom-built servers emblazoned with its leprechaun-green logos.

Elemental servers sold for as much as $100,000 each, at profit margins of as high as 70 percent, according to a former adviser to the company. Two of Elemental's biggest early clients were the Mormon church, which used the technology to beam sermons to congregations around the world, and the adult film industry, which did not.

Elemental also started working with American spy agencies. In 2009 the company announced a development partnership with In-Q-Tel Inc., the CIA's investment arm, a deal that paved the way for Elemental servers to be used in national security missions across the U.S. government. Public documents, including the company's own promotional materials, show that the servers have been used inside Department of Defense data centers to process drone and surveillance-camera footage, on Navy warships to transmit feeds of airborne missions, and inside government buildings to enable secure videoconferencing. NASA, both houses of Congress, and the Department of Homeland Security have also been customers. This portfolio made Elemental a target for foreign adversaries.

Supermicro had been an obvious choice to build Elemental's servers. Headquartered north of San Jose's airport, up a smoggy stretch of Interstate 880, the company was founded by Charles Liang, a Taiwanese engineer who attended graduate school in Texas and then moved west to start Supermicro with his wife in 1993. Silicon Valley was then embracing outsourcing, forging a pathway from Taiwanese, and later Chinese, factories to American consumers, and Liang added a comforting advantage: Supermicro's motherboards would be engineered mostly in San Jose, close to the company's biggest clients, even if the products were manufactured overseas.

Today, Supermicro sells more server motherboards than almost anyone else. It also dominates the $1 billion market for boards used in special-purpose computers, from MRI machines to weapons systems. Its motherboards can be ▶

◀ found in made-to-order server setups at banks, hedge funds, cloud computing providers, and web-hosting services, among other places. Supermicro has assembly facilities in California, the Netherlands, and Taiwan, but its motherboards—its core product—are nearly all manufactured by contractors in China.

The company's pitch to customers hinges on unmatched customization, made possible by hundreds of full-time engineers and a catalog encompassing more than 600 designs. The majority of its workforce in San Jose is Taiwanese or Chinese, and Mandarin is the preferred language, with *hanzi* filling the whiteboards, according to six former employees. Chinese pastries are delivered every week, and many routine calls are done twice, once for English-only workers and again in Mandarin. The latter are more productive, according to people who've been on both. These overseas ties, especially the widespread use of Mandarin, would have made it easier for China to gain an understanding of Supermicro's operations and potentially to infiltrate the company. (A U.S. official says the government's probe is still examining whether spies were planted inside Supermicro or other American companies to aid the attack.)

With more than 900 customers in 100 countries by 2015, Supermicro offered inroads to a bountiful collection of sensitive targets. "Think of Supermicro as the Microsoft of the hardware world," says a former U.S. intelligence official who's studied Supermicro and its business model. "Attacking Supermicro motherboards is like attacking Windows. It's like attacking the whole world."

Well before evidence of the attack surfaced inside the networks of U.S. companies, American intelligence sources were reporting that China's spies had plans to introduce malicious microchips into the supply chain. The sources weren't specific, according to a person familiar with the information they provided, and millions of motherboards are shipped into the U.S. annually. But in the first half of 2014, a different person briefed on high-level discussions says, intelligence officials went to the White House with something more concrete: China's military was preparing to insert the chips into Supermicro motherboards bound for U.S. companies.

The specificity of the information was remarkable, but so were the challenges it posed. Issuing a broad warning to Supermicro's customers could have crippled the company, a major American hardware maker, and it wasn't clear from the intelligence whom the operation was targeting or what its ultimate aims were. Plus, without confirmation that anyone had been attacked, the FBI was limited in how it could respond. The White House requested periodic updates as information came in, the person familiar with the discussions says.

Apple made its discovery of suspicious chips inside Supermicro servers around May 2015, after detecting odd network activity and firmware problems, according to a person familiar with the timeline. Two of the senior Apple insiders say the company reported the incident to the FBI but kept details about what it had detected tightly held, even internally. Government investigators were still chasing clues on their own when Amazon made its discovery and gave them access to sabotaged hardware, according to one U.S. official. This created an invaluable opportunity for intelligence agencies and the FBI—by then running a full investigation led by its cyber- and counterintelligence teams—to see what the chips looked like and how they worked.

The chips on Elemental servers were designed to be as inconspicuous as possible, according to one person who saw a detailed report prepared for Amazon by its third-party security contractor, as well as a second person who saw digital photos and X-ray images of the chips incorporated into a later report prepared by Amazon's security team. Gray or off-white in color, they looked more like signal conditioning couplers, another common motherboard component, than microchips, and so they were unlikely to be detectable without specialized equipment. Depending on the board model, the chips varied slightly in size, suggesting that the attackers had supplied different factories with different batches.

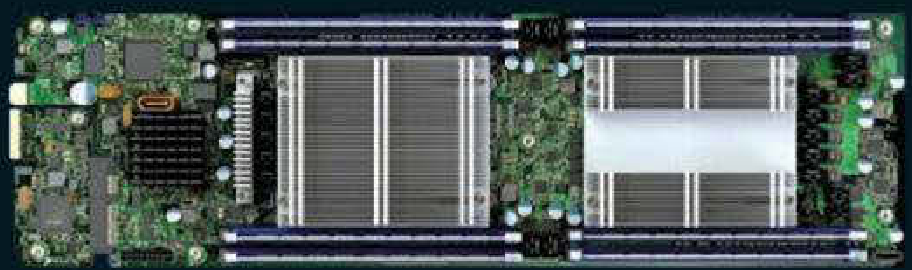
Officials familiar with the investigation say the primary role of implants such as these is to open doors that other attackers can go through. "Hardware attacks are about access," as one former senior official puts it. In simplified terms, the implants on Supermicro hardware manipulated the core operating instructions that tell the server what to do as data move across a motherboard, two people familiar with the chips' operation say. This happened at a crucial moment, as small bits of the operating system were being stored in the board's temporary memory en route to the server's central processor, the CPU. The implant was placed on the board in a way that allowed it to effectively edit this information queue, injecting its own code or altering the order of the instructions the CPU was meant to follow. Deviously small changes could create disastrous effects.

Since the implants were small, the amount of code they contained was small as well. But they were capable of doing two very important things: telling the device to communicate with one of several anonymous computers elsewhere on the internet that were loaded with more complex code; and preparing the device's operating system to accept this new code. The illicit chips could do all this because they were connected to the baseboard management controller, a kind of superchip that administrators use to remotely log in to problematic servers, giving them access to the most sensitive code even on machines that have crashed or are turned off.

This system could let the attackers alter how the device functioned, line by line, however they wanted, leaving no one the wiser. To understand the power that would give them, take this hypothetical example: Somewhere in the Linux operating system, which runs in many servers, is code that authorizes a user by verifying a typed password against a stored encrypted one. An implanted chip can alter part of that code so the server won't check for a password—and presto! A secure machine is open to any and all users. A chip can also steal encryption keys for secure communications, block security updates that would neutralize the attack, and open up new pathways to the internet. Should some anomaly be noticed, it would likely be ▶

How the Hack Worked, According to U.S. Officials

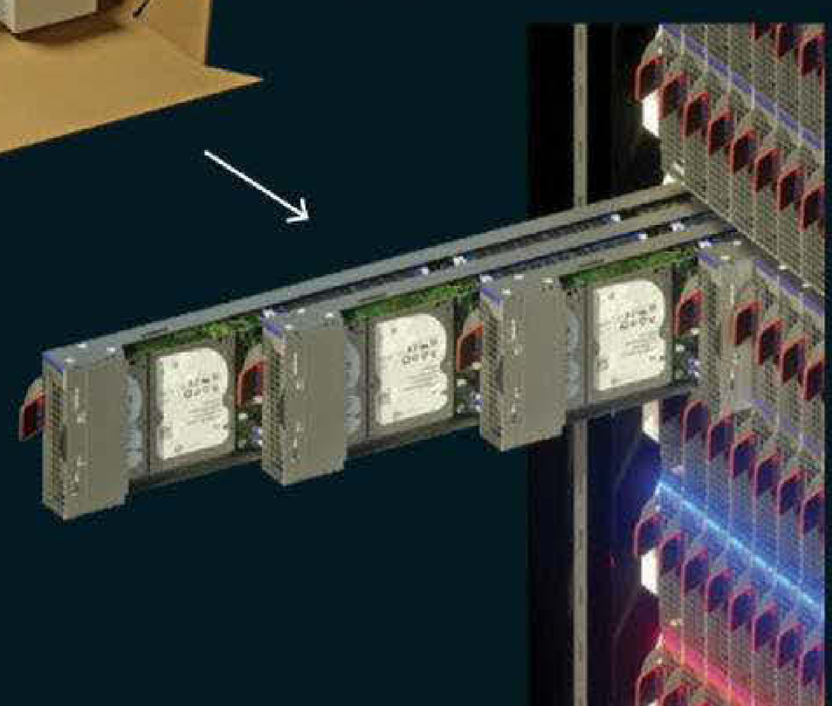
❶ A Chinese military unit designed and manufactured microchips as small as a sharpened pencil tip. Some of the chips were built to look like signal conditioning couplers, and they incorporated memory, networking capability, and sufficient processing power for an attack.



❷ The microchips were inserted at Chinese factories that supplied Supermicro, one of the world's biggest sellers of server motherboards.

❸ The compromised motherboards were built into servers assembled by Supermicro.

❹ The sabotaged servers made their way inside data centers operated by dozens of companies.



❺ When a server was installed and switched on, the microchip altered the operating system's core so it could accept modifications. The chip could also contact computers controlled by the attackers in search of further instructions and code.

◀ cast as an unexplained oddity. "The hardware opens whatever door it wants," says Joe FitzPatrick, founder of Hardware Security Resources LLC, a company that trains cybersecurity professionals in hardware hacking techniques.

U.S. officials had caught China experimenting with hardware tampering before, but they'd never seen anything of this scale and ambition. The security of the global technology supply chain had been compromised, even if consumers and most companies didn't know it yet. What remained for investigators to learn was how the attackers had so thoroughly infiltrated Supermicro's production process—and how many doors they'd opened into American targets.

The security of the global technology supply chain had been compromised, even if consumers and most companies didn't know it yet

Unlike software-based hacks, hardware manipulation creates a real-world trail. Components leave a wake of shipping manifests and invoices. Boards have serial numbers that trace to specific factories. To track the corrupted chips to their source, U.S. intelligence agencies began following Supermicro's serpentine supply chain in reverse, a person briefed on evidence gathered during the probe says.

As recently as 2016, according to *DigiTimes*, a news site specializing in supply chain research, Supermicro had three primary manufacturers constructing its motherboards, two headquartered in Taiwan and one in Shanghai. When such suppliers are choked with big orders, they sometimes parcel out work to subcontractors. In order to get further down the trail, U.S. spy agencies drew on the prodigious tools at their disposal. They sifted through communications intercepts, tapped informants in Taiwan and China, even tracked key individuals through their phones, according to the person briefed on evidence gathered during the probe. Eventually, that person says, they traced the malicious chips to four subcontracting factories that had been building Supermicro motherboards for at least two years.

As the agents monitored interactions among Chinese officials, motherboard manufacturers, and middlemen, they glimpsed how the seeding process worked. In some cases, plant managers were approached by people who claimed to represent Supermicro or who held positions suggesting a connection to the government. The middlemen would request changes to the motherboards' original designs, initially offering bribes in conjunction with their unusual requests. If that didn't work, they threatened factory managers with inspections that could shut down their plants. Once arrangements were in place, the middlemen would organize delivery of the chips to the factories.

The investigators concluded that this intricate scheme was the work of a People's Liberation Army unit specializing in hardware attacks, according to two people briefed on its activities. The existence of this group has never been revealed before, but one official says, "We've been tracking these guys for longer than we'd like to admit." The unit is believed to focus on high-priority targets, including advanced commercial technology and the computers of rival militaries. In past attacks, it targeted the designs for high-performance computer chips and computing systems of large U.S. internet providers.

Provided details of *Businessweek*'s reporting, China's Ministry of Foreign Affairs sent a statement that said "China is a resolute defender of cybersecurity." The ministry added that in 2011, China proposed international guarantees on hardware security along with other members of the Shanghai Cooperation Organization, a regional security body. The statement concluded, "We hope parties make less gratuitous accusations and suspicions but conduct more constructive talk and collaboration so that we can work together in building a peaceful, safe, open, cooperative and orderly cyberspace."

The Supermicro attack was on another order entirely from earlier episodes attributed to the PLA. It threatened to have reached a dizzying array of end users, with some vital ones in the mix. Apple, for its part, has used Supermicro hardware in its data centers sporadically for years, but the relationship intensified after 2013, when Apple acquired a startup called Topsy Labs, which created superfast technology for indexing and searching vast troves of internet content. By 2014, the startup was put to work building small data centers in or near major global cities. This project, known internally as Ledbelly, was designed to make the search function for Apple's voice assistant, Siri, faster, according to the three senior Apple insiders.

Documents seen by *Businessweek* show that in 2014, Apple planned to order more than 6,000 Supermicro servers for installation in 17 locations, including Amsterdam, Chicago, Hong Kong, Los Angeles, New York, San Jose, Singapore, and Tokyo, plus 4,000 servers for its existing North Carolina and Oregon data centers. Those orders were supposed to double, to 20,000, by 2015. Ledbelly made Apple an important Supermicro customer at the exact same time the PLA was found to be manipulating the vendor's hardware.

Project delays and early performance problems meant that around 7,000 Supermicro servers were humming in Apple's network by the time the company's security team found the added chips. Because Apple didn't, according to a U.S. official, provide government investigators with access to its facilities or the tampered hardware, the extent of the attack there remained outside their view.

American investigators eventually figured out who else had been hit. Since the implanted chips were designed to ping anonymous computers on the internet for further instructions, operatives could hack those computers to identify others who'd been affected. Although the investigators couldn't be sure they'd found every victim, a person familiar with the U.S. probe says they ultimately concluded that the number was almost 30 companies.

That left the question of whom to notify and how. U.S. officials had been warning for years that hardware made by two Chinese telecommunications giants, Huawei Corp. and ZTE Corp., was subject to Chinese government manipulation. (Both Huawei and ZTE have said no such tampering has occurred.) But a similar public alert regarding a U.S. company was out of the question. Instead, officials reached out to a small number of important Supermicro customers. One executive of a large web-hosting company says the message he took away from the exchange was clear: Supermicro's hardware couldn't be trusted. "That's been the nudge to everyone–get that crap out," the person says.

Amazon, for its part, began acquisition talks with an Elemental competitor, but according to one person familiar with Amazon's deliberations, it reversed course in the summer of 2015 after learning that Elemental's board was nearing a deal with another buyer. Amazon announced its acquisition of Elemental in September 2015, in a transaction whose value one person familiar with the deal places at $350 million. Multiple sources say that Amazon intended to move Elemental's software to AWS's cloud, whose chips, motherboards, and servers are typically designed in-house and built by factories that Amazon contracts from directly.

A notable exception was AWS's data centers inside China, which were filled with Supermicro-built servers, according to two people with knowledge of AWS's operations there. Mindful of the Elemental findings, Amazon's security team conducted its own investigation into AWS's Beijing facilities and found altered motherboards there as well, including more sophisticated designs than they'd previously encountered. In one case, the malicious chips were thin enough that they'd been embedded between the layers of fiberglass onto which the other components were attached, according to one person who saw pictures of the chips. That generation of chips was smaller than a sharpened pencil tip, the person says. (Amazon denies that AWS knew of servers found in China containing malicious chips.)

China has long been known to monitor banks, manufacturers, and ordinary citizens on its own soil, and the main customers of AWS's China cloud were domestic companies or foreign entities with operations there. Still, the fact that the country appeared to be conducting those operations inside Amazon's cloud presented the company with a Gordian knot. Its security team determined that it would be difficult to quietly remove the equipment and that, even if they could devise a way, doing so would alert the attackers that the chips had ▶

More Elements of the Attack

Even as Amazon, Apple, and U.S. officials were investigating malicious microchips embedded in Supermicro server motherboards, Supermicro was the target of at least two other possible forms of attack, people familiar with multiple corporate probes say.

The first of the other two prongs involved a Supermicro online portal that customers used to get critical software updates, and that was breached by China-based attackers in 2015. The problem, which was never made public, was identified after at least two Supermicro customers downloaded firmware—software installed in hardware components—meant to update their motherboards' network cards, key components that control communications between servers running in a data center. The code had been altered, allowing the attackers to secretly take over a server's communications, according to samples passed around at the time among a small group of Supermicro customers. One of these customers was Facebook Inc.

"In 2015, we were made aware of malicious manipulation of software related to Supermicro hardware from industry partners through our threat intelligence industry sharing programs," Facebook said in an emailed statement. "While Facebook has purchased a limited number of Supermicro hardware for testing purposes confined to our labs, our investigations reveal that it has not been used in production, and we are in the process of removing them."

The victims considered the faulty code a serious breach. Firmware updates obtained directly from the manufacturer are usually assumed to be secure. Firmware is tailored to specific types of computer hardware and embedded directly into those parts, where it provides a narrow set of operating instructions. Detecting attacks at this level requires specialized security programs, so the code is rarely scanned for bugs. By corrupting Supermicro's update mechanism, the attackers were trying to get customers to infect themselves. While the chip and software attacks could be effective on their own, security experts say these approaches could also be used in concert, with the corrupted network cards amplifying the capabilities of the embedded chips.

In its denial that a chip attack had reached its server network, Apple did acknowledge to *Bloomberg Businessweek* that it had encountered malware downloaded from Supermicro's customer portal. Apple said the infection occurred in 2016, months after the events described by Facebook, and involved a single Windows-based server in one of the company's labs. The malware was on a network card driver, which is distinct from firmware and allows an operating system and a piece of hardware to communicate. This was the reason Apple gave for dropping Supermicro as a supplier later that year. "As a matter of practice, before servers are put into production at Apple they are inspected for security vulnerabilities and we update all firmware and software with the latest protections," Apple said in its statement to *Businessweek*. "We did not uncover any unusual vulnerabilities in the servers we purchased from Super Micro when we updated the firmware and software according to our standard procedures."

However, a person familiar with Apple's investigation says that around the time the company discovered malicious chips, it also found a more serious problem with network cards on Supermicro motherboards. Some Supermicro servers had network cards that came with outdated firmware, so the machines that were delivered to customers contained a critical security vulnerability that had been fixed in newer versions. This was potentially a third avenue of attack. Security experts say attackers could take advantage of a known firmware vulnerability in the same way they would use a more traditional software exploit. Once inside a target network, hackers could seek out servers with the dated code and easily infect them.

◀ been found, according to a person familiar with the company's probe. Instead, the team developed a method of monitoring the chips. In the ensuing months, they detected brief check-in communications between the attackers and the sabotaged servers but didn't see any attempts to remove data. That likely meant either that the attackers were saving the chips for a later operation or that they'd infiltrated other parts of the network before the monitoring began. Neither possibility was reassuring.

When in 2016 the Chinese government was about to pass a new cybersecurity law—seen by many outside the country as a pretext to give authorities wider access to sensitive data—Amazon decided to act, the person familiar with the company's probe says. In August it transferred operational control of its Beijing data center to its local partner, Beijing Sinnet, a move the companies said was needed to comply with the incoming law. The following November, Amazon sold the entire infrastructure to Beijing Sinnet for about $300 million. The person familiar with Amazon's probe casts the sale as a choice to "hack off the diseased limb."

As for Apple, one of the three senior insiders says that in the summer of 2015, a few weeks after it identified the malicious chips, the company started removing all Supermicro servers from its data centers, a process Apple referred to internally as "going to zero." Every Supermicro server, all 7,000 or so, was replaced in a matter of weeks, the senior insider says. (Apple denies that any servers were removed.) In 2016, Apple informed Supermicro that it was severing their relationship entirely—a decision a spokesman for Apple ascribed in response to *Businessweek*'s questions to an unrelated and relatively minor security incident (sidebar, page 57).

That August, Supermicro's CEO, Liang, revealed that the company had lost two major customers. Although he didn't name them, one was later identified in news reports as Apple. He blamed competition, but his explanation was vague. "When customers asked for lower price, our people did not respond quickly enough," he said on a conference call with analysts. Hayes, the Supermicro spokesman, says the company has never been notified of the existence of malicious chips on its motherboards by either customers or U.S. law enforcement.

Concurrent with the illicit chips' discovery in 2015 and the unfolding investigation, Supermicro has been plagued by an accounting problem, which the company characterizes as an issue related to the timing of certain revenue recognition. After missing two deadlines to file quarterly and annual reports required by regulators, Supermicro was delisted from the Nasdaq on Aug. 23 of this year. It marked an extraordinary stumble for a company whose annual revenue had risen sharply in the previous four years, from a reported $1.5 billion in 2014 to a projected $3.2 billion this year.

One Friday in late September 2015, President Barack Obama and Chinese President Xi Jinping appeared together at the White House for an hourlong press conference headlined by a landmark deal on cybersecurity. After months of negotiations, the U.S. had extracted from China a grand promise: It would no longer support the theft by hackers of U.S. intellectual property to benefit Chinese companies. Left out of those pronouncements, according to a person familiar with discussions among senior officials across the U.S. government, was the White House's deep concern that China was willing to offer this concession because it was already developing far more advanced and surreptitious forms of hacking founded on its near monopoly of the technology supply chain.

In the weeks after the agreement was announced, the U.S. government quietly raised the alarm with several dozen tech executives and investors at a small, invite-only meeting in McLean, Va., organized by the Pentagon. According to someone who was present, Defense Department officials briefed the technologists on a recent attack and asked them to think about creating commercial products that could detect hardware implants. Attendees weren't told the name of the hardware maker involved, but it was clear to at least some in the room that it was Supermicro, the person says.

The problem under discussion wasn't just technological. It spoke to decisions made decades ago to send advanced production work to Southeast Asia. In the intervening years, low-cost Chinese manufacturing had come to underpin the business models of many of America's largest technology companies. Early on, Apple, for instance, made many of its most sophisticated electronics domestically. Then in 1992, it closed a state-of-the-art plant for motherboard and computer assembly in Fremont, Calif., and sent much of that work overseas.

Over the decades, the security of the supply chain became an article of faith despite repeated warnings by Western officials. A belief formed that China was unlikely to jeopardize its position as workshop to the world by letting its spies meddle in its factories. That left the decision about where to build commercial systems resting largely on where capacity was greatest and cheapest. "You end up with a classic Satan's bargain," one former U.S. official says. "You can have less supply than you want and guarantee it's secure, or you can have the supply you need, but there will be risk. Every organization has accepted the second proposition."

In the three years since the briefing in McLean, no commercially viable way to detect attacks like the one on Supermicro's motherboards has emerged—or has looked likely to emerge. Few companies have the resources of Apple and Amazon, and it took some luck even for them to spot the problem. "This stuff is at the cutting edge of the cutting edge, and there is no easy technological solution," one of the people present in McLean says. "You have to invest in things that the world wants. You cannot invest in things that the world is not ready to accept yet." Ⓑ

Bloomberg LP has been a Supermicro customer. According to a Bloomberg LP spokesperson, the company has found no evidence to suggest that it has been affected by the hardware issues raised in the article.

Statements

Amazon

It's untrue that AWS knew about a supply chain compromise, an issue with malicious chips, or hardware modifications when acquiring Elemental. It's also untrue that AWS knew about servers containing malicious chips or modifications in data centers based in China, or that AWS worked with the FBI to investigate or provide data about malicious hardware.

We've re-reviewed our records relating to the Elemental acquisition for any issues related to SuperMicro, including re-examining a third-party security audit that we conducted in 2015 as part of our due diligence prior to the acquisition. We've found no evidence to support claims of malicious chips or hardware modifications.

The pre-acquisition audit described four issues with a web application (not hardware or chips) that SuperMicro provides for management of their motherboards. All these findings were fully addressed before we acquired Elemental. The first two issues, which the auditor deemed as critical, related to a vulnerability in versions prior to 3.15 of this web application (our audit covered prior versions of Elemental appliances as well), and these vulnerabilities had been publicly disclosed by SuperMicro on 12/13/2013. Because Elemental appliances are not designed to be exposed to the public internet, our customers are protected against the vulnerability by default. Nevertheless, the Elemental team had taken the extra action on or about 1/9/2014 to communicate with customers and provide instructions to download a new version of the web application from SuperMicro (and after 1/9/2014, all appliances shipped by Elemental had updated versions of the web application). So, the two "critical" issues that the auditor found, were actually fixed long before we acquired Elemental. The remaining two non-critical issues with the web application were determined to be fully mitigated by the auditors if customers used the appliances as intended, without exposing them to the public internet.

Additionally, in June 2018, researchers made public reports of vulnerabilities in SuperMicro firmware. As part of our standard operating procedure, we notified affected customers promptly, and recommended they upgrade the firmware in their appliances.

Apple

Over the course of the past year, Bloomberg has contacted us multiple times with claims, sometimes vague and sometimes elaborate, of an alleged security incident at Apple. Each time, we have conducted rigorous internal investigations based on their inquiries and each time we have found absolutely no evidence to support any of them. We have repeatedly and consistently offered factual responses, on the record, refuting virtually every aspect of Bloomberg's story relating to Apple.

On this we can be very clear: Apple has never found malicious chips, "hardware manipulations" or vulnerabilities purposely planted in any server. Apple never had any contact with the FBI or any other agency about such an incident. We are not aware of any investigation by the FBI, nor are our contacts in law enforcement.

In response to Bloomberg's latest version of the narrative, we present the following facts: Siri and Topsy never shared servers; Siri has never been deployed on servers sold to us by Super Micro; and Topsy data was limited to approximately 2,000 Super Micro servers, not 7,000. None of those servers has ever been found to hold malicious chips.

As a matter of practice, before servers are put into production at Apple they are inspected for security vulnerabilities and we update all firmware and software with the latest protections. We did not uncover any unusual vulnerabilities in the servers we purchased from Super Micro when we updated the firmware and software according to our standard procedures.

We are deeply disappointed that in their dealings with us, Bloomberg's reporters have not been open to the possibility that they or their sources might be wrong or misinformed. Our best guess is that they are confusing their story with a previously-reported 2016 incident in which we discovered an infected driver on a single Super Micro server in one of our labs. That one-time event was determined to be accidental and not a targeted attack against Apple.

While there has been no claim that customer data was involved, we take these allegations seriously and we want users to know that we do everything possible to safeguard the personal information they entrust to us. We also want them to know that what Bloomberg is reporting about Apple is inaccurate.

Apple has always believed in being transparent about the ways we handle and protect data. If there were ever such an event as Bloomberg News has claimed, we would be forthcoming about it and we would work closely with law enforcement. Apple engineers conduct regular and rigorous security screenings to ensure that our systems are safe. We know that security is an endless race and that's why we constantly fortify our systems against increasingly sophisticated hackers and cybercriminals who want to steal our data.

Supermicro

While we would cooperate with any government investigation, we are not aware of any investigation regarding this topic nor have we been contacted by any government agency in this regard. We are not aware of any customer dropping Supermicro as a supplier for this type of issue.

Every major corporation in today's security climate is constantly responding to threats and evolving their security posture. As part of that effort we are in regular contact with a variety of vendors, industry partners and government agencies sharing information on threats, best practices and new tools. This is standard practice in the industry today. However, we have not been in contact with any government agency regarding the issues you raised.

Furthermore, Supermicro doesn't design or manufacture networking chips or the associated firmware and we, as well as other leading server/storage companies, procure them from the same leading networking companies.

China's Ministry of Foreign Affairs

China is a resolute defender of cybersecurity. It advocates for the international community to work together on tackling cybersecurity threats through dialogue on the basis of mutual respect, equality and mutual benefit.

Supply chain safety in cyberspace is an issue of common concern, and China is also a victim. China, Russia, and other member states of the Shanghai Cooperation Organization proposed an "International code of conduct for information security" to the United Nations as early as 2011. It included a pledge to ensure the supply chain security of information and communications technology products and services, in order to prevent other states from using their advantages in resources and technologies to undermine the interest of other countries. We hope parties make less gratuitous accusations and suspicions but conduct more constructive talk and collaboration so that we can work together in building a peaceful, safe, open, cooperative and orderly cyberspace.

—*Translated by Bloomberg News in Beijing*

BY JOSHUA GREEN

PHOTOGRAPH BY MICHAEL FRIBERG

MR. OCTOBER SURPRISE

HOW JOHN BURTON, A FORMER OBAMA OPPO RESEARCHER, BUILT A NEW ANTI-REPUBLICAN ATTACK MACHINE

One evening in September, Tanya, a consultant at a big New York firm, was on her laptop scrutinizing public records and reading posts on VKontakte, the Russian social network, involving Representative Dana Rohrabacher, the Republican congressman from California. She was looking for dirt. On the other side of the country, Genevieve, a science teacher in San Diego, was doing the same. So was Vadim, an insurance representative in Phoenix. And they weren't alone.

Tanya, Genevieve, and Vadim have never met and probably never will. But they have two things in common: They're members of the so-called Resistance, working to oust Republicans. And they're being directed by a former J.P. Morgan banker named John Burton, who's become a field general of sorts in the liberal opposition—and soon, he hopes, the cause of consternation and, ultimately, unemployment for dozens of Republican lawmakers in races from Maine to California.

Before he was a banker, Burton, 38, was a practitioner of the dark art of opposition research, or "oppo"—digging up and surreptitiously deploying damaging information about politicians. As it did for so many people, Donald Trump's election turned Burton's life upside down. He quit his job, joined a Resistance group, and devoted himself to returning his country to the path he'd believed it was on when he worked for Barack Obama's campaign a decade ago.

Some Resisters march or knock on doors; others raise money or run for office. Burton felt his gifts lay elsewhere: namely, in tearing down political opponents. Over the past year, backed by mysterious donors, he's organized what may be the most audacious grass-roots project in the age of Trump. Burton has amassed an army of 16,000 amateur sleuths who, with professional guidance, have spent months ferreting out damaging material on scores of vulnerable Republicans in Congress and state legislatures. Now he's ready to unleash it just in time for the midterms. As he told me, "We're going to do with real information and real Americans what the Russians tried to do with fake information and fake Americans."

Oppo works best when its target is unaware, so Burton's project, dubbed Citizen Strong, has operated by stealth, waiting until just now to publicly declare its existence as a 501(c)4 "dark money" group with three affiliated political action committees. Even this step doesn't reveal much. Dark money donors can give unlimited sums anonymously, and Burton won't identify his benefactors or even the three operatives he's hired to help run the group.

But you needn't know the source of his funding to see the potential of his army to upend close races. Rohrabacher presents a ripe target. The Orange County congressman has been so friendly to Moscow, in 2012 the FBI warned that Russian spies were trying to recruit him. Rohrabacher is also one of the least wealthy members of Congress, but he's developed a pair of odd and remunerative sidelines: He invested in an obscure biotech company that shot up 100-fold in value; and he's sold screenplays with names like *The French Doctoress* for tens of thousands of dollars, including one to a man later sent to prison for fraud. (None has been made into a movie.) In a statement, a Rohrabacher campaign spokesman says, "It's October and Democratic super PACs are flush with cash. Every dirt digger on the left has a fistful of contracts and a bag of tricks and treats they are shopping to reporters. Most of it is old news, and the questions have been asked and answered long ago."

Examining these windfalls for potential fraud or conflict of interest would usually require a professional investigator such as Christopher Steele, the ex-MI6 agent who produced the infamous dossier on Trump. Most campaigns can't afford that. But the main requirements for being a successful oppo researcher—time, patience, and dogged determination—were qualities Burton saw in abundance among his Resistance compatriots. Many were skilled professionals whose expertise he thought he could weaponize for politics if they were willing to spend their free time doing things like digging through social media accounts and newspaper clippings or hunting down property records and arrest filings at the local courthouse. When he put out a call for help on Rohrabacher, he soon had at his disposal a forensic accountant, a team of corporate lawyers, and a fluent Russian speaker—Tanya, the New York consultant. "As far as I'm concerned, it's all hands on deck," she says. "If someone has a special ability, they should be using it to help take back the House." (She and other volunteers I spoke to for this story asked that their full names not be used to protect their identities and prevent problems at work.)

With his Citizen Strong partners, all veteran researchers, Burton has spent the year choosing his targets. In February he decided to focus on districts that leaned slightly right—ones like Rohrabacher's that haven't been competitive but would be if a Democratic wave emerged. That bet looks prescient. A recent *New York Times* poll showed Rohrabacher, a 15-term incumbent, tied with his Democratic challenger. Control of Congress will hinge on whether Rohrabacher and other endangered Republicans can withstand a midterm wave. Citizen Strong's October surprises will make survival that much harder.

Burton has a trove of anti-Republican material. The art of oppo lies in culling and distributing that kind of information to tell a particular story—a negative story—that will tarnish the incumbent and weaken his or her support. Sometimes researchers will quietly slip it to reporters, hoping it will yield a story and gain the imprimatur of a nonpartisan news outlet. Other times, oppo can be the basis of an ad campaign or used to build a website voters and the media can scrutinize—a bit like WikiLeaks. (Burton says none of his material is obtained through hacking or other illegal means.) With the midterms looming, he's begun disseminating his "citizen oppo" in three Senate races, 22 House races, and 133 state legislative races across 13 states. He's hoping these last-minute attacks will help push many of these races into the Democratic column, flipping control of the House—and possibly even the Senate—as well as state legislatures that will play a critical role in redrawing congressional lines in 2020, a process that will shape national politics for the next decade.

While the story of the Resistance tends to focus on the positive—the revival of civic activism—Burton has the hard-bitten perspective of someone who's fought in the campaign trenches and knows that placards and pussy hats aren't enough to beat Republicans. "John is willing to go where we need to go," says his friend Laura Moser, a former Democratic congressional candidate. "He knows we've got to play dirty to win."

Burton spent election night 2016 at a dive bar in New York with old friends from Democratic politics, revisiting a life he'd long since left behind. After growing up in Miami and earning a scholarship to Harvard, he'd moved to Washington to work on economic policy at a progressive think tank. As the 2008 election approached, his boss encouraged him to join the Obama campaign, where his quick mind and grasp of policy would be an asset. She had a role in mind for him. "She told me, 'You'd be great at oppo,'" Burton recalls. "I said, 'What's that?'"

As a member of Obama's oppo team, Burton was pitted against Hillary Clinton and then John McCain, which forced him to master arcane issues of local concern, from hog lots to the Colorado River Compact. It also taught him the art of sowing discord to weaken an opponent. According to Burton, the campaign purposely leaked stories critical of certain McCain staffers, knowing the staffers would likely blame internal rivals for the attacks. His most memorable assignment was combing property records to determine how many homes McCain owned. When the question arose in an interview, McCain couldn't come up with the correct answer—eight—and looked like an out-of-touch plutocrat rather than a maverick war hero.

After the election, Burton joined Obama's Treasury Department and spent a stressful year and a half fighting the financial crisis. "That's when I lost my hair," he says. In 2010 he left politics, got a degree at the Stanford Graduate School of Business, and landed an investment banking job at JPMorgan Chase & Co. in San Francisco, working with clients such as Google and Twitter Inc. So certain was he that his future lay in finance that he passed up working on Obama's reelection and stayed in California. His trip to New York in November 2016 was meant to be part reunion, part celebration of Clinton's victory.

By 9 p.m. it was clear there would be nothing to celebrate. "Being from Miami, I could tell right away that the numbers from Dade County were off," Burton remembers. The next morning, he woke up in a daze. "I stumble into the J.P. Morgan office in New York, and it's just a weird vibe," he says. "Some people are happy, but most are scared. I was known as an Obama guy, so it was an awkward period."

Burton was racked with guilt that he hadn't done his part to stop Trump. This was somewhat alleviated when Moser recruited him for an idea she'd had about creating a productive outlet for the hundreds of aggrieved friends and acquaintances who wanted to act but didn't know how. By mid-December, Moser had started a group called Daily Action to give Resistance members a single, focused task, delivered via text each morning—calling a key senator to object to a nominee, say, or marshaling supporters at airports to protest Trump's travel ban. She leaned on Burton to help figure out what those tasks should be. "John is more deeply knowledgeable about politics and its mechanisms than anyone I've ever known," she says.

"THE JOB FELT LIKE SECOND NATURE, PULLING TOGETHER DATA, HELPING TO FIND PHOTOS OF THE RUSSIANS HE'D MET WITH"

Moser and Burton expected a few hundred people to sign up but were hit with a torrent. On Day 1, Daily Action got 3,000 volunteers. By Inauguration Day, the number reached 40,000. The Women's March pushed it past 100,000, as activists discovered, in Moser's phrase, how to "use your phone to fight Trump."

The moves Burton and Moser were orchestrating gave a sense of agency to Resisters and had tangible effects. When the travel ban hit, they didn't just rally supporters. They shared the phone numbers of 189 U.S. Customs and Border Protection offices at airports and gave callers a script saying that detaining travelers was wrong and insisting they be released. "Those little airport offices are used to getting calls from FedEx or importers," Burton says. "But they were the weakest link. We told volunteers, 'Be polite, but give them a terrible day.'" One agent at Louis Armstrong New Orleans International Airport was so besieged with callers, he pretended to be an answering machine.

As the matter of Russian electoral meddling came to dominate the news shortly after Trump's inauguration, Burton wanted to bring pressure on the Department of Justice. Knowing that Washington power is driven more by mundane parochial concerns than lofty idealism, he unleashed 78,000 callers not on the executive branch but on the Senate Judiciary Committee, to demand that a special counsel be appointed to investigate Russia. Committee senators oversee the Justice Department and control its budget, so their pressure, if applied, can't be ignored. "The insider logic was that this would create a huge headache for them, and they would in turn go to the Justice Department and say, 'Make this headache go away,'" Burton says. Robert Mueller was appointed special counsel soon after.

Burton was living a double life, banking by day and organizing by night—sometimes all night. "Being on the West Coast turned out to be great, because I'd be up overnight and then hit people with their marching orders just as they were waking up on the East Coast and reacting to the news," he says. But the scale of the enterprise made this schedule impossible to sustain. Daily Action's first phone bill was for $40,000, which Burton worried he'd have to help cover with his J.P. Morgan bonus. Then, in April, as the group approached 300,000 members, Moser announced she was moving to Texas to run for

Congress. "It's just one of those things that was happening right after Trump," he says. "People were quitting their jobs to start Resistance groups, and then quitting their Resistance groups to run for Congress."

Burton was at a crossroads, but he didn't struggle with his decision. "He was making money, had a great job, was on the right career track," Moser says. "But when Trump won, he knew he had to jettison his old life." His boss guessed he was quitting before Burton summoned the nerve to tell him.

He took control of Daily Action and led it until September 2017, by which point joining forces with a larger institution made sense. MoveOn.org acquired the group, and Burton suddenly found himself with free time. Having advised startups as a banker, he now sought to launch one himself in politics. Resistance volunteers were already being deployed in daily activism, voter registration, and fundraising, but nobody had tried to harness that energy for opposition research. Doing so at a mass scale posed enormous logistical challenges, and few political professionals imagined that amateurs could do the work. "If I were just coming off a campaign or the Hill, I'd underestimate what volunteers are capable of doing," Burton says. "After Daily Action, I knew what was possible."

Odd as it may sound, his approach to citizen oppo owes a lot to amateur astronomers, who divvy up pieces of the night sky to search for new stars, comets, or signs of extraterrestrial intelligence. The key is making the research tasks as small and easily replicable as possible to guard against error. Using SurveyMonkey, Citizen Strong sends volunteers targeted assignments, prompting them to pull court records, for instance, or translate Russian articles, only bumping the material up the chain of command when three volunteers produce the same result.

Burton had no problem winning recruits, many of whom were already volunteering for Daily Action and proved to be effective diggers. Genevieve, the San Diego science teacher, had signed up for Daily Action when a relative of one of her Muslim students was detained during the travel ban. She jumped at the chance to investigate Rohrabacher, a nearby congressman. "I'd never engaged in politics at this level before," she says. "But the job felt like second nature, pulling together data, helping to find photos of the Russians he'd met with. I'm trained as a scientist, so data collection is a very comfortable place for me to be."

Choosing whom to go after was the next challenge. Burton knew Democrats in clear toss-up races would have sufficient resources to conduct their own research. So Citizen Strong concentrated on House races the *Cook Political Report*, a nonpartisan handicapper, rated "lean Republican," where Democrats were likely to be new, underfunded, and unfamiliar with the darker side of politics. The group focused especially on state legislative contests in Michigan, Minnesota, Ohio, Wisconsin, and other states where the chambers are closely divided and the politicians unaccustomed to sophisticated attacks.

Citizen Strong's liberal activists instinctively want to attack Republicans on gun control, abortion, or other social issues. But given the political geography of the group's Republican targets, such attacks would likely hurt their cause. So their professional guides steered them toward a more constructive vector. Burton and his partners devised a "Midas Index" of Republicans, including Representatives Bruce Poliquin of Maine and Erik Paulsen of Minnesota, who'd taken more than $1 million in PAC money from Wall Street or Big Pharma. Alleging greed or complicity in the opioid crisis, as Burton intends to do, is more apt to engender anger in swing voters than the thorny cultural issues many Resisters would prefer.

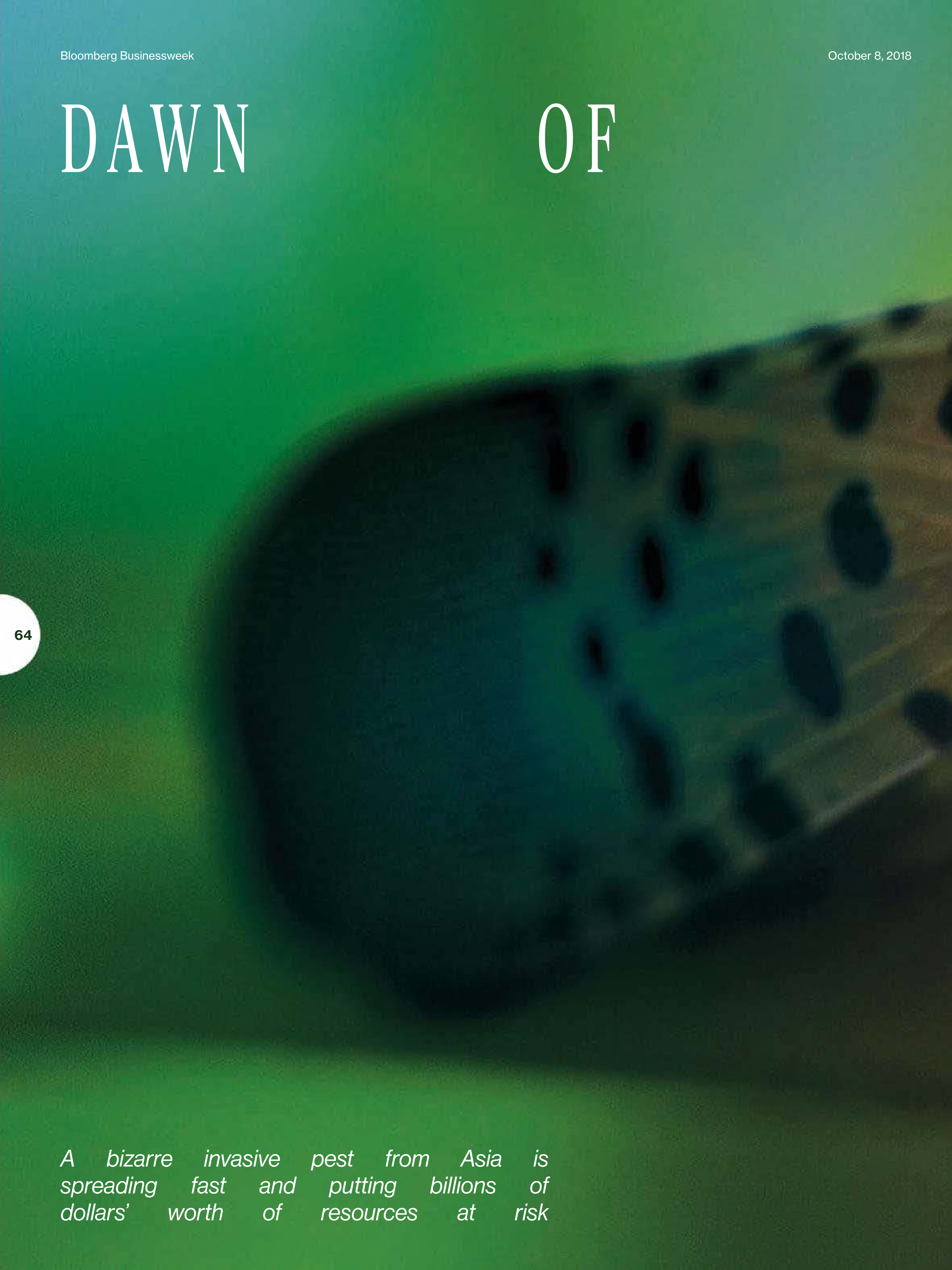
More colorful was the "Sloth Index." Volunteers tracked the attendance and output of incumbents, including Facebook posts, videos, and press releases, on the theory that those who didn't bother showing up for work, and didn't do much when they did, would be easier to pick off. Many of the politicians on the list have never faced a tough race and so haven't taken elementary precautions such as registering their own domain names. Burton has snapped up 203 domains of incumbent Republicans that will soon bear the fruit of his researchers' efforts. Voters searching for information on Representatives Mike Bost of Illinois and Dave Schweikert of Arizona will discover their fondness for staying at Ritz-Carltons and the Waldorf Astoria, a perilous habit in light of Trump's attacks on the Washington "Swamp." For Tyler Vorpagel, a Wisconsin state representative who's voted to cut public assistance programs, readers will learn that his wife collected unemployment while she was running his first campaign in 2014, all the while posting Instagram pictures of herself (and her dog Teddy) at happy hours and baseball games. ("My wife spent countless hours looking for a new job and never turned down a job that was offered to her," Vorpagel says in a statement. "[T]he bills we passed require everyone to look at welfare benefits as temporary assistance, not a long-term lifestyle.") Meanwhile, Rohrabacher.ru will feature Citizen Strong's trove of materials on the Putin-friendly California congressman. And, if the Russian government shuts it down, ComradeRohrabacher.com will replace it.

Citizen Strong's volunteer army has come together at a propitious moment. Not only has the Trump-fueled tumult of the past two years made hundreds of Republican incumbents vulnerable, but the last decade has seen an explosion of information sources that anybody can mine. "There's so much just sitting out there that's been made available through sunshine laws, through states posting personal financial disclosures and putting lobbyist disclosures online, and through social media," Burton says. "There's just a ton of content, far more than there was when I was starting out 10 years ago."

Burton laughs as he shares more highlights of what his researchers turned up, tidbits he's not yet willing to put on the record. Sometimes, it's best to spring the trap at the last moment. "This is what gets found when you have an army who can read every line of every document," he says.

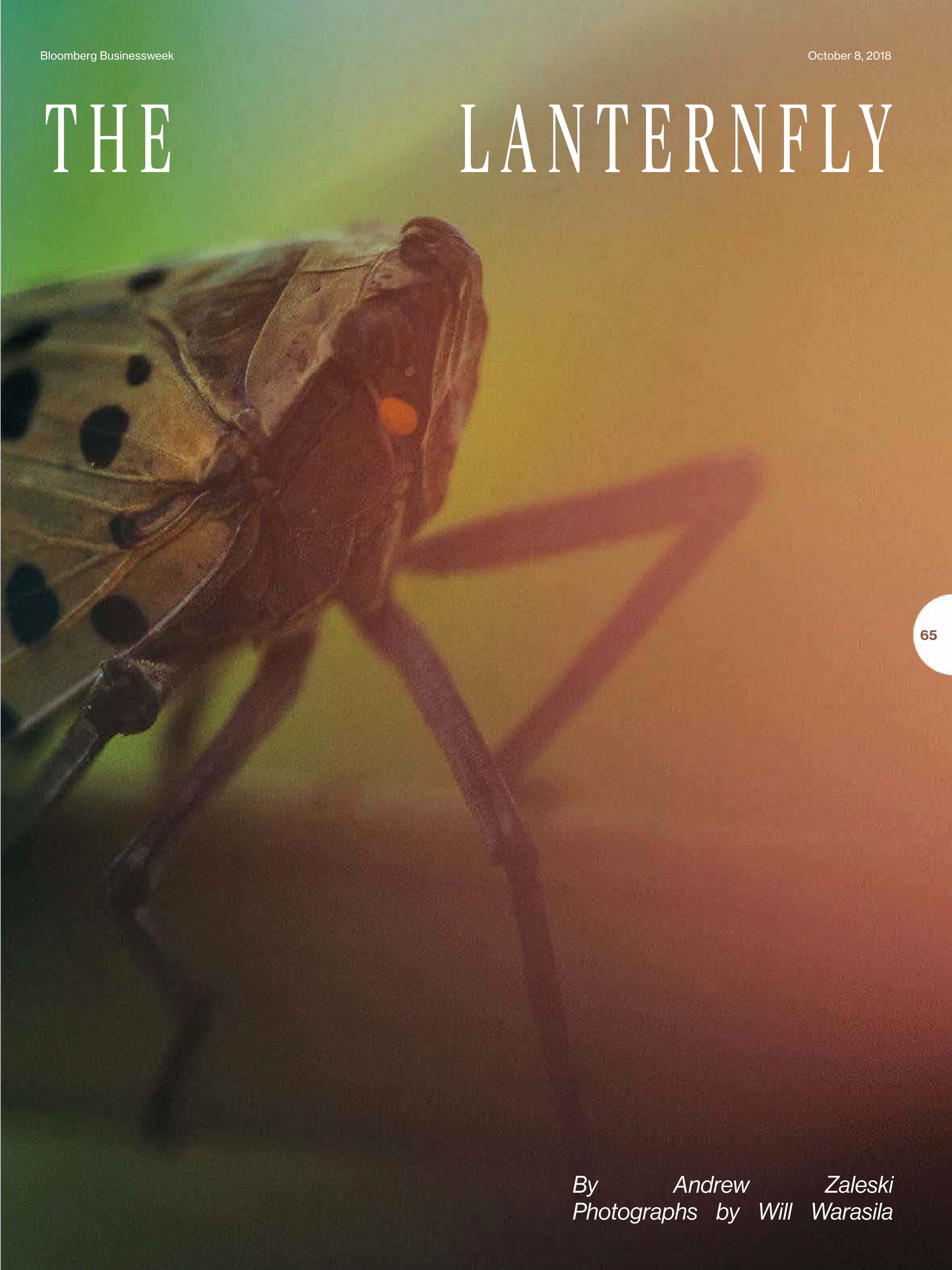
After Nov. 6, we'll know if that's enough to hand political power back to the Democrats.

DAWN OF



A bizarre invasive pest from Asia is spreading fast and putting billions of dollars' worth of resources at risk

THE LANTERNFLY



By Andrew Zaleski
Photographs by Will Warasila

From the road heading east, the apple trees of Beekman Orchards unfold in waves, rising and falling on a sea of verdant grass. Behind them, basking in the June sunlight, are row upon row of pinot noir, Riesling, and Traminette grapes. It's for the vineyard that I've driven to this 170-acre estate in Berks County, an hour and a half northwest of Philadelphia. Beekman Orchards is a fourth-generation family enterprise, now carefully stewarded by Calvin Beekman, a large 59-year-old man with a calm voice and meat-hook hands.

"I told one fella one time I don't need to go to Atlantic City, because we're the biggest gamblers there are," he tells me outside his farmhouse. In 1999, Beekman planted the vineyard, 40 acres of red and white grapes that once brought in about a quarter-million dollars annually. On this day, several rows of vines in the middle of the patch are a lush green, close to the fruit-set stage. Mid-June is usually when clusters of grapes bloom, growing until harvest begins in mid-September. In the rows farther out, though, no clusters are visible, and the grape-shoot trunks are blackened, dead. Beekman gestures toward a set of Riesling vines that went in just last year. "This row contains 140 plants," he says. "I don't think you can find one percent that's viable."

A third of his vineyard has suffered a similar fate. Another third is struggling. And the luxuriant middle third? It could be at risk, too. He points to the woodlands surrounding his farm and utters a word that's been unnerving farmers, foresters, public officials, and entomologists alike: "lanternflies."

The spotted lanternfly, *Lycorma delicatula*, is a moth-like insect about an inch long and a half-inch wide. Native to Southeast Asia, it was discovered in Berks County in 2014. Already it's threatening to harm more plants and crops than even the brown marmorated stink bug, discovered in Pennsylvania around the turn of the century and now wreaking havoc in 43 states.

Beekman points to a patch of terrain where, last August, he counted 325 lanternflies in the span of a yard. Unlike the stink bug and the emerald ash borer, another invasive insect that arrived from Asia to the mid-Atlantic region, the lanternfly moves in hordes. Spot one lanternfly, and lurking nearby you'll likely find hundreds, if not thousands. They can overwhelm a tree, coating it from root to leaf, feasting on sap before disgorging a glutinous substance that disrupts photosynthesis and kills plants. "You come outside, and it's just swarms and swarms and swarms," Beekman says, describing the scene from last summer. "You probably would've had 20 of them crawl up you by now."

In 2017, Pennsylvania's lanternfly population soared, spreading across 4.5 million acres and prompting a quarantine that required businesses and residents to check outdoor items for bugs before moving them out of any of 13 affected counties. "We thought the stink bug was bad, because it feeds on a wide range of plants, can cause damage to different crops, and has a nuisance factor," says Emelie Swackhamer, a horticulturalist with Penn State University. "But the lanternfly, it's just much worse. It has this really broad feeding behavior, and that's unusual for an insect. And it threatens so many of our high-value commodities."

Quantifying or predicting the economic damage caused by invasive pests is difficult, but Beekman's tally of his farm's damages and expenses provides some insight into the danger: His 2017 losses, he estimates, were $100,000, with projected 2018 losses of $250,000. In June, the Pennsylvania Department of Agriculture suggested the spotted lanternfly might cause $18 billion in damage statewide. Posting on Facebook in mid-September, Penn State said the fly "could be the most destructive species in 150 years."

The state hasn't come up with industry-specific estimates, but the hardwood and fruit-growing industries are especially threatened. "This is our No. 1 concern," says Sarah Hall-Bagdonas of the Northern Tier Hardwood Association, which is hosting dozens of information sessions for lumber companies from Virginia to New York. In New York, forestry is a $13.1 billion industry that supports 42,000 jobs. In Virginia, it's a $21 billion business with 108,000 workers. In Pennsylvania: $19 billion and 66,000 employees. Hardwood companies working in any of the 13 quarantined counties now require a special permit from the state agriculture department proving that they can identify the lanternfly and have a plan to contain the bug, which is thought to hitch rides across state borders on the undercarriages of cars, trains, and 18-wheelers.

This February, U.S. Secretary of Agriculture Sonny Perdue announced that his department was committing $17.5 million to stem the lanternfly's spread. In a sense, it was already too late. The lanternfly had been spotted in New York a few months earlier and in Virginia weeks before. Three New Jersey counties are under quarantine after confirmed sightings in July. Delaware and Maryland are both on alert.

State and federal entomologists have recommended a few containment strategies, but they don't yet have a foolproof way to kill, or even count, the bug. If they can't find a solution, lanternflies could infest forests all along the Atlantic seaboard, giving communities from New England to Florida an intimate look at what Penn State entomologist Tom Baker calls "the weirdest, most pernicious insect I've ever seen."

Each May, lanternfly larvae hatch in groups of 30 to 50. The nymphs look like shiny, overgrown ticks, with black bodies and white spots. Through July they grow into fluttering adults, developing wings whose exterior is drab white with black spots, and whose underside is bright red. When folded, the wings resemble a cloak, draped over a yellow, potbellied abdomen marked by horizontal black bands. The adults flourish through October, with the females laying eggs starting in late September and continuing sometimes into December, provided temperatures are warm enough. Come spring, the cycle begins anew.

Adult lanternflies prefer to feed on *ailanthus altissima*, aka the tree of heaven, itself an invasive species that originated in China and was brought to the U.S., near Philadelphia, in the 1780s. Yet their palate and appetite are large: grapes, apples, cherries, peaches, plums, hops, birches, oaks, pines. Lanternflies don't eat the plants, but rather suck nutrient-rich sap from the trunks through their proboscides. The sticky substance they excrete after dining is called honeydew (no relation to the invasive melon overrunning your fruit salad). Honeydew spreads to nearby plants and just about anything else: your hair, your roof, your children's swing set, my windshield as I drive through quarantined areas. It also attracts other pests.

The lanternfly came to Pennsylvania's attention in September 2014, when a state game commission employee found an unrecognizable bug on his property in Berks County. He called the agriculture department, and two staff entomologists identified it as a species native to Asia. They gave the bug its common name, a nod to its form, which resembles a Chinese lantern.

No one knows for sure where in Asia the spotted lanternfly came from or where its immigrant's tale took shape. Talk to folks in Berks County, and they'll tell you an egg mass arrived with a shipment for Rolling Rock Building Stone Inc., a specialty company about 6 miles from Beekman's farm that routinely imports from China and India. Rolling Rock's president, Gary Weller, says there's no evidence his property was the beachhead, though; he was surprised when state entomologists showed up, inspected his ailanthus stands and found them crawling with lanternflies. "It's something that's going to haunt me for many years," he says. "I would love to know where it came from, I really would."

Within months of the discovery, the state placed five townships under quarantine. Any person or business moving items such as logs, stones, outdoor equipment, or grapevines and other plants out of a quarantine zone now required a permit. "We have to inspect everything," says Beekman, whose farm is located in the first set of quarantined areas. "We're looking for egg masses, looking for insects, certifying that everything is free and clear."

At first invasive pests appear to cluster in defined areas, making containment seem manageable. But that's only because there are so few reported sightings, and they have little to no immediate economic impact. "What we see with a lot of new insect populations is a slow growth and then an exponential growth," says John Crowe, spotted lanternfly national policy manager at the U.S. Department of Agriculture. "They take footholds, and then they explode."

When the lanternfly explosion happened in the fall of 2017, the Pennsylvania Department of Agriculture confirmed infestations at 1,462 properties, primarily in the southeast of the state, up from 335 the year before. "They come into one area like locusts, beat the crap out of it, and then move on to another resource," says David Biddinger, a Penn State entomologist who studies pest management in tree-fruit habitats.

The hardest-hit businesses so far have been grape and other fruit growers. Beekman is considering getting out of grapes entirely. "It costs about $15,000 to put in an acre of ▶

Lanternflies in Berks County

COMING SOON TO A FOREST NEAR YOU?

States with habitat suitable for the spotted lanternfly
Counties under quarantine

DATA: USDA; NEW JERSEY DEPARTMENT OF AGRICULTURE; PENNSYLVANIA DEPARTMENT OF AGRICULTURE

◀ vineyard," he says. "How do I come in here, tear it all out, and replant it? It'll be three years until any production comes back." Pre-lanternfly, he harvested 3 tons per acre of vineyard and sold the grapes for $2,000 a ton, grossing $240,000 a year. Were he to stop producing entirely for those three years, he'd lose that annual income, to say nothing of the risk that lanternflies will infest newly planted vines. Even the grapes that survive are an oenophile's nightmare—one winemaker Beekman supplies told him that batches produced from bug-ridden Riesling and Traminette grapes are redolent of cabbage.

For the forestry industry, the economic hardships have thus far been less direct. So far the destruction has been limited, but the trees' capacity as carriers has been hurting companies just the same. "Logs have to get inspected pretty heavily," says Don Kellenberger, the owner of a small logging and land-clearing company in Berks County. "We have to spend more time, and there's no extra money to do that. So it's costing us more, and we're getting paid the same." Some tracts of land in the quarantine zone are so infested that companies won't even harvest tree species that lanternflies generally ignore, lest they transport the insects into a new community or into their own sawmills.

"This particular pest is such an excellent hitchhiker," says Hall-Bagdonas, of the Northern Tier Hardwood Association. "It lays its eggs on anything flat. It's adapting and doing different things every year." Adult lanternflies, once thought to be better hoppers than flyers, have recently been observed winging between trees, for instance. "They were flying into headwinds and flying further distances than we thought they could," Penn State's Swackhamer says.

Long-distance travel is officials' biggest fear. Biddinger suspects it's only a matter of time until the 15,000 acres of juice grapes along the south shore of Lake Erie in northwestern Pennsylvania are hit. Once lanternflies finish feeding there, they might move to the 30,000 acres of juice grapes across the border in New York. Maryland and Delaware haven't been infested yet, but entomologists consider that more luck than anything else. The bugs have already hopped past Maryland to get to Virginia, where egg masses have been spotted by the hundreds; researchers' best guess is that a mass hitchhiked some 180 miles to get there. Even Michigan, with a combined 80,000 acres of blueberry and cherry crops, is eyeing the spread warily, Biddinger says.

The worst-case economic scenario for Pennsylvania, and the rest of the country, would be for the spotted lanternfly to overrun the Port of Philadelphia. The flat shipping containers there would make excellent larval grounds, which, combined with heavy shipping and trucking traffic, could help the bugs spread quickly to the south and west. Beekman points out, too, that the port isn't far from 30th Street Station, Philly's main passenger rail depot, visible from the hills of his vineyard. Ominously, in August parks officials found lanternflies in four urban locations, including Center City and the Horticulture Center at West Fairmount Park, a popular wedding venue close to the city's art museum.

"The bugs aren't good. They're moving," says Beekman. "You're going to see the spread of this is farther than anyone projected."

On a sweltering afternoon, Rick Hartlieb, a 10-year veteran of the Pennsylvania Bureau of Forestry, drives his pickup truck to a clearing on Gibraltar Hill, an area of William Penn State Forest about 35 minutes south of Beekman's grapevines. We park, exit, and walk over to a lone ailanthus covered with pockets of lanternflies: a few dozen here, a handful there, maybe 200 from trunk to canopy. Standing beside the tree, I feel a distinct misting sensation, then notice small droplets on my forearms. "That's the honeydew," Hartlieb says. I'm being barfed on by bugs.

I soon see that some of the lanternflies aren't moving. They've been killed, Hartlieb explains, by a chemical called dinotefuran. The insecticide is classified as a systemic, which means it's sprayed onto trees and absorbed into the plant, ready to be sucked out by unwitting lanternflies. Hartlieb and his colleagues have sprayed about 50 trees in this area, part of a pilot project funded by the state and designed to produce a measurable lanternfly reduction before next spring, when a new generation spawns. Biddinger is running a similar trial on a plot of farmland adjacent to Penn State's Berks County campus, spraying potted peach trees and grapevines with various insecticides, including dinotefuran.

Systemics proved effective in killing the stink bug when it made its way to Pennsylvania, but the chemicals are costly, and combating an entire species requires a lot of spraying. For the forestry industry, the hope is that a single treatment of a spray such as dinotefuran will last a year; determining the chemical's persistence is one aim of Hartlieb's pilot. "The important thing is we're trying. Hopefully doing something is better than doing nothing," he says.


Insecticide experiment

For farmers, multiple sprays would be required over a single growing season, delicately timed to be sure food is both pest- and pesticide-free. Don't spray often enough, and crops will be destroyed or infested; spray too often or too close to harvest time, and they'll be covered with chemicals. Applying chemical insecticides to fruit could also kill other species, such as wild bees, which tree-fruit growers rely on for pollination.

A large chunk of the $17.5 million the USDA has committed to combating the lanternfly will be spent in Pennsylvania, in addition to $3 million set aside in the state's most recent budget. Some of this money will be dedicated to creating more effective counting methods, some to assessing economic damage. The USDA and the state are also paying to apply insecticides on ailanthus trees near rail lines and on "trap trees"—designated killing grounds—in the quarantine zone. "The idea is we have to expand the area where we have this kind of treatment and then sustain it for a couple years," says Ruth Welliver, director of Pennsylvania's Bureau of Plant Industry.

Researchers would love to introduce a predatory species that could end the infestation—in China, a parasitic wasp kills the majority of lanternfly eggs. But biological control is a fraught business, a lesson entomologists learned when they tried to contain gypsy moths that invaded New England and the mid-Atlantic in the early 1900s. "They brought in a fly that prefers to attack about 300 native butterflies and moths over gypsy moths," Biddinger says. "So now there's a very long quarantine process to bring in a biocontrol agent from another country."

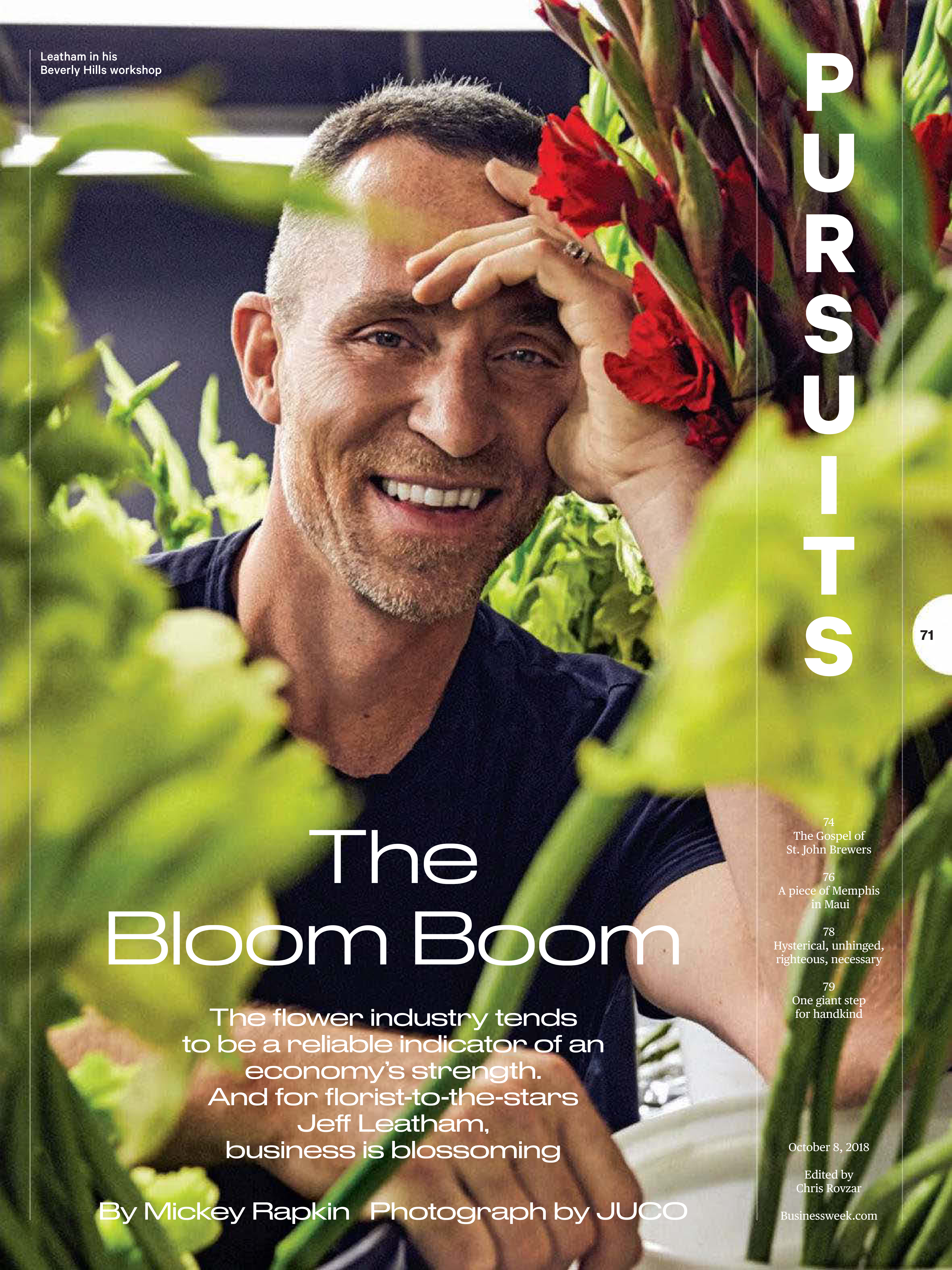
For the moment, that leaves hypervigilance and scorched-earth gardening. Swackhamer, who works out of a Penn State office in quarantined Montgomery County, is spearheading Pennsylvania's public education program. Humans are also excellent carriers, so she encourages people to inspect each other, their bags, and their cars if they're traveling through affected counties. Should you spot an egg mass—a challenge, since they resemble splotches of mud—the prescribed remedy is to scrape it into a plastic bag filled with hand sanitizer, using a credit card or something similarly thin. Don't scrape too hard, though, or the eggs are liable to scatter.

Weller has resorted to chopping down and burning virtually all the ailanthuses on Rolling Rock Building Stone's 600-acre property. He says he's seeing results: "Other years you could hardly count the lanternflies, there were so many. This year there are very few."

As for Beekman's grapes, he's been spraying them with a systemic called imidacloprid, which is known to be effective on other sucking insects, such as moths and beetles. Compared with last year, he says, he's seen fewer lanternfly nymphs on the borders of his vineyard.

That sounds like a promising sign, until we walk up to the woods at the southern edge. At the base of a tree, he crouches down and gingerly lifts up a piece of foliage: Walking along the stem are two lanternfly nymphs, not more than a few weeks old. Above us, on the underside of an ailanthus branch hanging high above our heads, Beekman points out six egg masses. Soon they'll hatch and mature into a swarm.

"There could be 400 lanternfly eggs in that little section," he says. "They'll figure out how to survive." Ⓑ



Leatham in his
Beverly Hills workshop

The Bloom Boom

The flower industry tends to be a reliable indicator of an economy's strength. And for florist-to-the-stars Jeff Leatham, business is blossoming

By Mickey Rapkin Photograph by JUCO

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Edited by Chris Rovzar

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When Iranian fashion model Nazanin Jafarian Ghaissarifar married Nigerian oil heir Folarin Alakija in June 2017, the wedding was held at Blenheim Palace, an 18th century pile in Oxfordshire where Winston Churchill was born. The day featured a 12-foot cake and a performance by *Blurred Lines* singer Robin Thicke. But it was the flowers that stole the show.

Billowing waves of white roses—1 million in all—cascaded across the floors. Thousands of white orchids dripped from chandeliers and reached in marshmallow arcs over fireplaces. The church altarpiece was made of hydrangeas.

The floral wizardry, which dominated social media and the *Daily Mail* for days afterward, was the work of Jeff Leatham, who serves a Hollywood clientele out of a Beverly Hills studio and also acts as the artistic director at Paris's Four Seasons George V. The florist had done extravagant weddings before—check out the photos of Tina Turner's Zurich nuptials in his book, *Jeff Leatham: Visionary Floral Art and Design*, published by Rizzoli in 2014. But this celebration was something else entirely. "It was, like, walls of orchids and walls of hydrangea," Leatham recalls. "It was a floral orgasm dream." The cost of a floral orgasm dream: $1.2 million.

It's also a sign of the times: The rich are spending more on parties, music, and food. But according to Leatham—and industry experts—flower sales are a true bellwether for a society's excess. Charlie Hall, an economist and professor of horticulture at Texas A&M University, says that before the last recession, in 2007, spending on floriculture reached $30.3 billion a year. That fell in 2008, to $28.9 billion, and again in 2009, to $25.7 billion, before climbing back to prerecession levels in 2016, hitting $30.8 billion. "The sales of flowers are what I call a coincident index," Hall says. "There's leading indices, lagging indices, and coincident indicators that are reflective of what's happening right now. If you match up flower sales to GDP, it's almost a perfect correlation."

Cut flowers are a good barometer for the economy because they're a luxury item for most consumers, says Daniel Sumner, an agricultural economist at the University of California at Davis. "If incomes go up, do cut flower sales go up just a little bit or quite a lot?" he asks. "The answer is quite a lot compared to any other agricultural product."

Perhaps nobody has had a better seat for this decadence than Leatham, 47, whose phone case features an image of reality mogul and client Kris Jenner giving the finger. At his studio in the basement of the Four Seasons in Beverly Hills—a windowless, fragrant workspace stocked with vases of all shapes and sizes—handsome men artfully assemble arrangements such as a $1,400 "Gigantic Rose Bowl." There's a framed thank-you from Dolly Parton on a side table in his office—it reads: "Anytime I need something spectacular I know where to look."

Leatham has more than 900,000 Instagram followers—due in part to his work with Jenner and the Kardashians—and his life is occasional fodder in tabloids such as *Us Weekly* and *In Touch*. At the George V, his opulent arrangements have turned the hotel lobby into a bona fide tourist attraction. "We're using over 13,000 stems of flowers a week," he says. "Just in that one hotel." (His budget there is more than $7 million a year.)

In 2014, in a ceremony at Versailles, Leatham was awarded the Chevalier de L'Ordre des Arts et des Lettres in recognition of his contribution to French culture. Now a Post-it above his desk reads: "Remember you're a f---ing knight." Not bad for a kid from Ogden, Utah. As a teen he worked the box office at a movie theater. At 19 he moved to Los Angeles, where he worked for the Gap before being discovered by a modeling agent and shipped off to Europe to do runway work.

He fell into flowers by chance in 1995 at the Four Seasons in Beverly Hills, working a part-time job for the in-house florist. Four years later he was hired by the George V, where he was able to hone his craft, thanks to the lavish budgets provided by owner Prince Alwaleed bin Talal of Saudi Arabia.

"I remember us being able to play and have fun," Leatham says. "We'd make something, say, 'I don't like that,' and throw it away. Just thousands and thousands of stems of lilies. It would be in the lobby, and I'd be like, 'No, I want to do purple.' " He credits his early success to "his Highness," as he calls Alwaleed, who provided room to create his signature look. The "Leatham Threes" are "clean, simple, chic," the florist explains. "Never mix more than three types of flowers."

Leatham moved back to Los Angeles in 2016, but he travels to Paris every five weeks to style the George V. "In L.A. they don't respect artists. They respect television stars," he says.

There's a framed thank-you from Dolly Parton on a side table: "Anytime I need something spectacular I know where to look"

"There's a respect for artists in Paris. They could give a f--- about celebrities."

Even so, it's celebrities who drive his brand. When Jenner stayed at the George V in 2014, he filled her room with flowers. The George V is where he met Turner and Oprah Winfrey. "My biggest clients, my greatest friends—how did you meet them? In the lobby of the George V. I did Chelsea Clinton's wedding. Where did I meet the Clintons? In the lobby of the George V." (After Hillary lost the presidential election, he sent a handwritten letter. Did she want flowers? "I'm sure that's the last thing she wanted," Leatham says.)

The now-iconic flower wall he created for Kim Kardashian

Clockwise, from left: Just some of the more than 1 million roses and orchids Leatham used at a June 2017 wedding in Blenheim Palace; one of his dramatic statement pieces in a single color, for the entrance to an event in Vienna; roses and hydrangeas set afloat in a pool for a party in Istanbul

and Kanye West's 2014 wedding kick-started a trend that, unlike cut flowers, will not die. "Every time I think it's over, we'll put some scene up with a couch and a floral wall," says Marcy Blum, a prominent Manhattan-based party planner. "And that's the thing everyone is Instagramming."

In March 2018, Leatham designed Khloé Kardashian's baby shower at the Hotel Bel-Air, an affair for 80 guests that included more than 20,000 carnations hanging from the ceiling. Roses were imported from Ecuador and displayed alongside huge moss-covered elephants, another Leatham signature. "I'm kind of the New Age Noah from Noah's Ark," he says.

The influence from these celebrity events filters to the masses: Call it trickle-down floranomics. According to Kate Penn, chief executive officer of the Society of American Florists, even brides working with a limited budget crave the kind of Instagrammable moment Leatham specializes in. "Some brides will put all their money into the really big showstopper piece," she says. "If they've got this fabulous floral chandelier, they'll do something more modest for the tables. They want something that's going to get people talking."

As his work has been posted and reposted, clients have gotten more demanding–and Leatham more selective. He prefers not to meet with a bride until four months before the wedding. "Brides lay in bed drunk on Instagram and change their minds," he gripes. But he concedes people are willing to spend a little extra these days. "I'll say, 'If you want this you have to spend an extra 20 grand,'" he says. "They understand if they see something wow, they'll need to spend something more wow."

When asked if brides are concerned with ecological impact, Leatham scoffs. "What are you going to do with all of those flowers? Float them down the Thames River?" he asks. "The last thing brides want to worry about after the wedding is where you're going to take all the flowers."

Leatham makes this observation effortlessly, with charm and a corn-fed smile that make his musings seem less catty and more funny. He admits that for his own 2017 wedding, to *Teen Wolf* star Colton Haynes, he was his most demanding client. "Listen," Leatham warned his then-fiance. "If you're marrying Jeff Leatham, you either have to do something where you get married naked on the beach in Cabo with nothing–it's just you, a horse, and sand–or you go big."

Jenner officiated at the wedding at the Parker, a hotel in Palm Springs, Calif., before stars like Sofía Vergara, Joe Manganiello, Jesse Tyler Ferguson, Melanie Griffith, and Chelsea Clinton. "Nothing prepared me for walking into that space," Jenner recalls. "He had put up this wall of green and all these red roses sprinkled throughout. It was the most romantic, beautiful setting I think I had ever seen."

The wedding was covered by tabloids and splashed across Instagram. It was, in the end, an expansion of Leatham's growing brand. In March he'll open a new studio in the Four Seasons in Philadelphia. This winter he'll orchestrate a wedding in Mumbai for one of the richest families in the world, which will require several weeks in India and 45 employees. In a sign of his increasing influence, a flower market in Holland recently named an orchid after him. It's something Leatham might call a "floral orgasm dream," if he only got a cut of the sales. B

PHOTOGRAPHS COURTESY JEFF LEATHAM

Brewing Up a Recovery

For the past year, the Tap Room on hurricane-ravaged St. John wasn't just an oasis where islanders could unwind. It was a place to put the pieces back together. *By Noelle Hancock*

ILLUSTRATION BY JAN BUCHCZIK

The restaurant where chef Patrick Allen works survived a devastating fire and two Category 5 hurricanes. On some days, when he arrives to cook up mahi mahi tacos for a mixed crowd of tourists and locals, he wears a T-shirt with a severe weather logo and the words: THIS IS WHY WE CAN'T HAVE NICE THINGS.

"It adds a little levity to the situation," he says. Allen works at the Tap Room, a pub and brewery that's now thriving on St. John in the U.S. Virgin Islands, a territory hard-hit by Hurricane Irma in September 2017. But if you want the whole story of the bar, you have to go back 15 years. It's a tale best told over a beer–and one, like many tales about craft brewing, that starts in New England.

Tap Room owners Kevin Chipman and Chirag Vyas met as dormmates at the University of Vermont. After graduating in 1999, they headed to opposite coasts: Vyas took a position as a support scientist for NASA in Silicon Valley; Chipman found work in Boston as a physical therapist. "My warm shower was the best part of my day," Chipman, now 41, recalls of life in Massachusetts. "It was dark when I left for work and dark when I got home."

In 2001 he visited St. John, the smallest island in the U.S. Virgin Islands at less than 20 square miles. "I remember sitting at this bar and thinking, I could live here," Chipman says. He persuaded a buddy to join him: Vyas, known to his friends as "Cheech." They bought one-way tickets and arranged to live on a sailboat for $250 a month. "We thought, This will be cool! We'll be partying on a boat in the Caribbean!" Vyas says.

The sailboat had no electricity, running water, or working bathroom. They worked as bartenders and busboys, storing dinner on a block of ice and eating by flashlight. They enjoyed their simple, sunny life but missed some aspects of their frosty college days, most notably the craft beer. They ordered a $50 brewing kit and spent two years playing with recipes and giving away samples. When their tangy mango ale developed a following, the two found a bottling partner, Shipyard Brewing Co. in Maine.

"It's a flavor combination that had never been done before with beer on a production level," Chipman says. "It's Caribbean meets craft." The partners pooled their savings, secured small loans from friends and family–in the $500 to $5,000 range–and started St. John Brewers in 2004. They were 27.

During the day, they delivered their product to local bars and restaurants in their 1989 Toyota pickup, working the bars at night. In 2006 they opened their own watering hole, the Tap Room, in St. John's main port, Cruz Bay. The menu reads like the fever dream of a Jimmy Buffett fan ordering his last meal on Earth: jalapeño poppers with pineapple cream cheese, a pulled pork sandwich with mango BBQ sauce, and, of course, beer cheese.

The Virgin Islands is haunted by the ghosts of failed restaurants, brought to you by stateside interlopers trying to sell a cheeseburger in paradise. But the Tap Room developed a solid following among tourists and locals. St. John Brewers has created 8 bottled and 18 draught beers; they play with local flavors such as starfruit and have convivial names like Pale Tourist pale ale and Island Hoppin' IPA. Vyas and Chipman have turned down distribution companies urging them to expand or sell. "We never looked at St. John Brewers as a short-term business with a buyout strategy," Chipman says.

In 2015, at 38, Vyas was diagnosed with avascular necrosis, a degenerative corroding of the bones, which required a an arduous double hip replacement and prolonged recovery. That same year the business next door caught fire and incinerated the Tap Room. Only the kitchen and office survived. They relocated the bar into the office space and spent the next two years rebuilding.

Just as renovations were winding down, the island began buzzing about Hurricane Irma barreling toward it. St. John hadn't seen a storm anywhere near that size since Category 3 Hurricane Marilyn in 1995.

Vyas and Chipman, along with bar manager Nick Rinaldi, operations manager Tim Hanley, and Vyas's wife, sandbagged the bar. The group rode out the storm's 185-mph winds—with gusts as high as 225 mph—in a concrete seaside condo with two hairless cats, Freddy and Frankie. "We made dams with sheets and towels and just bailed water for hours," Rinaldi says.

The group ventured out at dawn. The once-lush island was startlingly brown, as though it had been set aflame. Utility poles slumped into the streets, dangling from their powerlines like marionettes. Sailboats lay in repose on the beach. There was a school in the road.

Knowing there would be no means to communicate, the staff had pledged to meet at the Tap Room after the storm. Word spread by the "coconut telegraph," as islanders call it, and what was supposed to be a staff meeting of 15 turned into a community gathering of 100 people searching for friends and information.

"Normally you ask people, 'How are you doing?'" says Hanley, the operations manager. "Instead the question was, 'Do you have a roof?'"

The bar staff handed out cold brews when things wrapped up. "It was so hot out," Vyas says. "It seemed like everyone could use a cold beer."

Two weeks later, Category 5 Hurricane Maria dumped an additional 35 inches of rain on the island. The Tap Room, tucked in a stone-and-mahogany shopping complex, escaped with mostly water damage. Vyas maintained a positive outlook. "We'd already been through a fire," he says. "So when the hurricanes happened, we said, 'We'll clean it up and move on.'"

When they weren't working on the bar, the owners were helping others clear out homes and driveways. Because the Tap Room couldn't open, they decided to give back what they could: cold beer. Every Friday for four weeks, St. John Brewers gave away its arsenal of 2,400 surplus bottles. "Why let it sit there when people could be enjoying it?" Chipman says.

Ryan West, administrator for the Love City Strong foundation, found out at the ferry dock, where he and his crew had just dispatched a group of evacuees, about Free Beer Fridays. (The nonprofit was created after the storms to assist in recovery and has received support from Bloomberg Philanthropies.)

"We were standing out in the sun, and everyone was emotionally fragile," Ryan recalls. "Someone said, 'The Tap Room is giving away free beer!'" The group shot for the bar. "You got to feel normal for a few moments. Not think about the people that left the island that day that you might never see again, or the tough decisions."

Over at the Cruz Bay Landing restaurant, owner Todd Beaty and his staff were serving up 1,000 free meals a day with the support of the Red Cross. They looked forward to Free Beer Friday all week. "We'd go racing down there," Beaty says. "Just to be able to have a cold beer and talk to everyone. It was absolutely precious to us."

Crowds swelled to 200 people. One Friday a DJ arrived packing his own generator. Someone brought bongos. "Then it started to rain, and people just danced in the middle of it," Vyas says. "No one talked about the storm," says Allen, the Tap Room chef. "It was almost like being at a normal happy hour."

It took two months to restore power to Cruz Bay and six to get the whole island running. The Tap Room resumed business in November 2017, still operating out of the converted office. This summer—three-and-a-half years after the fire—the Tap Room 2.0 was finally unveiled.

The brewpub that started with just four taps in 2006 now has 24. The space is four times larger, with seating for 120 people, and a second floor with a cathedral ceiling. Production has increased from 5 kegs a week to 20. It's one of the only restaurants on St. John with air-conditioning. There's a beautiful stretch of mahogany below the new bar counter: some of the wood Chipman and Vyas salvaged from the old Tap Room after the fire.

"It feels very well-deserved," says West, the nonprofit administrator, of the airy new digs. "Tap Room stepped up and threw morale-boosting parties once a week. They weren't looking for praise and didn't make money." He adds: "People don't forget that kind of thing." Ⓑ

BOTTLES OF NOTE

Pale Tourist
A hoppy pale ale with a light body and a dry, clean finish

Liquid Sunshine
A Belgian-style ale that tastes of Caribbean orange and coriander

Coffee stout VI (Massive Series)
A stout made with cold-brew coffee featuring notes of chocolate

Green Flash
A nonalcoholic energy drink that's not too saccharine

Memphis, Hawaii

An island home that also happens to be a design paradise. *By James Tarmy*

The entrance to the home of Adrian and Lesley Olabuenaga looks like the gateway to a fun house dreamed up by Dr. Seuss: A fire-engine-red door gives way to a canary-yellow entryway, and once inside there's a glass table held up by a sphere, a square, and a triangle. One bathroom is tiled in Pepto-Bismol pink.

For 21 years, the owners have kept their Maui home exactly as it was imagined by its architect, Ettore Sottsass. The Italian designer was the driving force behind the Memphis Group, a loose coalition of artists who developed the zany patterns and bright colors that defined the late 1980s and early '90s. He built only seven houses during his lifetime, and this one, completed in 1997, is arguably his most distinctive.

This month, the couple are putting the house on the market. (It has multiple levels, and the Olabuenagas are getting older.) They've listed it with Becky Hanna of Island Sotheby's International Realty for $9.8 million.

The Olabuenagas were already admirers of the movement when they commissioned Sottsass. They sold accessories by Memphis designers through their company, Acme Studios Inc., and after Sottsass agreed to do the home, they handed the reins to him entirely. "We wanted it to be a complete expression of what he had in his brain," Adrian says. "We didn't want to get in the way."

After it was finished, the couple filled the home with Memphis-style furniture to complete the look. This includes one of Sottsass' trademark yellow-and-brown desk chairs, which sits in front of a typewriter he did for Olivetti, and a black, green, and orange floor lamp by the Memphis-aligned architect Michele De Lucchi. Sottsass designed a bookshelf to hold Adrian's collection of radios, and one of his vividly phallic, pale-pink Shiva vases is on display in the guest bathroom.

In the subsequent decades, the owners' only intervention was to put a new coat of paint on the house's exterior. "We live and breathe Ettore Sottsass," Lesley says. "We eat with his cutlery and china. We drink out of his glasses." The furniture, the couple say, could be included in the sale of the house for an extra fee.

Although the Memphis Group has become a popular reference point again, it's still a polarizing strain of

PHOTOGRAPHS COURTESY TRADE WINDS PHOTOGRAPHY home décor: The group pioneered the use of laminates and particleboard, neither of which is regarded as a high-quality material today. The style was broadly pilloried in the 1988 Tim Burton movie *Beetlejuice*, where much of the plot concerns an out-of-town couple who move into a classic New England home with the intention of turning it into a vulgar display of Memphis-style architecture.

But the Olabuenagas say they've had no problem living with Memphis. Over the years, they filled the house with contemporary art and entertained a stream of friends and visitors interested in the building. "We were concerned that we would have to walk around with kid gloves," Lesley says, "but we use it like a normal house." In 20 years, the only damage she says occurred was a couple of broken drinking glasses and a shattered plate.

The house is set inland, near the center of Maui, about 30 minutes from Kahului Airport. But its perch on a hilly half-acre plot affords ocean views from much of the property. There's about 2,750 square feet of living space, with three bedrooms (all on the second floor) and two and a half bathrooms. One, which is shared by two bedrooms, has multicolored tiles and a soaking tub.

The house is also clearly divided into public areas downstairs and private rooms upstairs. A dining alcove is separated from the rest of the space by an arch outlined in wood, and the kitchen—which is open to the living room—is populated by colorful, blocky cabinets and counters. The bedrooms are cozier and slightly less jarring, but no one would confuse them with those in a conventional abode.

Sottsass had carte blanche with the landscaping, too. A 1,500-square-foot deck is attached to the house, and there's a courtyard tiled in terra cotta and porcelain. Sottsass "sketched out the garden, for what we should do in the front and the back," Lesley says. The plan included a grove of trees that would shield the home from the road, plus a lush—albeit compact—garden with pathways. Two cypresses flank the back door. "When we got them they were around 3 feet tall," Adrian says. "Now they're 40 feet."

From left: The western facade, in vivid red, yellow, and pastel green; the master bedroom, with a Sottsass-designed bed; the living room, with chairs and a table by the architect

The couple's decision to sell underscores the particular plight of design-focused homeowners who have, in their own way, devoted a significant part of their life to maintaining what they consider an architectural masterpiece. The $9.8 million price puts it in rarefied company: Only 23 homes on Maui are listed for $9 million or more, according to Zillow, and all but one of those houses is on the ocean. (The other is a 20-acre-plus property.) Whoever buys this one will probably do so just because she loves it.

And if she doesn't? "We've spoken about it a hundred times," Adrian says. "The longer we think about it, the more we come to terms with it." Obviously, he says, "we'd love for someone to keep it exactly as it is. But once we sell it, we have to cut our ties." He compares it to owning a valuable painting or a 1960s Ferrari. "You're the caregiver," he says, "and then you pass it on to the next person." B

Mad as Hell

A new book on female rage is a call to arms for women who aren't going to take it anymore. *By Rebecca Greenfield*

I am an Angry Woman and proud of it. By outing myself, I'm jeopardizing my career—when women express anger at work, they lose status and wages and are viewed as less competent, research has found. I also risk coming off as unlikable, a scold, and unhinged. And I can expect even more men to tell me to smile.

But after reading Rebecca Traister's *Good and Mad: The Revolutionary Power of Women's Anger* (Simon & Schuster, $27), I'm convinced that the benefits of publicly owning my feelings outweigh all that. And, no matter your gender, you should feel that way, too.

The book is largely an aggregation of rage from the past two years, from the 2016 election through #MeToo up to the midterm races happening right now. History has a habit of erasing female anger, Traister argues. Fuming-hot ire is the necessary and righteous fuel for igniting radical social change: It drove the suffragists, labor organizers, second-wave feminists, and civil rights activists to push for the right to vote, humane working conditions, reproductive freedoms, and racial equality under the law.

But when we think of Rosa Parks or Susan B. Anthony, we think of gentle, smiling folk heroes in soft focus. Their anger and others' is diminished, negated, or, even worse, demonized, despite its often necessary role in furthering positive change. That damping keeps the power of female anger in check, because we've seen what happens when it gets out of control—massive, disruptive social revolutions. "It had become clear that I needed to work swiftly to capture this rebellion before its sharp, spiky contours got retroactively smoothed and flattened by time," Traister writes.

And she's right. That softening has already started to happen. Traister reminded me of many of the moments of disgust I've had over the past two years, which had receded into the depths of my brain to make room for more pressing infuriating things. She reminded me about powerful men in my own industry who harassed women out of their jobs and careers. She reminded me about the avalanche of sexist remarks male pundits made about female politicians during the election and after. And she reminded me that some of those same men also, allegedly, harassed women at work.

Reading about those moments was physically enraging, and that's the point. Traister wants women to hold on to the feelings of the past two years and not feel shame. Our anger has already led to positive change: #MeToo has forced companies to oust harassers and take a look at their policies and cultures, and a record number of women are running for office and winning their primaries. Our anger has been a force for good. "The task," she writes, "is to keep going."

Women are often told the contrary. Study after study has found that men are admired for their anger, while women, especially women of color, are seen as "out of control." We saw this play out in early September when Serena Williams got chastised and fined for expressing herself during the U.S. Open. Or think about how Kamala Harris was called "hysterical" after she questioned Jeff Sessions on the Trump-Russia investigation. For many women, this double standard is a regular occurrence.

But Traister knows that not all women have the privilege of openly expressing their anger. Just look at Dr. Christine Blasey Ford. Her testimony in front of the U.S. Senate Committee on the Judiciary was a case study in female composure. At times she was outright apologetic, even as she described her alleged sexual assault. Contrast that with Brett Kavanaugh, the U.S. Supreme Court nominee, who yelled and got visibly upset in his almost hourlong opening remarks. Traister spends a lot of the book analyzing incidents like that—the ways women contort themselves to avoid showing their true feelings. Or more often, the times women get angry.

Ultimately there isn't a satisfying answer for what women should do in these impossible situations. For some, their anger will hurt them. Black women, studies have found, are particularly penalized and at risk of gross stereotyping. Some women have already lost their jobs for protesting the president.

Traister doesn't encourage her readers to get openly angry. But she's optimistic that if more people take female rage seriously, things can change. For men, that means honoring female anger just as much as we honor the anger of disaffected men. For women, it means honoring other women's anger and, most important, your own.

ILLUSTRATION BY TARA BOOTH

On the Cutting Edge

You never give scissors much thought—until you get a bum pair. With the Fiskars PowerArc tin snips, you may never think about them again

Photograph by Joanna McClure

PROP STYLIST: JOJO LI

Scissors have been around for thousands of years, but there hasn't been much innovation in the category since the days of King George III, when English entrepreneur Robert Hinchliffe produced the first pair made of cast steel. That changed last year when Fiskars introduced its PowerArc Easy Action 13-inch tin snips ($50). Its patent-pending curved blade is angled for up to 40 percent more power. The oversize loops—one of them open—are even roomy enough to use with thick gloves.

THE COMPETITION

• Klein Tools' industrial high-leverage shears have one serrated edge for better grip, but the $26 pair comes armed with only an 8-inch blade.
• Clauss Cutlery Co. measures up with 10-inch blades and ergonomically molded handles on its $25 PowerFlexx.
• The 10-inch blades of Wiss's shop shears ($15) are forged from durable titanium, but an adjustable pivot may make them loosen over time.

THE CASE

Every detail of the Easy Action tin snips, down to the fixed pivot bolt, is excellently designed. The thick blades make quick work of siding and sheet metal. A textured soft grip nudges your hands into the right position, so you can leverage your full strength. They're lightweight enough to dramatically reduce hand fatigue, and an easy-open lock will protect the blades when not in use. *$50; fiskars.com*

The Pay Gap, Microsoft, and The Limits of Class Actions

By Joe Nocera

ILLUSTRATION BY GEORGE WYLESOL

Moussouris v. Microsoft Corp.

Case #2:15-cv-01483

● CLASS IS IN? In the wake of the *Dukes* decision, there was talk that the Supreme Court had gutted class actions. But they've seen a resurgence, in large part because appeals courts aren't interpreting *Dukes* as narrowly as business would like, says Robert Klonoff, a professor at Lewis & Clark Law School.

● THEN AGAIN... How long will the reprieve last? With judicial vacancies being rapidly filled by conservative jurists, class actions may soon be a relic. That would be a shame. While there have certainly been frivolous or abusive class actions, the suits are a powerful tool to right real wrongs.

❶ THE ORIGIN Katie Moussouris, a Microsoft engineer specializing in security issues, claims she was told during her May 2012 performance review that she'd had an outstanding year, and on a scale of 1 to 5 she'd earned the second-highest rating, a 2—but because the number of employees who can get top ranks is capped, she got a 3 instead. The same thing happened in 2013. She left in 2014 and sued in 2015, alleging she was passed over for promotion in favor of less qualified men and was paid less than her male peers.

❷ THE LAWSUIT Moussouris and her lawyers sought class-action status on behalf of 8,000 women on the grounds that all were routinely discriminated against at Microsoft. The plaintiffs got a boost when U.S. District Judge James Robart ruled they could seek evidence from Microsoft. What the lawyers found gave them high hopes—for instance, according to one of the plaintiffs' expert witnesses, women at the company earn a "statistically significant" 8.6 percent less than men. Microsoft denies discriminating on pay and promotions.

❸ THE ISSUE The plaintiffs had to overcome one important hurdle: a 2011 Supreme Court case, *Wal-Mart Stores Inc. v. Dukes*. In a 5-4 decision written by the late Antonin Scalia, the court ruled that because thousands of low-level managers were making the pay and promotion decisions, there wasn't enough "commonality" among the plaintiffs to justify a class. The Microsoft plaintiffs believed that corporate policies such as the forced ranking system were a big part of the problem, making it an issue of corporate culture, not individual decisions.

❹ THE RESULT Robart ruled for Microsoft in July, citing the *Dukes* precedent. The plaintiffs, he wrote, "have not identified a common mode of exercising discretion that pervades the entire company." However, in late September, the Ninth Circuit Court of Appeals agreed to review the decision to deny certification. If the appeals court certifies the class, Microsoft will have to decide whether to take the case to trial—where its alleged discrimination will get a public airing—or settle and move on. Ⓑ —*Nocera is a business columnist for Bloomberg Opinion*

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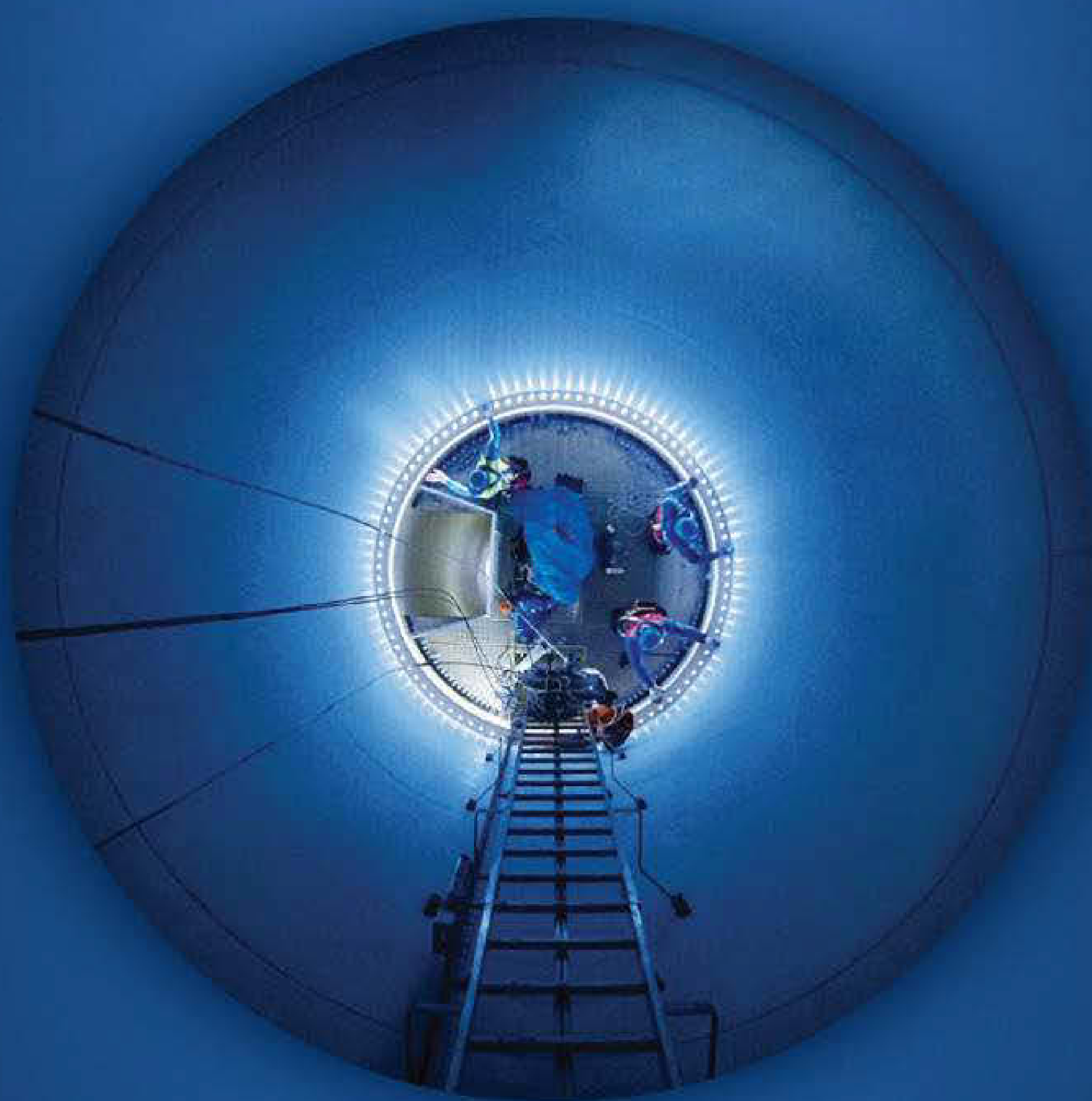

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