● Can anyone fix Intel? 46 ● Slipping into poverty 30 ● AstraZeneca's vaccine drama 40

Bloomberg Businessweek

April 12, 2021

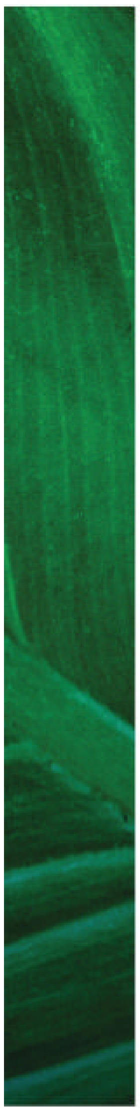
How to LOSE $20 billion* in 2 days

SWAPS! LEVERAGE! GOD! AND MORE!

*GIVE OR TAKE

Few people had ever heard of Bill Hwang. Then a wild bet blew up his fortune 24

E-COMMERCE STRATEGIES FOR A POST-PANDEMIC WORLD



While e-commerce was steadily growing prior to Covid-19, the pandemic vastly accelerated consumer acceptance of transacting online, exponentially increasing demand for a reliable and enjoyable digital shopping experience.

Online purchases for the winter holidays grew by 45% in 2020, more than triple the growth rate in 2019. The pace of growth will likely slow as business normalizes post-Covid, but it will not drop back to pre-pandemic levels, says Melissa O'Keefe, Ryder's Group Director of Product Development & Innovation, E-commerce.

"E-commerce is here to stay," she says. "We've taken that leap, and we're not going back. The numbers are here, and now we have to react to the capacity constraints that exist."

Consumer embrace of e-commerce has created a tremendous opportunity for retailers to build business and connect with customers in a new way. But, for companies to successfully make this transition in the midst of the global health crisis, they must navigate a host of new challenges.

The stakes are high. Retailers that can't meet the online expectations of their customers are at risk of losing them.

Here are three ways retailers can respond to today's challenges—and set themselves up for success in a post-pandemic world.

Emphasize the consumer experience.

During the height of the pandemic, consumers were more willing to accept delivery delays or other shipping issues, O'Keefe says. As the pandemic subsides, their expectations are likely to rise again, with more consumers seeking free shipping and expedited delivery, or in-store or curbside pickup, even from small retailers.

"They want the ability to get everything same-day, one-day or two-day," she says. "But they often opt for a free or cheaper shipping option if one is available." Best-in-class retailers will extend that consumer experience with branded packaging and a simple, streamlined process for returns.

Find the right partner.

Meeting evolving consumer expectations poses greater challenges for small and medium-size businesses. Even just picking-and-packing items in-store can come with substantial expenses and have a negative impact on the experience for in-person customers.

Smaller retailers also don't have the scale necessary to maintain multiple distribution nodes and their overhead costs, or to negotiate lower parcel rates. The solution for such retailers is to connect with a third-party logistics (3PL) partner that can provide access to more locations and geographies and offer cutting-edge technology for real-time inventory management across multiple locations.

"With e-commerce fulfillment capabilities, small businesses can compete with the big-box retailers if they choose a 3PL partner that allows them to do so," says O'Keefe.

Build resilience into your supply chain.

The pandemic has provided retailers with valuable lessons about prioritizing flexibility within their supply chains to prevent disruption from unexpected events. There's still plenty of work to do: only about one-fifth of supply chain executives polled last year by Gartner said that they had a highly resilient supply chain, while more than half said they planned to build in more resilience within the next few years.

"Now is a good time for retailers of all sizes to take the learnings from the past year and refresh their disaster recovery plans," O'Keefe says.

For small businesses, other supply chain lessons might include the importance of having multiple fulfillment centers in different geographic regions, having more than one shipping partner and having processes and systems to deal with labor shortages.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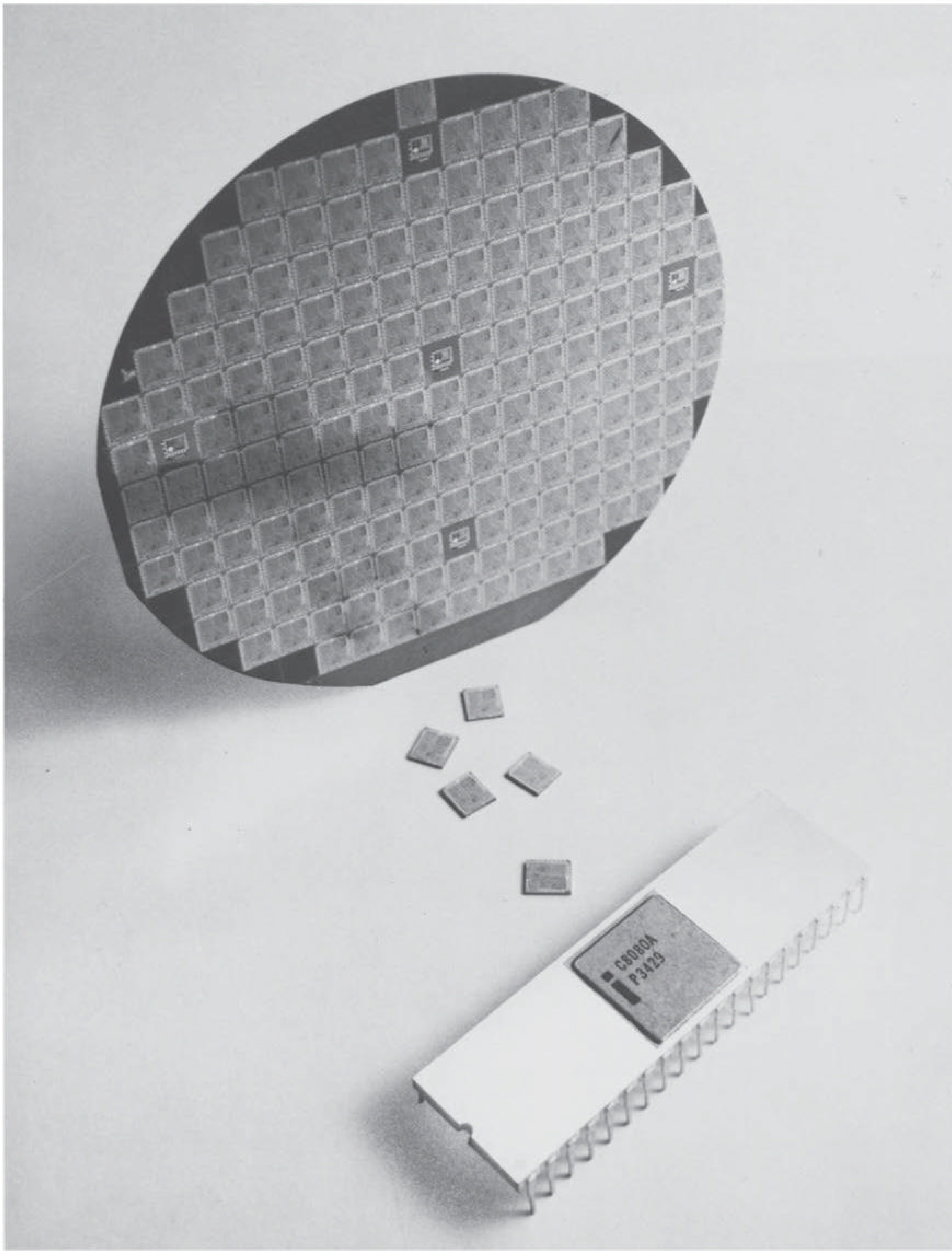

◀ Intel once found its way into thousands of devices with products such as the 8080, introduced in 1974. The company's recent efforts in mobile have been far less successful.

COURTESY INTEL CORP.

FEATURES

CORRECTION

"The Mountain State Kingmaker" (Politics, Feb. 1, 2021) named Joe Manchin (D-W.Va.), Jon Tester (D-Mont.), and Susan Collins (R-Maine) as the only three senators elected in states whose voters chose a president of the opposite party. There is a fourth, Sherrod Brown (D-Ohio). ● "Eyes on the Street" (Politics, March 29, 2021) stated that Pak Ho was assaulted in Oakland, Calif.'s Chinatown; the attack occurred in another part of the city.

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■ COVER TRAIL

How the cover gets made

❶

"So this week's cover is about Bill Hwang."

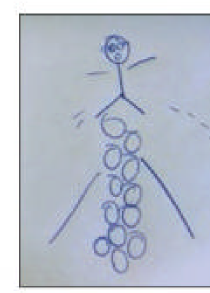
"Bill who?"

"Hwang. He has this family office called Archegos."

"Oh, *right*—the guy who lost all his billions in, like, two days?"

"Turns out, betting everything on a handful of stocks isn't such a great idea."

"Maybe we draw him precariously perched atop his stocks and then leverage it all up for a tumble—kind of like this."



"Uh..."

"Yeah?"

"..."

"The planks on the sides are the leverage."

"Um..."

"What is it, tell me? I'm happy to tweak."

"Let me put it this way: Maybe this week we need less drawing, more words?"

"Wow, it's like I'll never be able to leverage my true skills in an environment like this."

Cover: Emile Wamsteker/ Bloomberg

ECONOMICS: LEFT: NICOLAS AXELROD/BLOOMBERG; RIGHT: RUHANI KAUR/BLOOMBERG

● Global cases of Covid-19 passed 133 million; almost

2.9m

have died. Vaccinations are ramping up, however, with more than 709 million shots given. The U.S. government won't issue so-called vaccine passports, White House Press Secretary Jen Psaki said on April 6, citing privacy concerns.

● Janet Yellen argued for a harmonized corporate tax rate across the world's major economies.

Speaking to the Chicago Council on Global Affairs, the U.S. Treasury secretary marked an American return to the "global stage." For his part, Amazon CEO Jeff Bezos said he supports a corporate tax hike to pay for the massive infrastructure investments Joe Biden has proposed.

● Tourists take in the tulips at the Holland Flower Festival during this year's Qingming Festival in Yancheng, China.

● "We don't train leg-neck restraints with officers in service, and as far as I know, we never have."

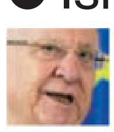
Lieutenant Johnny Mercil, who trains Minneapolis police officers in the use of force, testified in the murder trial of Derek Chauvin that the police officer's actions toward George Floyd on May 25, 2020, were far outside department policy.

● Credit Suisse will take a

$4.7b

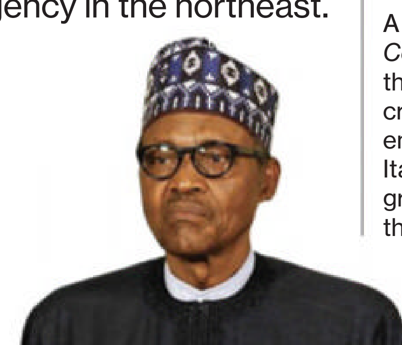
hit tied to the Archegos Capital fiasco. The bank cut its dividend, froze stock buybacks, and scrapped bonuses for top execs as it braces for a pretax loss of 900 million francs ($960 million) in the first quarter. ▷ 24

● The IMF upgraded its global growth forecast to 6% for 2021, the strongest in four decades. Last year GDP shrank 3.3%. The IMF's *World Economic Outlook* also warned about widening inequality and the divergence between advanced and developing economies.

● Israeli President  Reuven Rivlin has asked Benjamin Netanyahu to  try to form a new government.

Netanyahu, who's on trial for fraud, bribery, and breach of trust, has six weeks to persuade other parties to join a governing coalition after the March election—the fourth in two years—didn't produce a winner. If the right-wing leader fails, Rivlin will appoint another lawmaker to take a stab.

● Suspected militants from the separatist group Indigenous People of Biafra attacked a prison in southeastern Nigeria on April 3, freeing more than 1,800 prisoners. President Muhammadu Buhari called it an act of terrorism. Africa's biggest oil producer is already struggling with a decade-long Islamist insurgency in the northeast.



● Bitcoin mining could undermine China's efforts to fight climate change.

A study published in *Nature Communications* on April 6 estimates that in 2024, when mining the cryptocurrency peaks in China, the energy it consumes will exceed Italy's total energy usage. And the greenhouse gases it produces will top the annual emissions of Spain.

TULIPS: YANG SUPING/GETTY IMAGES. NETANYAHU: LIOR MIZRAHI/GETTY IMAGES. RIVLIN: MAJA HITIJ/GETTY IMAGES. BUHARI: PHILL MAGAKOE/GETTY IMAGES

Biden's Infrastructure Plan Is a Good Start, But It Needs Work

Like much of Joe Biden's presidency to date, his $2.3 trillion infrastructure plan is remarkably ambitious. Rightly so. The economic future of the U.S. is at stake.

The country needs a bold commitment to public investment. It's visibly falling behind. Any recent traveler to Beijing or Shanghai is struck by how shabby American airports and city streets look in comparison. And this isn't just about appearances. China is proving that modern infrastructure is an essential component of industrial competitiveness and economic growth. Unless something changes, Congress's neglect of roads, bridges, and other connective tissue, plus failure to invest in the infrastructure of the future, will condemn the U.S. to relative economic decline.

Give Biden credit for thinking big. His aims far exceed the kind of workaday repairs that have long characterized such proposals. Not content to fill potholes and mend bridges, the plan seeks to revive domestic manufacturing, overhaul the energy industry, mitigate climate change, and undertake a variety of "transformative investments." Biden is also right to see an opportunity to advance other goals at the same time—such as creating good jobs and reducing inequality.

The proposal takes many steps in the right direction. It offers more than $600 billion for transportation and doubles funding for mass transit. It devotes big bucks to strengthening the power grid and expanding access to high-speed internet. It includes a lot of smart ideas, such as a competitive grant program to reward local governments that eliminate exclusionary zoning policies and an aggressive expansion of research and development investment.

A particular strength is the plan's bold proposals for decarbonizing the economy. It aims for carbon-free electricity by 2035, offers tax credits for clean energy generation and storage, invests in carbon capture technologies, adds significant new funds for climate research, and much else.

All this is good. But the plan is by no means flawless. It does too little to address an enormous backlog of humdrum repairs. By one estimate, the cost of deferred maintenance nationally—on crucial things such as highways, waterworks, and bridges—may exceed $1 trillion. Yet the plan's funding for such upkeep is dwarfed by huge outlays on elder care (at $400 billion) and manufacturing support ($580 billion).

The proposal also falls short on financial discipline. Many aspects, such as its commitment to Davis-Bacon rules on wages paid to government contractors and "Buy America" provisions limiting use of imports, raise costs and do so deliberately. It's essential that the investments Biden favors are made as efficiently as possible and don't divert resources from needed repairs, compounding the deferred maintenance problem.

A final flaw is that Biden's plan is needlessly partisan. An ambitious new commitment to infrastructure could conceivably have attracted Republican support—and would have been better for it. Instead, this plan would likely need to be passed through the budget reconciliation process, which means it can't include the kind of regulatory changes that could facilitate the projects Democrats favor. In shunning funding streams that Republicans might have gotten behind (such as a carbon tax) the plan relies on measures (raising the corporate tax rate) that are less likely to command lasting support.

Biden's vow to "unify and mobilize the country" behind a plan to restore infrastructure is surely the right sentiment—not only to heal U.S. divisions but also to get this essential work done right. As the debate on the components of this proposal moves forward, he should try harder to keep that promise. B

For more commentary, go to bloomberg.com/opinion

■ AGENDA

► Are Things Looking Up for Banks?

JPMorgan Chase and Wells Fargo report earnings on April 14. Analysts, who say the banks' pandemic rebound should continue, are wondering how potentially rising interest rates might affect mortgage lending.

► Economists expect to see signs of an accelerating recovery for Chinese manufacturing when the country releases data on its exports and balance of trade on April 13.

► The U.S. Census Bureau publishes its March housing starts figures on April 16. The number soared during the pandemic as people fled cities, but it began to fall again in January.

► The U.S. reports its core inflation rate on April 13; France, Germany, and Italy follow on April 15. Economists tracking Covid stimulus measures are watching inflation closely.

► Turkey's Central Bank announces its decision on interest rates on April 15. President Recep Tayyip Erdogan unexpectedly ousted the hawkish central bank governor in March.

► Analysts anticipate that year-over-year industrial production will have dropped yet again in Russia when the Federal State Statistics Service releases its latest data on April 15.

► Comfort foodies will celebrate National Grilled Cheese Day on April 12, assuming there is anyone anywhere not sick of the sandwich after a year of sad, lonely lunches.

ILLUSTRATION BY MIN HEO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Asian Americans Are Ready for a Hero

Picture an athlete. Now a movie star. And now a politician. You probably pictured a White man. Or a Black or Latino person. I'm guessing you didn't picture an Asian American. I know I usually don't. And I'm an Asian-American television writer who thinks up imaginary people for a living. We Asian Americans don't have many cultural or political figures of national stature. Or, one could argue, any. And though segments of the Asian-American community, particularly South Asians, have enjoyed economic success relative to other minority groups, few Asians overall occupy C-suite corner offices. Politically, culturally, and economically, in the positions that matter, Asian Americans are almost invisible.

There has been no Asian-American Martin Luther King Jr., Malcolm X, or Barack Obama. In California, Arizona, and a host of other states, Cesar Chavez Day is a state holiday. Who's the national, towering Asian-American figure who would be so honored? Andrew Yang? There's no Asian Jay-Z or Beyoncé, no Asian Bad Bunny or Selena. We've seen for years how Black actors have been underrepresented at the Academy Awards. Meanwhile, there has been one Asian American nominated for best actor: Steven Yeun, this year, for his role in *Minari*, directed by an Asian-American filmmaker, one of two such nominations for Asian-American directors in history.

The absence of Asian-American cultural and political figures who imprint themselves into America's collective consciousness means we are viewed as a race of middle managers, destined to provide technical support and financial advice for White and Black and Latino (but usually White) leaders. Yes, there's one C-suite position in the org chart where nobody is surprised to see an Asian face: chief technology officer. How did we get here, successful economically but without the commensurate social status? How did we go from "model minority" to invisible minority to hunted minority?

Model minority was the patronizing label first used in the 1980s to describe Japanese Americans, but it soon broadened to encompass Asian Americans generally. At first we embraced the label, because it implied recognition of economic and educational achievements. Soon we understood how demeaning it was: We were "model" in that we were pliant, didn't get uppity or riot. We showed up, did our job for slightly less pay than our White colleagues, and didn't complain when we were passed over for big jobs. It was a pat on

PHOTO ILLUSTRATION BY 731

● After going from "model minority" to invisible minority to hunted minority, the community needs a new generation of cultural and political leaders

● By Karl Taro Greenfeld

the head by Whites, praising us for our passivity in the face of continuing racism.

But the label also inserted a wedge between Asians and other minorities—as if Asian economic success made irrelevant the dynamics of racism that still, undeniably, affected Asian-American lives. In the protest movements of the 1960s, Asians, African Americans, and Latinos marched and rallied together. Japanese-American Richard Aoki joined the Black Panthers and rose to the rank of field marshal, speaking at rallies with Bobby Seale and Huey Newton. The multiethnic Free Speech Movement and Students for a Democratic Society demanded cultural studies programs for each of the ethnic groups whose histories academia had overlooked. But African-American and Asian-American interests, at one point so closely aligned, soon began to diverge, in part because the model minority conceit chipped away at solidarity.

Pitting minority groups against each other has always served ruling majorities. America has embraced that tradition by making access to meritocratic educational institutions a scarce resource to be fought over by competing minorities. From the University of California system to New York City's specialized high schools, the proposed revamping of admissions standards away from standardized testing toward assessments that weigh racial backgrounds would reduce Asian-American enrollment. For the Asian-American community that long ago recognized the tool of standardized testing as a means of gaining entree to America's elite institutions, the effect of these policies, in New York and California, is to pit Asian interests against African-American and Latino interests.

And why wouldn't other minorities be suspicious of the majority's favorite minority? Wesley Yang, the essayist and author of *The Souls of Yellow Folk*, says that when Asian parents fight back, they are viewed as "White supremacy adjacent, when they are actually for Asian supremacy." The result is many Asian Americans feel estranged from the national social justice movement, even though we haven't approached anything like cultural or social equality with White Americans. Asian-American academic success has become the anecdote some White Americans can use to argue that we live in a meritocratic system rather than a caste system. "They reason that if Asian Americans can succeed in this system," says Lok Siu, professor of Asian-American studies at the University of California at Berkeley, "then the system must be fair."

And so, we came to 2020 and the pandemic caused by a virus that jumped the species barrier in Asia. The subsequent anti-Asian sentiment, propagated in part by the then-president of the U.S., caused numerous incidents of anti-Asian verbal and physical assault, some of them by Black Americans. "The Asian community has become a source of blame," wrote student Milind Singh in the *Spokesman*, his high school newspaper, in Princeton, N.J. "Such a nation cannot exist in a world where people are beaten in the streets for something that happened on the other side of the planet." According to Stop AAPI Hate, a group that tracks discrimination against Asian Americans, there have been more than 3,800 such incidents since March 2020. The Center for the Study of Hate and Extremism at California State University at San Bernardino reports hate crimes against Asian Americans increased 149% in 2020 from a year earlier. On March 17, in the worst example of anti-Asian violence in the U.S. in many years, eight people, including six Asian women, were murdered by a White man.

Most smaller incidents go unreported. Even in my own life, during the first lockdown, I was accosted while walking a few blocks from my house in a predominantly White suburb of Los Angeles by a White man riding an electric bicycle. He rode alongside me for a short distance, telling me I was in the wrong place. I ignored him, assuming he'd mistaken me for someone else. He then cut me off on the sidewalk, and only when I asked him, in my unaccented English, "What the f--- are you doing?" did he seem to realize I was not whomever he thought I was and rode away. It wasn't until I got home and told my wife what had happened and how perplexing the whole experience was that I recognized I'd been subjected to racist harassment. She had to point out the obvious. ▶

◀ I wasn't beaten by a cop. I wasn't shot in the back. I haven't experienced anything like the terror that young African Americans face when dealing with law enforcement. I've never felt I was in grave physical danger during an interaction with police, and I recognize that as a form of privilege. But it shouldn't take the mass murder of Asian Americans to make the case that we, too, are victims of racism. "No matter who you are, even if you are an executive or manager, you are still subjected to possible violence for being Asian American," Siu says. "So, no matter how much upward mobility you attain, you're still seen as Asian American."

Around the time of the social justice protests over the murder of George Floyd, a curious dynamic began to emerge over the term Bipoc—Black, Indigenous, and people of color—and just who was covered by the abbreviation. I'd always assumed that Asians were included in "poc." Why wouldn't we be? We were, after all, "of color" if you go by skin pigment. But the etymological evolution of Bipoc over the summer to focus specifically on descendants of slaves and victims of European and American colonialism meant excluding specific groups, among them some Asian Americans. The reasoning is, in part, that our economic and educational success means we're no longer oppressed enough, so to speak. I began to notice spokespeople for social justice movements and even prominent celebrities urging justice for Black Americans and Latinos but conspicuously leaving Asians out of their demands. Political scientist Claire Jean Kim calls this process "racial triangulation," an insidious evolution that's resulted in Asian Americans being both "White" and "other."

Perhaps our social justice needs don't seem as urgent compared with other minorities. We weren't being shot in the streets—or not as often anyway. But that can't be the standard of inclusion. My own experiences with discrimination have generally been more subtle. Here's another: During a disagreement with a producer on a television show I was writing for, the producer told me I should be happy with the credits I was getting as I was an "affirmative-action hire," which wasn't true. Television writing doesn't have an affirmative action program, and though studios do have programs to promote racial diversity in writing staffs, I wasn't the beneficiary of such a program. It felt as if the producer were reminding me that I was other, different, less than, and therefore should be grateful for what I had, even if it was less than what I was entitled to.

I tried to make sense of that exchange and still, to this day, don't understand why the producer, who'd been a friend, decided to "put me in my place" in that manner. But I've begun to suspect that when I can't figure out why something negative is inexplicably happening to me, it may actually be racism. Asians, like African Americans and Latinos, still have to work harder for promotions and raises than White Americans.

We're in this struggle, too, and recent events have been a stark reminder. We want to be part of this conversation without being accused of appropriating another race's platform, as often happens on social media when Asian Americans try to join the discourse around Black Lives Matter. That also means that Asian Americans must not fall for White-American praise and assume that means we're beneficiaries of the status quo. Because when it matters, we just aren't. We have our own historical legacy, from Chinese laborers brought here in the 19th century who lived in conditions similar to chattel slavery and who were denied virtually every human right, including the right to reproduce, to Filipino farmworkers in California and Japanese Americans in internment camps in the 20th century. My Japanese mother, Foumiko Kometani, when she emigrated to America in 1960, herself didn't know that history. When I asked what she would have done had she known, she said she would never have come to America.

Racial triangulation has meant we have evolved from model minority to forgotten minority. What could raise our national profile? Perhaps this next generation of Asian Americans will assume those C-suite and cultural C-suite positions that will make it impossible to ignore us. Right now we don't have the cultural and political leaders who could demand, and receive, a seat at the table for conversations with White Americans on one side and Black, Latino, and Indigenous leaders on the other. In a recent interview with the *Atlantic*, author Cathy Park Hong made the point that "because we're invisible, the racism against us has also been invisible." One partial remedy: cultural and political leadership of the Jay-Z or Obama level, national figures whose swagger demands to be seen. (Kamala Harris, we see you.)

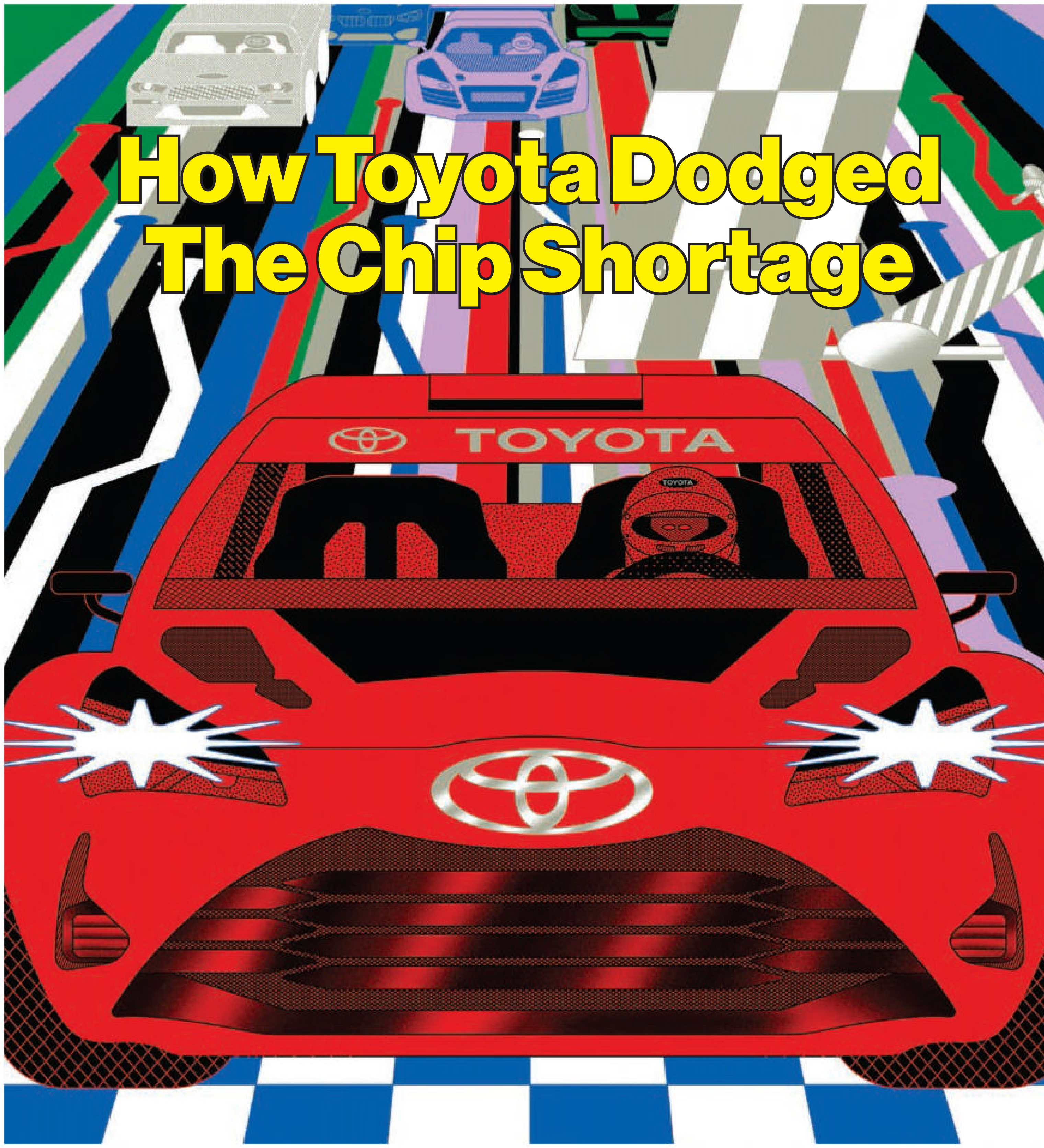
I was a magazine journalist and novelist for decades before becoming a television writer. Three of the last four shows I've worked on were set in Asia. Yet all three showrunners were very talented White males. (I'm worried that even pointing this out might cost me jobs.) Imagine three shows in Black settings. Would the networks, production companies, and, more important, the Black community let that arrangement pass without comment? Until that changes, until the showrunners, movie stars, and political leaders are also Asian Americans, we will continue to be patted on the head as the model minority or excluded from the social justice movement for being already sufficiently privileged. Sure, we have Awkwafina, Jeremy Lin, and Eddie Huang, and they're each stars in their own right. But come on, much of America has never heard of any of them. It will take a true political and cultural hero, someone who strides the globe like that greatest Asian superstar of all, Godzilla, to galvanize our own community and demand attention from the larger American community. I am confident he or she will emerge. Right now, somewhere in this land, an Asian-American future media mogul is raising capital or rising up the corporate hierarchy. The future politician and film director and pop star are writing or dreaming the project that will make them the transformative figures who will embody the change we so desperately need them to be.

They won't magically solve our problems. But they will finally make us impossible to ignore. Ⓑ *—Greenfeld is a novelist, a television writer, and the author of* China Syndrome: The True Story of the 21st Century's First Great Epidemic

In Schools and Now Beyond

Across America, schools are closed. Millions of students are facing challenges that threaten to stand in the way of their success in school and life. At Communities In Schools, we go wherever we're needed and do whatever it takes to connect vulnerable students to the support they need in the classroom and beyond. While schools are closed, we're working in and across communities to bring resources like meals, household supplies, and educational materials to the kids that need them most.

See how you can help students impacted by school closures: CISnational.org/COVID19



How Toyota Dodged The Chip Shortage

● As rivals shutter plants, the automaker's close monitoring of its supply chain gives it an edge

When the Tohoku earthquake triggered a tsunami that struck Japan's northeastern coastline in March 2011, killing more than 15,000 people, Toyota Motor Corp. spent half a year struggling to get back on its feet. One of the biggest hurdles: Tokyo-based Renesas Electronics Corp., a major producer of chips for the automotive industry, saw its main plant knocked offline for three months after the tsunami, sparking a supply squeeze that rippled through the industry.

As Toyota scrambled to repair its facilities and procure missing parts, it also pored over its supply chain to identify the most at-risk items in the hope of preventing a similar disruption in the future. The automaker came up with a list of about 1,500 parts it deemed necessary to secure alternatives for or to stockpile. The company also put in place an intricate system to monitor the vast network of suppliers that produce those items—and the smaller companies those suppliers buy materials from—to develop an early-warning system for shortages.

A decade later, that deep contingency planning is being put to the test. The world's automakers have for months been grappling with a pandemic-induced shortage of semiconductors

ILLUSTRATION BY INKEE WANG

Edited by James E. Ellis

that threatens to knock about $60 billion off the industry's global sales this year. On March 19 the situation got even worse, when a fire broke out at a giant Renesas chip plant in Hitachinaka. The damaged factory, which could take at least 100 days to get back to normal production, accounts for about 6% of global automotive semiconductor output, according to Barclays Plc. Toyota is one of Renesas' largest customers.

During the industry crisis this time, however, Toyota's bolstered inventories and steadier control over its supply chain mean it's better positioned than many of its rivals. Toyota is in the process of gauging the extent to which its output will be affected by the fire but for now says it doesn't see an immediate need to halt production.

Toyota President Akio Toyoda addressed the chips shortage last month at a briefing in his capacity as chairman of the Japan Automobile Manufacturers Association. Amid a global dearth of semiconductors, "there are automakers that are really struggling and others that are not scarred as deeply," he said. "What's proven important: very close communication between automakers, chipmakers, and the part suppliers that rely on those chips."

Toyota's ability to carefully manage its supply chains has helped it trudge through not only the chip shortage but also the past year in general, as pandemic-related disruptions threatened the industry's access to everything from fibers used in air bags to the ships needed to transport its vehicles to foreign markets, says Nakanishi Research Institute head Takaki Nakanishi.

Other automakers haven't been so lucky. Suzuki Motor Corp. on April 5 said it's freezing production at two car plants because of chip shortages. Stellantis NV, the parent company of Chrysler and Fiat, on March 26 said it plans to idle five factories in North America starting on March 29 through early to mid-April, while Ford Motor Co. is temporarily shutting its Dearborn, Mich., truck factory. General Motors, Honda, and Nissan have also had rolling stoppages.

"The semiconductor crisis is one that everyone in the world could have avoided," Nissan Chief Operating Officer Ashwani Gupta says. The problem is many automotive companies didn't rigorously manage their supply chains when it comes to Tier 3 or Tier 4 suppliers. "We often don't know the risks down there," he says. Nissan is now looking to improve its digital supply chain management tools. "Every expert is good at backward analysis," Gupta says. "It's harder to look forward. Nissan has learned from this."

The chip shortage sneaked up on many of the world's biggest automakers precisely because it originated several layers below the top, among the chipmakers and foundries that big chip manufacturers outsource production to. Giant carmakers generally deal directly with only their first- and second-tier parts suppliers, which include major companies like Continental AG and Robert Bosch GmbH. Those big parts makers in turn communicate with smaller automotive-chip designers.

Toyota asks its Tier 1 suppliers to input detailed information about their most obscure parts and materials providers in a complex database that it maintains. Using this system to glean information about, say, a single headlight Toyota purchases for one of its cars, it can get information as granular as the names and locations of the companies that make the materials that go into surface treatments used on those headlights' lenses and even the producers of the lubricants used on the rubber pieces in the assembly, Toyota spokeswoman Shiori Hashimoto says.

These lines of communication alerted the company early on that it needed to stockpile chips. "The process of making semiconductors is complex, and the facilities used to create them are specialized," Hashimoto says. "With that in mind we've needed to make sure there's enough stock to cover a period of potential supply disruption."

The auto industry has for decades embraced just-in-time inventory management, wherein many components reach assembly facilities only days or even hours before they're needed. But the Tohoku earthquake's aftermath pushed Toyota to increase flexibility, and the value of inventory Toyota carries has almost doubled since 2011. Speaking at a briefing in February, Toyota Chief Financial Officer Kenta Kon said as part of the company's business continuity plans, it keeps as many as four months of stock for some crucial components such as chips. Toyota didn't expect the semiconductor shortage to disrupt production in the near term, he said.

That show of optimism came just one day after Japanese rivals Honda Motor Co. and Nissan Motor Co. disclosed they expected to sell a cumulative total of 250,000 fewer cars through March, in large part because of their inability to secure enough chips. Toyota, by contrast, is likely to account for only a "minor" share of the roughly 500,000 units estimated to be knocked off Japanese automakers' output amid the shortage, according to a report from Mitsubishi UFJ Morgan Stanley Securities Co.

Toyota appears to be handling the shortages even better than it initially expected. In an ▶

"What's proven important: very close communication between automakers, chipmakers, and the part suppliers"

◀ email to suppliers seen by Bloomberg last month, Toyota warned that plants in the Czech Republic, Turkey, and the U.K. might have to partially or completely shut because of a shortage of chips. A Toyota official in charge of purchasing asked all suppliers using semiconductors to, as usual, "re-confirm their supplier delivery commitments are in place to secure supply in the coming months," according to the memo. He asked the suppliers to contact Toyota immediately if they encountered any difficulty. A month later, only the Czech plant has been forced to temporarily halt its operations.

This isn't the first time Toyota has overcome a pandemic obstacle. In early 2020 the automaker quickly learned to maneuver through the lockdowns, implementing infection prevention measures and ramping up production in China, where virus-related disruptions dissipated relatively early on. That helped it churn out a record number of vehicles each month since August, unseating Volkswagen AG to become the world's top-selling automaker for the year. Toyota's "ability to bounce back from supply crunches stands out," Nakanishi says. —*River Davis*

THE BOTTOM LINE Chip shortages may cost the auto industry $60 billion in sales this year. Toyota has avoided much of the disruption by closely managing suppliers.

Will Pizzas and Signing Bonuses Woo Workers?

● Despite high unemployment, a record number of small businesses say they can't fill jobs

Early in the Covid-19 pandemic, Melissa Anderson laid off all three full-time employees of her jewelry-making company, Silver Chest Creations in Burkesville, Ky. She tried to rehire one of them in September and another in January as business recovered, but they refused to come back, she says. "They're not looking for work."

Sierra Pacific Industries, which manufactures doors, windows, and millwork, is so desperate to fill openings that it's offering hiring bonuses of as much as $1,500 at its factories in California, Washington, and Wisconsin. In rural Northern California, the Red Bluff Job Training Center is trying to lure young people with extra-large pizzas in the hope that some who stop by can be persuaded to fill out a job application. "We're trying to get inside their head and help them find employment. Businesses would be so eager to train them," says Kathy Garcia, the business services and marketing manager. "There are absolutely no job seekers."

These are anecdotes, but they're borne out by statistics. On April 1 the National Federation of Independent Business reported that in March a record-high percentage of small businesses surveyed said they had jobs they couldn't fill: 42%, vs. an average since 1974 of 22%. Also 91% of respondents said they had few or no qualified applicants for job openings in the past three months, tied for the third highest since that question was added to the NFIB survey in 1993.

On April 6 the Bureau of Labor Statistics reported the highest seasonally adjusted rate of job openings—4.9% in February—since record keeping began in 2000. In another sign that workers think it's easy to find jobs, the number of people quitting stayed at 2.3% of employment in February, seasonally adjusted, just a tenth of a percentage point below the record.

What makes these figures surprising is that the unemployment rate in March, though well off its peak of 14.8% a year ago, was still 6%. That's far above the 3.5% rate of February 2020, before the pandemic. So judging from the jobless rate, which the Federal Reserve tracks closely, there's still plenty of slack in the labor market. But that's not how employers and job counselors see it. There will be even less slack in coming months as the economy strengthens. The median forecast of economists surveyed by

Bloomberg is that the jobless rate will fall to 4.5% in the second quarter of 2022.

There's some evidence for the conservative argument that generous unemployment benefits discourage people from seeking work. Anderson, the jewelry maker, says her former employees told her they were better off unemployed. Usually you can't collect jobless benefits if you're turning down work, but she says state employees told her they were easing up on that rule during Covid. (A spokeswoman for Kentucky's Labor Cabinet had no comment.) The American Rescue Plan that Congress approved last month provides an extra $300 a week in jobless benefits through Sept. 6. "There still will be some people who say, 'I'm glad to take my $300 to $400 a week and stay home, rather than go out and work and earn $500 a week,'" BTIG LLC analyst Peter Saleh told Bloomberg in March.

The pandemic is also clearly part of the problem. A U.S. Census Bureau survey found that workers 55 and older, who are most at risk of Covid, are more likely to retire early because of the disease. Fear of getting sick is keeping some younger would-be workers home as well, especially those in customer-facing occupations. And with many schools closed, some parents are turning down work to care for children, says Holly Wade, executive director of the NFIB Research Center. Also, she says, the small businesses in the NFIB survey may have trouble competing for workers with the likes of Amazon.com Inc., whose worldwide employment grew 63% last year, to 1.3 million. Twenty-eight percent of small businesses surveyed said they were raising pay, almost double the share of last summer but still well below the 2018 peak of 37%.

Some would-be workers may have lost their gumption. "I'm worried that after all this time that's gone by, it's going to be very hard for a lot of people to come back full time," says Garcia, the job counselor in California. A full-time job "used to be the gold standard," she says, but now employers are parceling out the work into part-time jobs to lure applicants.

Alienation from work is most common among the young. A Pew Research Center survey in October found that 53% of those ages 18 to 29 who are working remotely because of Covid said it was difficult for them to feel motivated to perform their duties. Only 20% of those 50 and older said the same.

On the social network Reddit, whose users skew young, a forum called r/antiwork has 264,000 members. It's filled with comments such as: "You're telling me I have to enslave myself to all these applications for hours on end, competing with my fellow man and woman, giving up my dignity just for a chance to enslave myself further so I don't literally die? I'm not having it." One Redditor posted a video of a home computer's mouse that's connected to a swiveling fan so it slides back and forth, making it appear the person is working.

This isn't to say that every unemployed person is alienated or that anyone who wants a job can get one. Tightness in the labor market varies by occupation and geography. The unemployment rate in March was 15% in mining, quarrying, and oil and gas extraction, and 13% in leisure and hospitality. By contrast, it was just 2.7% in government (which includes public school teachers) and 3.4% in financial activities. Hawaii had the nation's highest unemployment rate in February, 9.2%, while South Dakota had the lowest, 2.9%.

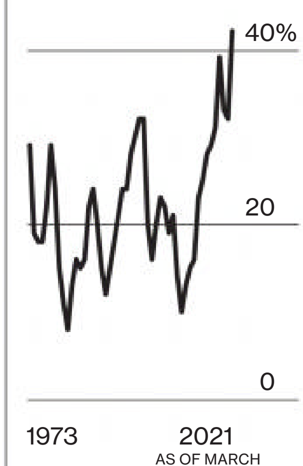
Many of the jobs that employers can't fill are low-paying, while the high-paying ones generally require skills that most people don't have. The pandemic accelerated digitization of work, creating shortages of talent in fields such as artificial intelligence, machine learning, data analysis, security, and network engineering, says Lisa Lewin, the chief executive officer of General Assembly, a training company owned by Adecco Group.

Employers would have an easier time filling job openings if they raised pay or got less picky about qualifications. Re'gine Johnson, 26, of Chicago said she interviewed with 40 companies before she landed a job, even after completing a three-month General Assembly boot camp in user interface design. "They're thinking, 'Do we really want to invest in somebody that's so junior, do we have the time to teach them something they may not know?'" she says. She's thriving now at Neon One LLC, the software company that hired her and provided on-the-job training.

Employers are going to have to adjust to a world in which workers are harder to get—and hope that people who left the workforce during the pandemic will begin to trickle back in. Taco Bell, a Yum! Brands Inc.-owned chain, is planning to offer drive-up interviews for a hiring day on April 21: Prospective employees won't even have to get out of their cars to apply. In Cleveland, meanwhile, manufacturers are striving to change the outdated impression that their jobs are dirty, boring, or dangerous. They have little choice; recruitment shortfalls are forcing them to turn away orders, says Ethan Karp, president and CEO of Magnet, a nonprofit consultancy. "It's their No. 1 problem," he says. *—Peter Coy, with Leslie Patton and Alex Tanzi*

THE BOTTOM LINE Only a year after the U.S. unemployment rate soared to 14.8%, many employers report that they're having a hard time finding workers to fill job openings.

▼ Share of small businesses reporting they have jobs they can't fill



SIGN: MARCO BELLO/REUTERS. DATA: NATIONAL FEDERATION OF INDEPENDENT BUSINESS

A HOT MEAL WHEN IT'S NEEDED MOST

A nourishing meal in a time of crisis is so much more than a plate of food—it's hope, it's dignity, it's a sign that someone cares and that tomorrow will be better

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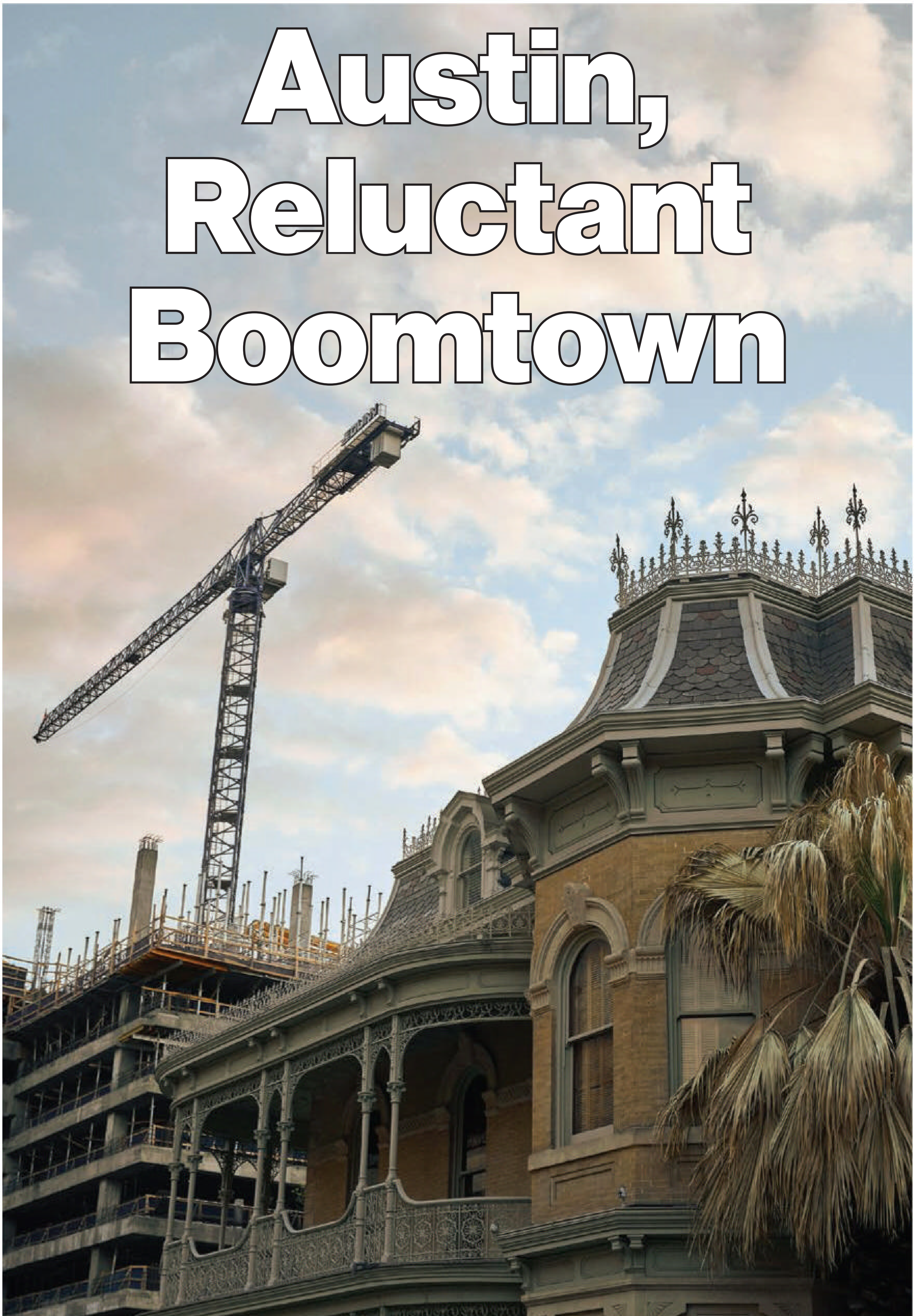
Austin, Reluctant Boomtown



◀ An historical downtown building is surrounded by new construction

PHOTOGRAPH BY ABIGAIL ENRIGHT FOR BLOOMBERG BUSINESSWEEK

Residents fear that the wave of tech workers arriving will turn the city into San Francisco

Edited by Joshua Brustein

▲ Tesla is redeveloping this former music rehearsal space into a showroom

Matthew Congrove got the first offer on his house one month into the pandemic. Now, says Congrove, who lives in an eclectic neighborhood on Austin's east side, he gets about a half-dozen all-cash offers every week. They come by phone, via text, in the mail, hanging on his doorknob, and slipped under his door. In the boldest attempt, a stranger simply showed up at his home unannounced and asked to buy it.

For years, Austin has attracted far-flung newcomers with its food and music scenes, along with low taxes and cost of living. The city grew 30% from 2010 to 2019, making it the fastest-growing major metro area in the country. It was adding about 170 people per day by the end of that period, according to the latest census count. So while rapid growth is nothing new for the city, the population shift associated with Covid-19 has intensified the struggle to, as the motto goes, "Keep Austin Weird." Even Congrove—a software engineer who moved from Florida seven years ago—is most concerned about how the new wave of tech workers is affecting his adopted city's culture. Lately, he's seen more T-shirts bearing startup logos than band names. New condos have sprouted up where quirky bungalows once stood. And the commute time to his downtown office has tripled.

"They just keep coming," Congrove says. "The fleece vests, the tech bros—that's definitely imported from California."

Since the pandemic started, a subset of the California-based tech industry has declared the need to relocate, citing the state's high taxes and prices, ineffectual government, and endemic wildfires. A few investors and executives loudly decamped to Miami, but an analysis of LinkedIn user data shows that about six times as many tech workers went from the San Francisco Bay Area to Austin.

During the pandemic, Austin has welcomed more new residents from the Bay Area than from any other region outside Texas, according to records provided to Bloomberg by the U.S. Postal Service. Tech is not new here—Dell Technologies was founded in the city, and Apple and Facebook have large presences. But there's been a slew of defections from California in recent months. Oracle late last year said it was moving its headquarters to Austin, and a stream of tech elites including prominent investor Jim Breyer and the chief executive officers of Dropbox and Splunk made plans to relocate.

Elon Musk, the second-richest man in the world, is now a resident of Texas—though he hasn't said where—and Tesla Inc. is building a factory in Austin's outskirts, where Musk has said the company will need 10,000 people by 2022. He's also expanding the Austin-area operations for Boring Co. and SpaceX and has moved his personal foundation to the city's downtown.

For all his boosterism, even Musk recognizes the potential hazards of the influx he's helping spark. In a tweet on April 4 he called out the "urgent need to build more housing in greater Austin area!"

The region is facing the same boomtown dynamics that have plagued San Francisco for decades. Last year the number of people sleeping on Austin's streets increased 45% by one count. Houses in the city are on the market for an average of just two weeks, according to the Austin Board of Realtors—compared with seven months a decade ago. And a minimum wage worker hoping to afford a one-bedroom rental would now need to work a 125-hour week.

"There is a fairly broad-based concern that some of the things that aren't working in other areas are going to be brought here," says Dax Williamson, a managing director for Silicon Valley Bank who leads its technology banking practice for Central Texas. "If we price out the musicians, we're going to find ourselves in a bad place." In a sign that may already be happening, Tesla recently selected a warehouse in southern Austin that served as a music rehearsal space, with plans to transform it into a $2.5 million Tesla showroom this summer.

Hating California is a tradition in Texas, but Austin's growing pains aren't all California's fault. According to the Austin Chamber, more than half of newcomers from 2014 to 2018 came from other parts of the state, followed by just 8% from California and 3% from New York. The majority of people who moved to Austin during the pandemic came from other parts of Texas, according to USPS data. The city is also home to the University of Texas at Austin, which attracts tens of thousands of students, who may be more

FROM LEFT: PHOTOGRAPH BY ABIGAIL ENRIGHT FOR BLOOMBERG BUSINESSWEEK. BRODY FORD

inclined to stick around after graduation because the city is thriving.

Still, out-of-state arrivals from affluent cities tend to be richer than average existing residents and, as a consequence, have a greater impact on the local economy. "Probably 5 out of 10 of my clients are Californians, and others could say the same thing," says Susan Horton, president of the Austin Board of Realtors. "The majority are all tech people, and the last wave were all coming to work at Tesla."

For its part, the city's burgeoning tech industry sees itself as the solution. Local nonprofit Austin Technology Alliance, which aims to promote tech companies' civic engagement, now includes Google, Facebook, Uber, and Lyft as members. The alliance weighs in on issues such as electric-car infrastructure and 5G coverage, areas where a tech industry partnership may be able to help the city.

Joe Lonsdale, a venture capitalist and co-founder of controversial data-mining company Palantir Technologies Inc., purchased a cowboy hat and boots and obtained a concealed-carry gun permit shortly after moving with his wife and three young daughters to the city last year. He says Austin can learn from San Francisco's mistakes, which he sees mostly as California's "misguided politics" and the anti-growth mentality that's driven up San Francisco's housing prices by restricting supply.

Lonsdale and his wife, Tayler, run the Cicero Institute, a public-policy think tank that operates in 12 states and now has a special focus on Austin. His priorities in the city include maintaining a strong police force, getting homeless people off the streets, building more housing, and decreasing traffic congestion. The last problem he believes could be solved by Musk's Boring Co., which aims to build underground tunnels to funnel traffic to its Texas Tesla Gigafactory and could theoretically create a network of them to help alleviate Austin traffic.

Of course, not everyone is convinced that tech billionaires should be the key drivers shaping Austin's future. Those from an earlier surge of California migration are feeling a sense of déjà vu. In 2016, Emil Davityan moved his startup Bluedot Innovation Inc. to San Francisco to be part of the tech boom. He says he loved the Bay Area at first, but over the years the quality of life there ebbed as the city's cost of living, traffic, and rates of homelessness climbed. In 2019 he moved the company and its eight employees to Austin. Now he fears he's witnessing the same deterioration.

"It's definitely on that trajectory of Austin becoming like Silicon Valley," Davityan says. He doesn't mean it as a compliment. —*Lizette Chapman, with Jonathan Levin*

THE BOTTOM LINE An influx of tech workers from San Francisco has some Austin residents worried, but the newcomers are confident they'll solve the city's problems, not cause new ones.

"If we price out the musicians, we're going to find ourselves in a bad place"

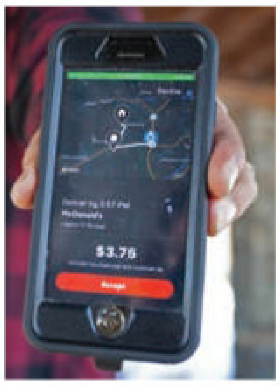
Gaming the Gig Economy

● A group of DoorDash workers are trying to set a minimum rate for deliveries

Dave Levy and Nikos Kanelopoulos are trying to beat the algorithm. The two DoorDash drivers—Dashers, as the company calls them—are trying to persuade their peers to turn down the lowest-paying deliveries so the automated system for matching jobs with drivers will respond by raising pay rates. "Every app-based on-demand company's objective is to constantly shift profits from the driver back to the company," Levy says. "Our objective is the reverse of that."

Their main tool is #DeclineNow, a 40,000-person online forum that provides a view into a type of labor activism tailored for the gig economy. While there's no reliable way to quantify its impact, #DeclineNow's members say they've already increased pay for workers across the country, including in Pennsylvania's Lehigh Valley, where Levy and Kanelopoulos live. But the effort raises difficult questions about the nature of collective action, and there are reasons to doubt whether using a company's own software systems against it is a strategy that can prove effective for a sustained period of time.

DoorDash Inc. isn't Levy and Kanelopoulos's first algorithmic boss. The men met in 2015 while waiting for Uber passengers in their local airport lot. "That's when the rates were good," says Kanelopoulos, whose name is still saved as "Nick Uber" in Levy's phone. But their income from Uber Technologies Inc. dwindled as the ▶



▲ A delivery offer on the DoorDash app

◀ company's app slashed rates, pushing their pay down to barely livable levels. Levy and Kanelopoulos worked for multiple gig economy platforms, experimenting with strategies for squeezing the most income out of them and hosting get-togethers of gig workers at the Wind Creek Casino in Bethlehem, Pa., to compare notes.

The pair noticed that when one DoorDash driver declined a delivery, the platform would offer it to another for slightly more money. As independent contractors, there was nothing obliging them to take these orders, so they figured Dashers could band together to set a de facto minimum pay rate. In a relatively small market such as the Lehigh Valley, it didn't take many people declining low-paying jobs to make a significant difference. "Then I said, 'That's it. That's the name. Why don't you just Decline Now?' " Levy says.

In October 2019 they launched the #DeclineNow Facebook group. They urge members to reject any delivery that doesn't pay at least $7, more than double the current floor of $3.

In a statement, DoorDash said drivers are always free to reject orders but added that coordinated declining slows down the delivery process. The company encourages workers to accept at least 70% of deliveries offered, which awards them with "Top Dasher" status. On #DeclineNow, low acceptance rates are a badge of honor. Levy rejects about 99% of the jobs he's offered, rapidly declining low-paying jobs to find enough lucrative ones to keep him busy.

Another tactic the company uses to discourage decliners is obscuring the full amount any job will pay by not disclosing the tip, making it harder for drivers to be picky. This and other nontransparent practices have led workers critical of the service to dub DoorDash's app "Tony's Casino," a reference to Chief Executive Officer Tony Xu.

#DeclineNow's strategy of selectively declining orders is well-known among DoorDash workers—and not universally accepted. Some question the strict minimum fee rule, citing regional price differences. Others find #DeclineNow to be mean-spirited and toxic, a place where people try to ridicule and bully others into going along with their plan. "They put out information as facts without backing it up," says Amy Lee, a DoorDash driver in the Dallas suburbs who runs the gig economy site PavementGrinders. "Then they publicly humiliate anyone who doesn't understand or agree."

#DeclineNow has little patience for such naysayers. Users who question the $7 minimum rule are punished with suspension from the group or, as the group's moderators like to put it, "a trip to the dungeon." One former moderator, Josie Lindström, claims to have personally suspended hundreds of people, saying the intolerance for dissent was necessary to keep the group moving in the right direction. "It has to be all of us, or it doesn't work," she says. But Lindström eventually quit, citing what she described as a toxic atmosphere.

Veena Dubal, a law professor at UC Hastings Law whose research focuses on worker experience in the gig economy, says the shaming may be part of whatever success #DeclineNow has in increasing pay. "It's actually quite hard to get people to adhere to these types of collective actions if there's not some kind of consequence," she says.

But sustaining such collective action is complicated by the constant influx of new workers. The company will "give bonus incentives to a bunch of new drivers," says Dubal. "And those drivers are not going to be a part of the club who know what to do. And then they're like the scabs." In trying to use algorithm-shifting strategies, she's observed, drivers are "always really disappointed in the end."

▲ #DeclineNow founders Levy and Kanelopoulos

For all their critiques, Levy and Kanelopoulos say they like driving for DoorDash and are simply working to improve it without violating its terms of service. But they also wonder whether the company is listening. On a recent Wednesday afternoon, Levy was waiting for orders in the area where he generally works. A Chick-fil-A delivery paying $3.50, including tip, popped up on his phone. He reached to decline, which requires the driver to select from a list of reasons. "Notice how on there, there was no option that said 'not enough money,' " he says. —*Brody Ford*

THE BOTTOM LINE The #DeclineNow forum is a guerrilla experiment to train a corporate algorithm to pay workers better, and its proponents insist it's already working.

FROM LEFT: BRODY FORD. GETTY IMAGES. DATA: CENTER FOR RESPONSIVE POLITICS

Oracle Can't Stop Fighting Google

● A decade-long court battle has ended. The war has not

The U.S. Supreme Court dealt Oracle Corp. a brutal defeat on April 5, ruling that Google hadn't violated Oracle's copyright when it used its Java programming language to develop the Android operating system. The dispute had been going on for a decade, with monumental financial stakes. By siding with Alphabet Inc.'s Google, the court reversed a ruling that could have allowed Oracle to collect about $9 billion in damages. Instead it's coming away with nothing.

Company executives immediately shrugged off the loss, saying Oracle has other ways to keep pressuring the company it sees as its main rival. "I've already moved on," says Executive Vice President Ken Glueck. "There is absolute consensus that Google is a problem, and we intend to keep pushing this."

Glueck is right to suggest that Google faces a continuing political challenge—and Oracle could take some credit for causing it. The database software company has spent years urging the Department of Justice, the Federal Trade Commission, and dozens of state attorneys general to investigate Google, arguing to regulators that the search giant collects a worrisome amount of personal information about web users and uses it to stymie competitors in the digital advertising market. Google has faced antitrust probes on at least four continents, including ongoing state and federal investigations in the U.S. The company has consistently contested charges that it acts anticompetitively, and Google spokesman José Castañeda has decried what he labeled Oracle's "cloak-and-dagger lobbying campaign."

One theory is that Oracle waged the privacy and antitrust battles partly to pressure Google to agree to an Oracle-friendly settlement in the copyright case. With that matter closed, its reasoning for a continued fight is unraveling. But the company has a long history of playing hardball with its corporate rivals. Two decades ago it hired an investigative firm that tried to pay cleaning women to rifle through the trash of a research group whose publications were often sympathetic to Microsoft Corp., and it's funded dark-money groups to publicize negative reports about Google, Facebook Inc., and Amazon.com Inc. Oracle has publicly defended the moves, saying it was trying to hold its rivals to account, and has even described probing groups for connections to Microsoft as its "civic duty."

Oracle also spent years trying to keep Amazon from winning a $10 billion Pentagon cloud contract on which it was also bidding. In 2019, after Microsoft instead won the deal, Oracle challenged the contract's structure all the way to the Supreme Court, an unusual move for a contract dispute.

In recent weeks, Glueck has been advocating for policies such as data portability, which would allow users to easily transfer their information from one platform to another. He also pressed for the creation of rules requiring companies to gain consent from users before collecting their data, a condition that large advertising platforms have resisted.

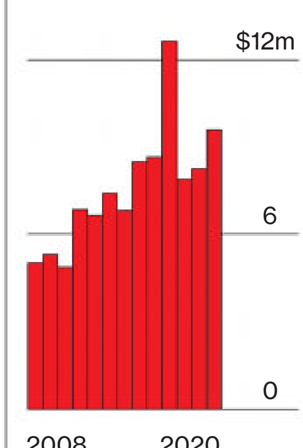
Given the public scrutiny on the largest tech companies, Oracle could yet score some important victories—assuming it defines "victory" as anything that hurts Google. But it's unclear that would actually help Oracle, whose revenue has plateaued at about $40 billion annually as its main rivals have grown far larger.

Those market dynamics don't appear to be lost on Google. Chief Legal Officer Kent Walker says the company will use the billions of dollars it no longer has to pay Oracle to invest in innovations such as artificial intelligence, quantum computing, and driverless cars. Oracle doesn't seem to be the top thing on Walker's mind. "They have their own business," he says. "We have ours." —*Naomi Nix*

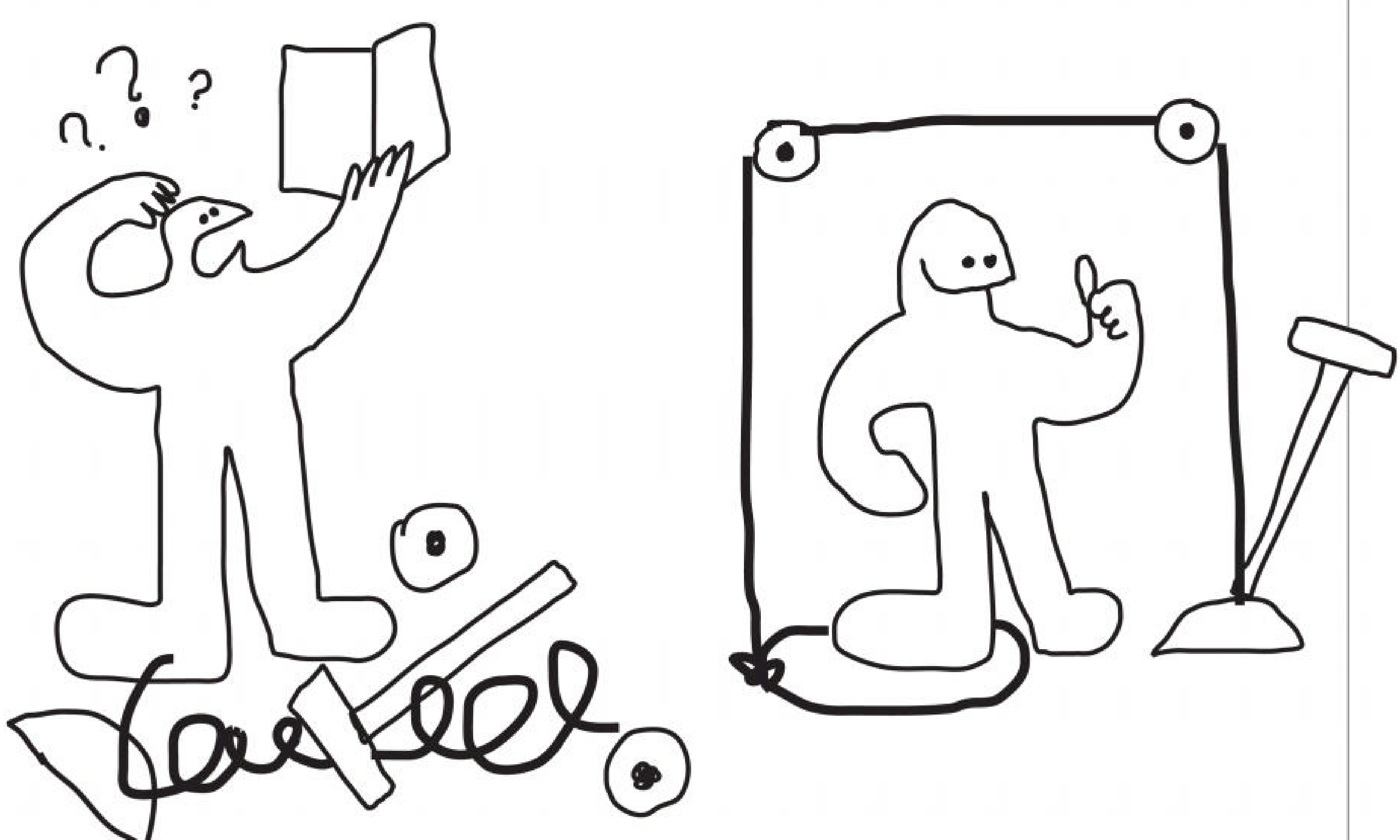
THE BOTTOM LINE Oracle's loss at the Supreme Court is a huge blow and removes a big part of the incentive to continue its battle against Google. Yet it seems likely to go on anyway.

"There is absolute consensus that Google is a problem, and we intend to keep pushing this"

▼ Oracle's spending on federal lobbying



Bill Hwang Built a Fortune



● The fast rise and even faster fall of a trader who bet big with borrowed money

Before he lost it all—all $20 billion—Bill Hwang was the greatest trader you'd never heard of.

Starting in 2013, he parlayed more than $200 million left over from his shuttered hedge fund into a mind-boggling fortune by betting on stocks. Had he folded his hand in early March and cashed in, Hwang, 57, would have stood out among the world's billionaires. There are richer men and women, of course, but their money is mostly tied up in businesses, real estate, complex investments, sports teams, and artwork. Hwang's $20 billion net worth was almost as liquid as a government stimulus check. And then, in two short days, it was gone.

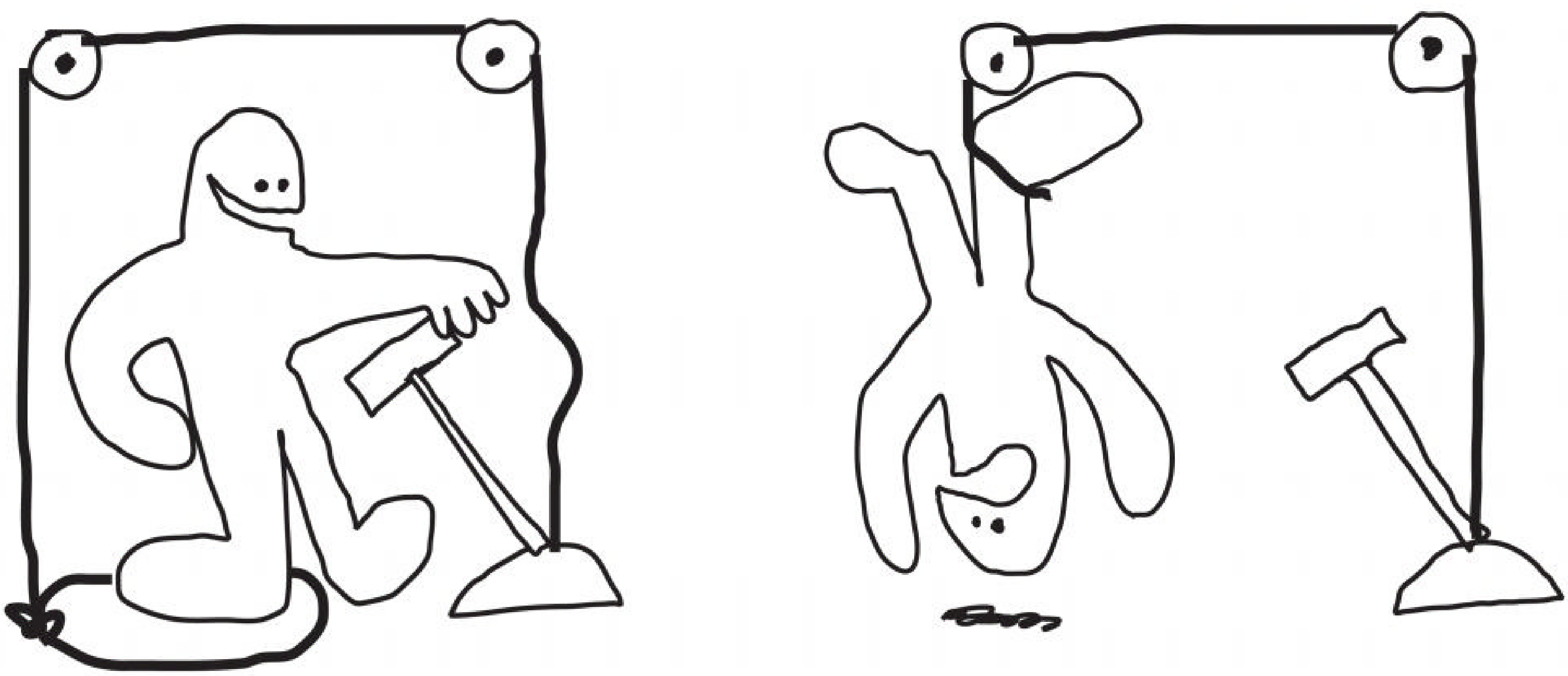
The sudden implosion of Hwang's Archegos Capital Management in late March is one of the most spectacular failures in modern financial history: No individual has lost so much money so quickly. At its peak, Hwang's wealth briefly eclipsed $30 billion. It's also a peculiar one. Unlike the Wall Street stars and Nobel laureates who ran Long-Term Capital Management, which famously blew up in 1998, Hwang was largely unknown outside a small circle: fellow churchgoers and former hedge fund colleagues, as well as a handful of bankers.

He became the biggest of whales—financial slang for someone with a dominant presence in the market—without ever breaking the surface. By design or by accident, Archegos never showed up in the regulatory filings that disclose major shareholders of public stocks. Hwang used swaps, a type of derivative that gives an investor exposure to the gains or losses in an underlying asset without owning it directly. This concealed both his identity and

ILLUSTRATION BY 731. HWANG: EMILE WAMSTEKER/BLOOMBERG

Edited by Pat Regnier

Then Lost It In Two Days



the size of his positions. Even the firms that financed his investments couldn't see the big picture.

That's why on Friday, March 26, when investors around the world learned that a company called Archegos had defaulted on loans used to build a staggering $100 billion portfolio, the first question was, "Who on earth is Bill Hwang?" Because he was using borrowed money and levering up his bets fivefold, Hwang's collapse left a trail of destruction. Banks dumped his holdings, savaging stock prices. Credit Suisse Group AG, one of Hwang's lenders, lost $4.7 billion; several top executives, including the head of investment banking, have been forced out. Nomura Holdings Inc. faces a loss of about $2 billion.

Hwang is anything but the larger-than-life figure one might expect at the center of a financial fiasco. There's no penthouse overlooking Manhattan's Central Park, no hillside chalet at the Yellowstone Club, no private jets. "I grew up in a pastor's family. We were poor," he said in a video recorded at New Jersey's Metro Community Church in 2019. "I confess to you, I could not live very poorly. But I live a few notches below where I could live."

Hwang owns a suburban New Jersey home and drives a Hyundai SUV. His is the paradoxical story of a man devoted to his church and driven to give generously, with a consuming taste for casinolike risk in his professional life. For now, Hwang isn't saying why he played such a dangerous game, and neither are his bankers. But pieces of the puzzle are falling into place.

Modest on the outside, Hwang had all the swagger he needed inside the Wall Street prime-brokerage departments that finance big investors. He was a "Tiger cub," an alumnus of Tiger Management, the hedge fund powerhouse that Julian Robertson founded. In the 2000s, Hwang ran his own fund, Tiger Asia Management, which peaked at about $10 billion in assets. ▶

● Hwang

◀ It didn't matter that he'd been accused of insider trading by U.S. securities regulators or that he pleaded guilty to wire fraud on behalf of Tiger Asia in 2012. Archegos, the family office he founded to manage his personal wealth, was a lucrative client for the banks, and they were eager to lend Hwang enormous sums.

On March 25, when Hwang's financiers were finally able to compare notes, it became clear that his trading strategy was strikingly simple. Archegos appears to have plowed most of the money it borrowed into a handful of stocks—ViacomCBS, GSX Techedu, and Shopify among them. This was no arbitrage on collateralized bundles of obscure financial contracts. Hwang invested the Tiger way, using deep fundamental analysis to find promising stocks, and he built a highly concentrated portfolio. The denizens of Reddit's WallStreetBets day trading on Robinhood can do almost the same thing, riding such popular themes as cord cutting, virtual education, and online shopping. Only no brokerage will extend them anywhere near the amount of leverage billionaires get.

To anyone who asked, Hwang liked to say he divided his time evenly among three passions: his family, his business, and his charity, the Grace & Mercy Foundation. "I try to invest according to the word of God and the power of the Holy Spirit," Hwang said in a 2019 video for his foundation. "In a way it's a fearless way to invest. I am not afraid of death or money."

Sung Kook Hwang immigrated to the U.S. from South Korea in 1982 and took the English name Bill. Raised by his widowed mother, he attended the University of California at Los Angeles and eventually earned an MBA at Carnegie Mellon University. At a videotaped business school reunion in 2008, Hwang recounted his one objective upon graduation: moving to New York. In 1996, after stints as a salesman at two securities firms, he landed an analyst's job at Tiger Management.

Working for Robertson, a titan of the industry, was like playing for the New York Yankees. Many of Hwang's colleagues at the time went on to start several of the world's most successful hedge funds, including Andreas Halvorsen's Viking Global Investors, Philippe Laffont's Coatue Management, and Chase Coleman's Tiger Global Management.

As Hwang recalled at the reunion, Robertson taught him a key lesson: to live with losses. At one point, Tiger had burned through \$2 billion in a wrong-way bet against the Japanese yen, and "everyone was panicking." Robertson entered the room and, according to Hwang, said, "Guys, calm down. It's only work. We do our best."

When Tiger closed in 2001, Robertson urged Hwang to start a fund and offered to seed it with capital. In the early days, both Tiger Asia and Coleman's Tiger Global were on the same floor at Robertson's Park Avenue offices. Hwang and Coleman would sometimes have lunch together to share views on the market. One former Tiger Asia employee remembers Hwang returning one day. He and Coleman had decided against paring back some investments amid market volatility. "I think Chase and I are very similar. We need to go on the offense," Hwang said, according to the former employee.

None of Hwang's former colleagues or employees agreed to be named speaking about him. Some remain friends and don't want to appear disloyal. Others are constrained by pledges of confidentiality. The people familiar with Archegos, both its

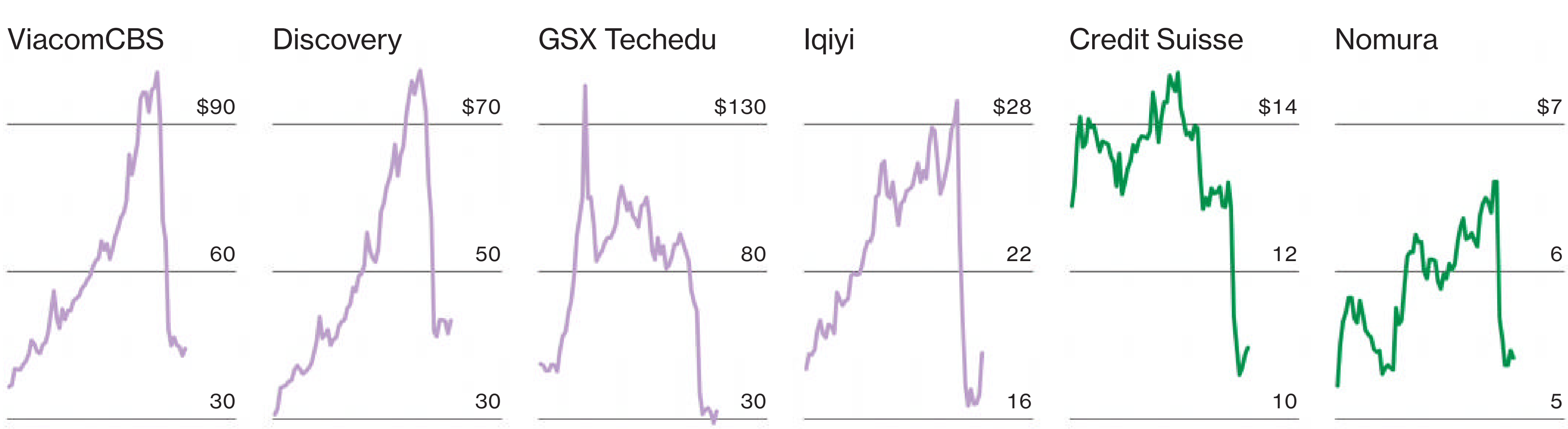
▶ What does leverage do?

Leverage is borrowed money many investors use to magnify the impact of their bets on stocks and other assets.

Damage to Hwang's Investments and Lenders

Share price, 1/4/21 to 4/6/21

The hardest-hit banks



DATA: COMPILED BY BLOOMBERG

accounts and positions, spoke on the condition of anonymity because they weren't authorized to comment.

Hwang initially sought to differentiate himself by investing only in Korean, Japanese, and Chinese companies that generated all of their revenue domestically. Former clients and colleagues say Hwang concentrated the Tiger Asia portfolio in a small number of stocks and levered it. Some of his 25 or so positions were longs (bets on rising prices) and some were shorts (bets on declining prices). And he was secretive, often concealing particularly large holdings from his own analysts, the former employee says. He'd repeat these patterns years later at Archegos.

In 2008, Tiger Asia was shorting Volkswagen AG when takeover speculation sent the shares soaring. The stock quadrupled in two days, and Hwang had to close his position at a loss. He ended the year down 23%, and many investors pulled out, furious that an Asia-focused fund was gambling in European markets.

At least once, Hwang stepped over the line between aggressive and illegal. In 2012, after years of investigations, the U.S. Securities and Exchange Commission accused Tiger Asia of insider trading and manipulation in two Chinese bank stocks. The agency said Hwang "crossed the wall," receiving confidential information about pending share offerings from the underwriting banks and then using it to reap illicit profits.

Hwang settled that case without admitting or denying wrongdoing, and Tiger Asia pleaded guilty to a U.S. Department of Justice charge of wire fraud. His mother, who'd become a missionary in Tijuana, Mexico, called to ask about the penalties. Hwang recounted the moment in a 2016 talk in South Korea. When he informed her that the fines and disgorgements totaled more than $60 million, she replied, "Oh, dear. You did well, Sung Kook. Our America is going through a difficult time. Consider the amount you are paying as a tax." He had to close the fund.

In 2013, Hwang started Archegos as a family office. There were no outside investors this time, only his money. Some friends, thinking back, figured he wanted to prove himself after the SEC settlement. Others saw no interest in redemption. Risk-taking is to Hwang as basketball is to LeBron James, something in his nature.

Although little known on Wall Street, Hwang has been a pillar of his church community. His Grace & Mercy Foundation gave millions of dollars a year to mostly Christian causes. The Fuller Foundation and Fuller Theological Seminary in Pasadena, Calif., and Washington's Museum of the Bible are two of its biggest beneficiaries. Others, in New York, include the Bowery Mission and the King's College, a Christian liberal arts school.

Hwang hosted three Scripture readings a week at his foundation offices in Midtown Manhattan—a 6:30 p.m. dinner on Monday, a 12:30 p.m. lunch on Wednesday, and a 7 a.m. breakfast on Friday. He paid for another at Metro Community Church, too. Between listening to scripture and reading himself, Hwang said he spent at least 90 hours over the course of every year digesting the entire Bible.

Hwang is closely involved with a group called Liberty in North Korea, or Link, that has helped about 1,300 North Koreans escaping the regime. "He doesn't use God as a cover," says Jensen Ko, a colleague at Archegos. "He lives that out."

In February 2016, Hwang's name appeared on an invitation emailed to members of the Financial Services Ministry, a group affiliated with New York's Redeemer Presbyterian Church that connects Christians in finance. It advertised a weekend retreat at the Princeton Theological Seminary "to explore the Gospel's power to transform who we are and what we have been called to do in this industry." The highlight was a dinner on a Saturday with three of the ministry's advisers: Cathie Wood, whose ARK Investments was then a startup money manager; Paul Gojkovich, a former director at Merrill Lynch; and Hwang.

For a while, Wood and Hwang shared a similar trajectory. As Archegos piled up winning trades outside the public eye, she became an investing sensation. Wood's flagship exchange-traded fund, a technology-heavy portfolio open to any retail investor, wowed the market with a 148% return in 2020. Hwang is also one of Wood's investors, and, according to one of his former employees, Archegos and ARK collaborated on industry research. ARK declined to comment.

The seminary retreat offered a glimpse of how Hwang reconciled faith with finance. One person who attended recalls talking to him about the Archegos portfolio, which then included Amazon.com, Facebook, LinkedIn, and Netflix. As Hwang explained it, cutting-edge companies were doing divine work by advancing society. He told congregants in his 2019 appearance at Metro Community that God loved Alphabet Inc.'s Google because it ▶

▶ What are family offices?

They're companies that serve a single family that has so much wealth its members need their own money managers, accountants, estate planners, lawyers, and other specialists to handle it all. According to some estimates, there are more than 10,000 single-family offices globally, at least half of which were started in the past two decades.

◀ provided "the best information to everybody." Archegos had owned the stock for five years. "God also cares about fair price, because the scripture said God hates wrong scales," Hwang says in the video, invoking the multiple references to just weights and balances in the Old Testament. "My company does a little bit, our part, bringing a fair price to Google stock. Is it important to God? Absolutely."

U.S. rules prevent individual investors from buying securities with more than 50% of the money borrowed on margin. No such limits apply to hedge funds and family offices. People familiar with Archegos say the firm steadily ramped up its leverage. Initially that meant about "2x," or $1 million borrowed for every $1 million of capital. By late March the leverage was 5x or more.

Hwang also kept his banks in the dark by trading via swap agreements. In a typical swap, a bank gives its client exposure to an underlying asset, such as a stock. While the client gains—or loses—from any changes in price, the bank shows up in filings as the registered holder of the shares.

That's how Hwang was able to amass huge positions so quietly. And because lenders had details only of their own dealings with him, they, too, couldn't know he was piling on leverage in the same stocks via swaps with other banks. ViacomCBS Inc. is one example. By late March, Archegos had exposure to tens of millions of shares of the media conglomerate through Morgan Stanley, Goldman Sachs Group Inc., Credit Suisse, and Wells Fargo & Co. The largest holder of record, indexing giant Vanguard Group Inc., had 59 million shares.

There's no evidence Archegos did anything improper. The atmosphere maintained in its offices was notably sober. One former employee says there was no cursing tolerated, a policy borrowed from Robertson's Tiger that stands in stark contrast to the profanity common on most trading floors. The same source also recalls Hwang toting a backpack like a college student and praising Uniqlo, the fast-fashion brand, because it's cheap and comfortable—a utilitarian ideal.

The clash of humility and audacity played out on the 38th floor of 888 Seventh Ave., high above Central Park. On one side was Grace & Mercy, on the other Archegos. People familiar with Hwang's investments the first few years he ran Archegos say they included Amazon; Expedia Group, the travel-booking engine; and LinkedIn, the job-search site Microsoft would acquire in 2016. A winning wager on Netflix Inc. netted Archegos close to $1 billion, one former colleague estimates. Hwang appeared to be channeling the same thesis Wood was applying at ARK and which millions of retail investors were beginning to embrace: technological disruption.

He was on a hot streak. By 2017, Archegos had about $4 billion in capital, according to a former banker who helped oversee its account at his firm. Hwang was sharing few financial details with his lenders, but no one raised any red flags. His leverage at the time was about the same as a typical hedge fund running a similar strategy, or two to two-and-a-half times, this person says.

One problem with stockpicking at Hwang's scale is hedging. Many sophisticated stockpickers try to reduce their risk by balancing long positions with shorts on similar names. That way they'll make up some losses with profits if the market tanks.

In principle, shorting is simple: You borrow shares and sell them, making money if the stock declines. In practice, it's often hard to find enough shares or borrow them cheaply. Another way to hedge is what's known as a portfolio short, a broad bet against the stock market, often made through an options or futures contract on the S&P 500. It's relatively easy to execute, but the hedge doesn't work if the market doesn't drop. The ex-banker says he recalls Archegos having a portfolio short.

At some point in the past few years, Hwang's investments shifted from mainly tech companies to a more eclectic mix. Media conglomerates ViacomCBS and Discovery Inc. became huge holdings. So did at least four Chinese stocks: GSX Techedu, Baidu, Iqiyi, and Vipshop.

Although it's impossible to know exactly when Archegos did those swap trades, there are clues in the regulatory filings by his banks. Starting in the second quarter of 2020, all Hwang's banks became big holders of stocks he bet on. Morgan Stanley went from 5.22 million shares of Vipshop Holdings Ltd. as of June 30, to 44.6 million by Dec. 31.

Leverage was playing a growing role, and Hwang was looking for more. Credit Suisse and Morgan Stanley had been doing business with Archegos for years, unperturbed by Hwang's brush with regulators. Goldman, however, had blacklisted him. Compliance officials who frowned on his checkered past blocked repeated efforts internally to open an account for Archegos, according to people with direct knowledge of the matter.

At the close of every trading day, Archegos would settle its swap accounts. If the total value of all positions in the account rose, the bank in question would pay Archegos cash. If the value fell, Archegos would have to put up more collateral or, in industry parlance, post margin.

"I try to invest according to the word of God and the power of the Holy Spirit"

ROBERTSON: ILYA S. SAVENOK/GETTY IMAGES. HALVORSEN: KEVORK DJANSEZIAN/GETTY IMAGES. LAFFONT: KIMBERLY WHITE/GETTY IMAGES. COLEMAN: AMANDA L. GORDON/BLOOMBERG

▶ Who are the Tiger cubs?

Tiger Management, run by Julian Robertson, became one of the first widely famous hedge funds. Many former Tiger employees went on to open their own shops. Hwang's onetime colleagues at Tiger Management include:

Andreas Halvorsen
Viking Global Management

Philippe Laffont
Coatue Management

Chase Coleman
Tiger Global Management

The fourth quarter of 2020 was a fruitful one for Hwang. While the S&P 500 rose almost 12%, seven of the 10 stocks Archegos was known to hold gained more than 30%, with Baidu, Vipshop, and Farfetch jumping at least 70%.

All that activity made Archegos one of Wall Street's most coveted clients. People familiar with the situation say it was paying prime brokers tens of millions of dollars a year in fees, possibly more than $100 million in total. As his swap accounts churned out cash, Hwang kept accumulating extra capital to invest–and to lever up. Goldman finally relented and signed on Archegos as a client in late 2020. Weeks later it all would end in a flash.

The first in a cascade of events during the week of March 22 came shortly after the 4 p.m. close of trading that Monday in New York. ViacomCBS, struggling to keep up with Apple TV, Disney+, Home Box Office, and Netflix, announced a $3 billion sale of stock and convertible debt. The company's shares, propelled by Hwang's buying, had tripled in four months. Raising money to invest in streaming made sense. Or so it seemed in the ViacomCBS C-suite.

Instead, the stock tanked 9% on Tuesday and 23% on Wednesday. Hwang's bets suddenly went haywire, jeopardizing his swap agreements. A few bankers pleaded with him to sell shares; he would take losses and survive, they reasoned, avoiding a default. Hwang refused, according to people with knowledge of those discussions, the long-ago lesson from Robertson evidently forgotten.

That Thursday his prime brokers held a series of emergency meetings. Hwang, say people with swaps experience, likely had borrowed roughly $85 million for every $20 million, investing $100 and setting aside $5 to post margin as needed. But the massive portfolio had cratered so quickly that its losses blew through that small buffer as well as his capital.

The dilemma for Hwang's lenders was obvious. If the stocks in his swap accounts rebounded, everyone would be fine. But if even one bank flinched and started selling, they'd all be exposed to plummeting prices. Credit Suisse wanted to wait.

Late that afternoon, without a word to its fellow lenders, Morgan Stanley made a preemptive move. The firm quietly unloaded $5 billion of its Archegos holdings at a discount, mainly to a group of hedge funds. On Friday morning, well before the 9:30 a.m. New York open, Goldman started liquidating $6.6 billion in blocks of Baidu, Tencent Music Entertainment Group, and Vipshop. It soon followed with $3.9 billion of ViacomCBS, Discovery, Farfetch, Iqiyi, and GSX Techedu.

When the smoke finally cleared, Goldman, Deutsche Bank AG, Morgan Stanley, and Wells Fargo had escaped the Archegos fire sale unscathed. There's no question they moved faster to sell. It's also possible they had extended less leverage or demanded more margin. As of now, Credit Suisse and Nomura appear to have sustained the greatest damage. Mitsubishi UFJ Financial Group Inc., another prime broker, has disclosed $300 million in likely losses.

It's all eerily reminiscent of the subprime-mortgage crisis 14 years ago. Then, as now, the trouble was a series of increasingly irresponsible loans. As long as housing prices kept rising, lenders ignored the growing risks. Only when homeowners stopped paying did reality bite: The banks all had financed so much borrowing that the fallout couldn't be contained.

The best thing anyone can say about the Archegos collapse is that it didn't spark a market meltdown. The worst thing is that it was an entirely preventable disaster made possible by Hwang's lenders. Had they limited his leverage or insisted on more visibility into the business he did across Wall Street, Archegos would have been playing with fire instead of dynamite. It might not have defaulted. Regulators are to blame, too. As Congress was told at hearings following the GameStop Corp. debacle in January, there's not enough transparency in the stock market. European rules require the party bearing the economic risk of an investment to disclose its interest. In the U.S., whales such as Hwang can stay invisible. —*Erik Schatzker, Sridhar Natarajan, and Katherine Burton*

THE BOTTOM LINE Using derivative contracts with multiple banks, Hwang was able to build a highly leveraged portfolio of just a handful of stocks that was vulnerable to sudden collapse.

A Squeeze on the Global Middle Class

An estimated 150 million people slipped down the economic ladder in 2020, the first setback in almost three decades

One of the most economically significant trends of the past few decades has been the emergence of a global middle class. The expectation that this cohort of consumers would continue to grow relentlessly, as rising incomes in developing countries lifted millions out of poverty each year, has been a central assumption in multinationals' business plans and the portfolio strategies of professional investors.

You can now add that to the list of economic truths that have been upended by this pandemic. For the first time since the 1990s, the global middle class shrank last year, according to Pew Research Center estimates. About 150 million people tumbled down the economic ladder in 2020, with South Asia and sub-Saharan Africa seeing the biggest declines.

Defining the parameters of this global middle class has long been a contentious exercise. Pew, which has been researching the topic for more than a decade, labels as middle income those making from $10.01 to $20 a day, using data that smooth out differences in purchasing power across countries. In Pew's analysis, there's a separate upper-middle-income band made up of those earning $20.01 to $50 a day. (Note that $50 per day falls shy of what a minimum wage worker in the U.S. takes home pretax for an eight-hour day.) Others have opted for a more expansive $10 to $100 a day definition.

Taken together, Pew's middle-income and upper-middle-income brackets encompass roughly 2.5 billion people—or a third of the world's population. Buried inside these big numbers are many personal stories. Here we bring you four, from South Africa, Thailand, India, and Brazil. They're tales of hard-won successes that evaporated overnight, along with well-paying jobs. Of once-accessible luxuries, like steak for dinner or home internet access, now out of reach.

Strivers face a far more uncertain future than in years past. In its latest World Economic Outlook, released in full on April 6, the International Monetary Fund predicts the global economy in 2024 will be 3% smaller than it would have been without the pandemic, largely because developing world governments have less room to spend their way to recovery, as the U.S. and Europe are doing.

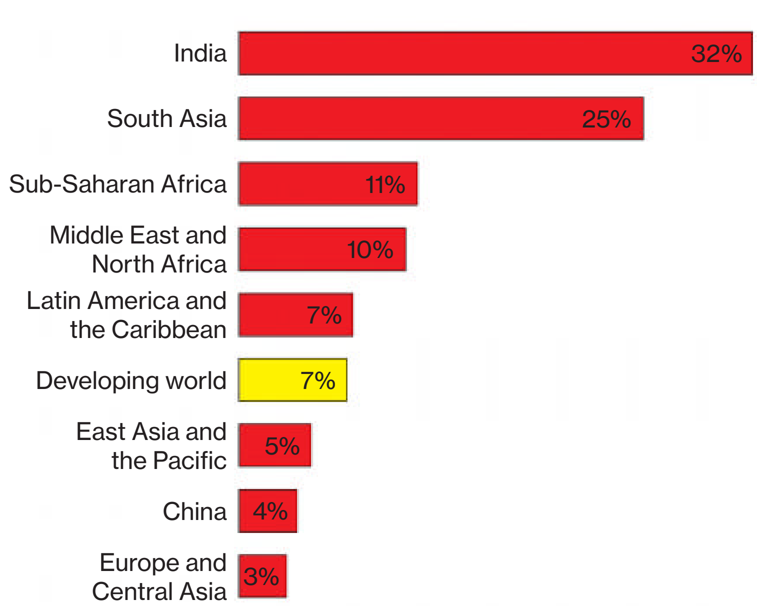
The divergences are stark. India will end 2021 with a gross domestic product that's 5.2% smaller than it would have been otherwise, according to forecasts by Bloomberg Economics. Indonesia's output will be 9.2% smaller than its pre-crisis trend foretold. The U.S.? Just 1.6% smaller.

The global economy is "bifurcating," says Carmen Reinhart, the World Bank's chief economist, who cautions that a rebound in growth rates should not be mistaken for a lasting recovery. One big issue: Immunizations are proceeding far more slowly in poorer countries that have yet to gain the same access to vaccines as the rich world has.

But it goes further than that. Reinhart is concerned that in some countries governments may be forced to switch into austerity mode prematurely because they can't shoulder their expanded debt loads. And while inflation is muted in the U.S. and Europe, in places such as Brazil food prices are soaring, leading central banks to tighten monetary policy prematurely. "This has been a very long year, and I think the damage has been underestimated," she says. —*Shawn Donnan*

Downwardly Mobile in Developing Nations

Reduction in middle- and upper-middle-class population, 2020



DATA: PEW RESEARCH CENTER, BASED ON WORLD BANK DATA. MIDDLE AND UPPER-MIDDLE INCOME DEFINED AS $10 TO $20 A DAY AND $20 TO $50, RESPECTIVELY.

Edited by Cristina Lindblad

GUILLEM SARTORIO/BLOOMBERG. *CHEAPEST MONTHLY RENTS, IN RAND, ARE LESS THAN 3,000 ($206); COSTLIEST ARE MORE THAN 25,000. DATA: TPN CREDIT BUREAU

▲ Kganyane in front of the room she rents out

● SOUTH AFRICA

Back to the Side Hustle

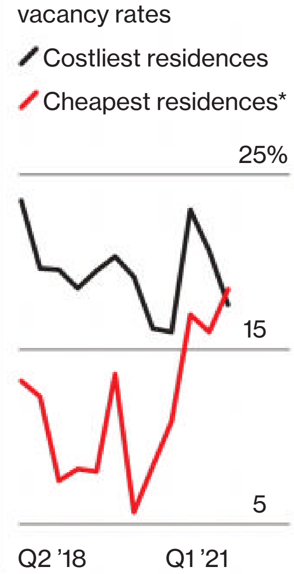
It was January 2020, and Mosima Kganyane was exulting in her newfound financial independence. The 26-year-old business administration graduate had landed a full-time job in Johannesburg and leased an apartment for 3,600 rand ($244) a month a few blocks from work so she could save on transportation costs.

Then, in early March, the country recorded its first Covid-19 infection and imposed a strict lockdown that would contribute to South Africa's biggest economic contraction in a century. By July, Kganyane's employer, one of the country's largest clothing retailers, was facing bankruptcy. She was laid off, joining the 1.4 million South Africans who lost their jobs last year, pushing the official unemployment rate to a record 32.5%. With no income to cover rent and utility bills and unwilling to dip into her savings, Kganyane paid a $271 penalty to break her lease, and moved back into her family home.

Many other South Africans found themselves in similar straits. Nationwide, the vacancy rate rose to a record 13.3% in the first quarter of 2021 from 7.5% a year earlier, according to TPN Credit Bureau. Most of the pressure has been on units that rent for about $475 a month or less, which account for two-thirds of the formal market.

The legacy of apartheid remains apparent almost three decades since its 1994 end in the persistent vulnerability to economic shocks for many in South Africa's Black majority. A 2018 study by the World Institute for Development Economics, which is part of United Nations University, found only 1 in 4 South Africans could be considered part of a stable middle class or elite. The rest were more accurately classified as chronic or transient poor, or among what the report dubbed a vulnerable middle class. ▶

▼ South Africa vacancy rates



◀ Having lost her own precarious hold on the ladder of success, Kganyane has been working tirelessly to climb back up, despite being diagnosed with Covid-19. She now works at a financial-services company on a temporary contract. But she's staking her future on the other income she gets from side hustles such as selling carpets, furniture, and eggs. Kganyane also spent $1,000 of her savings to build an extra room at the back of the family home so she could take in a boarder.

So in less than a year, she's gone from being a renter in the formal property market to a landlord in the country's large informal rental market. "Covid-19 taught me not to relax," she says, "and that I need to fight, to fight for survival, because I don't know what tomorrow holds." —*Prinesha Naidoo*

● THAILAND

Waiting for the Tourists to Return

It's early Friday afternoon on Khaosan Road, in the heart of what's normally a busy thoroughfare for foreign backpackers, and Yada Pornpetrumpa is running through the new routine catering to a modest crowd of late-night partyers.

Yada, 52, as well as the other food vendors along Khaosan Road, immediately felt the effects of the pandemic's near-total halt in international travel, losing more than three-quarters of their customers. "Before all of this, when I started setting up my shop, there would already be a line for fruit juice," she says. "I had a 50% profit on everything I sold."

Now she's scraping together a living on government assistance and the meatball skewers and juice she can sell in a night. She figures her daily income has plunged more than 90% since Covid-19 hit, to 700 baht ($22.42) a day.

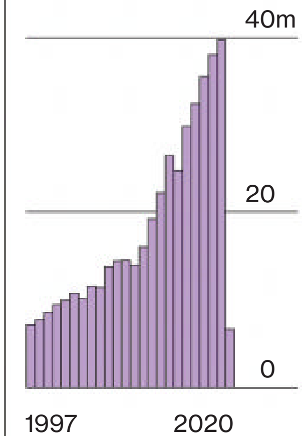
Yada's middle-class life began to unwind last year when she defaulted on the mortgage on a house in a Bangkok suburb, along with her car loan. She now lives with her 31-year-old daughter, five dogs, and 12 cats in a home she rents from a landlord who's agreed to extend her a discount until business improves. She decided to give up one of her two mobile phones and to cancel internet service at home.

Tourism generated one-fifth of Thailand's gross domestic product before the pandemic, meaning there's a giant hole in the economy that will likely take years to fill. Government-supported efforts to lure wealthy visitors through Covid-safe resort packages and quarantine centers at golf courses have fallen flat so far. The Bank of Thailand expects about 3 million visitors this year, half of what the country saw in 2020 and fewer than a tenth of the 39.9 million arrivals in 2019.

To feed herself and her daughter, Yada grows her own vegetables. As the leader of a group that lobbies the government on behalf of shopkeepers on Khaosan Road, she sometimes receives free meals from other vendors.

Yada, whose first endeavors on the strip involved selling fake Rolexes to tourists and the occasional brush with the police, says she has a new attitude about what's important in life. She prizes her newfound freedom from debt she incurred to buy material comforts. "Having a car or a house is just what society tells us we should value, but it doesn't define the middle class," she says. "I have no assets now. But I have peace of mind." —*Randy Thanthong-Knight, Suttinee Yuvejwattana, and Michelle Jamrisko*

▼ Tourists visiting Thailand



▼ Yada at her stall on Khaosan Road

FROM LEFT: NICOLAS AXELROD/BLOOMBERG; RUHANI KAUR/ BLOOMBERG. *MAY 2020 FIGURES REFLECT ALL DOMESTIC CAR SALES; BREAKDOWNS WEREN'T RELEASED IN PANDEMIC IMMEDIATE AFTERMATH.
DATA: BANK OF THAILAND (THAILAND); MATURI SUZUKI INDIA (INDIA)

▲ Sharma with his family

● INDIA

Dreams of Car Ownership Postponed

Ravi Kant Sharma spent more than a decade saving up to buy a $6,000 Maruti Suzuki Alto, the first car many Indians purchase when they make the leap from motorcycles to four-wheelers. He started 2020 with enough for a down payment and a plan to celebrate his upcoming wedding anniversary with the purchase. The pandemic changed all that.

When the Indian economy froze, Sharma, 37, lost his job as an automotive engineer. He managed to find a new one but in another city and at lower pay. The move ate into his savings and put his dream of car ownership on hold. His family of four will be relying on their old motorcycle for some time to come. “I have exhausted all my savings. We are finding it difficult to pay installments of existing loans,” he says from his new home in Bahadurgarh near New Delhi.

Sharma is part of an Indian middle class that, by some estimates, makes up one-third of the country’s 1.3 billion population. Its growth has lured multinationals making everything from cars to mobile phones, as well as giants in retail and e-commerce, to set up operations in the country. So a hit to middle-class incomes has consequences for the global economy.

The pandemic has exposed what political scientist Leela Fernandes calls “the socioeconomic fragility” of India’s middle class, which she likens to “a stock market bubble waiting to burst.”

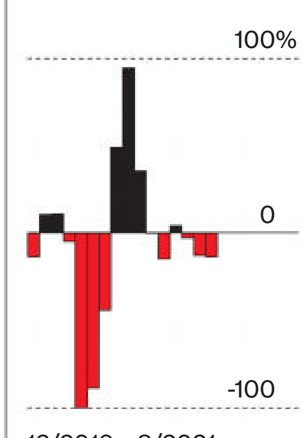
As in other countries, India’s poorest have borne the largest share of the economic pain from the coronavirus crisis, Fernandes says. But the downturn has also wiped out scores of white-collar jobs such as engineers and teachers. About 21 million salaried workers lost their jobs between April and August of last year, according to the Centre for Monitoring the Indian Economy.

The upshot is that India’s middle class shrank by 32 million people in 2020, accounting for 60% of the worldwide drop in the number of people earning $10 to $20 a day, according to Pew Research Center estimates. The reversal looks like the largest India has seen since it began liberalizing its economy in 1991.

The ripple effects have been particularly visible in India’s automobile sector, which is the world’s fourth-largest and accounts for half of the country’s entire manufacturing output. It saw a fall in vehicle sales of more than 18% in the 12 months through February.

Sharma grew up in the central Indian state of Madhya Pradesh and is the third generation in his family to attend university. He’s worked hard to shield his two school-age daughters and wife from the economic impact of the pandemic. Still, it’s hard to ignore how much his well-laid plans have been disrupted. “My life has been set back by at least three years, even as my dreams have moved beyond my reach,” he says. —*Vrishti Beniwal*

▼ Year-over-year change in sales of Alto and other Maruti Suzuki mini-vehicles in India*



● BRAZIL

A Less Rich Diet

Kidney, tongue, liver. Francinete Alves doesn't love organ meat, but that's what she's mulling bringing home from the discount butcher shop in a suburb of Brasilia. At least dinner won't be another omelet.

For Alves and her 24-year-old daughter, Meatless Mondays have become Meatless Tuesdays, too. Brazil, the country renowned globally for its churrascaria steaks, is battling a vicious Covid-19 outbreak that shows no sign of peaking, and its economic consequences are visible in the diet of middle-class Brazilians.

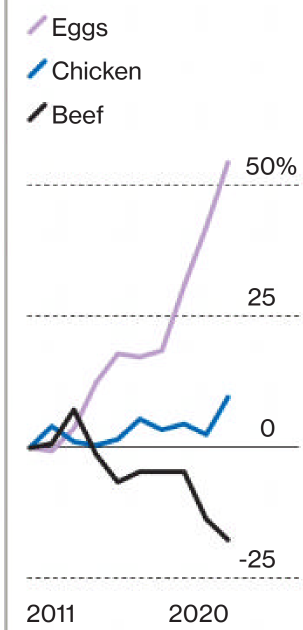
Data from Conab, the national agricultural agency, shows that residents of the world's No. 1 exporter of beef are eating less of it. Per capita, beef consumption fell 5% last year, to 29.3 kilograms (64.6 pounds), its lowest level since 1996. At the same time, consumption of eggs rose 3.8% to hit an all-time high of 250 eggs per person.

Alves, 58, is lucky in that she's still employed as an office assistant. Her monthly salary of 5,000 reais ($881) is too high to qualify her for emergency cash transfers that the government of President Jair Bolsonaro introduced at the start of the pandemic. But her paycheck doesn't go as far as it used to, because food prices have soared on a combination of rising commodity prices and a weaker currency. Ironically, the government's largesse has played a role in raising prices, since in boosting the incomes of some 67 million poor Brazilians, it's also boosted demand for basic staples.

In what has become a pandemic ritual, Alves scours the sales circulars and butchers' social media posts for discounts before she goes grocery shopping, trying to find a way to justify buying the steak that she's come to miss so badly. It's not just beef. At the outdoor vegetable market where she tries to stretch the 30 reais in her pocket, the price of everything from apples to tomatoes has skyrocketed. "In the past, 20 reais was enough for you to leave here with a lot of things," she says as her eyes wander over corn she can't afford.

Despite her own tribulations, Alves can still spare a thought for those less fortunate. "I keep thinking about people who have a family to support and receive only a minimum wage," she says. "I honestly don't know how they live."
—*Shannon Sims and Marisa Wanzeller*

▼ Change in consumption, Brazil

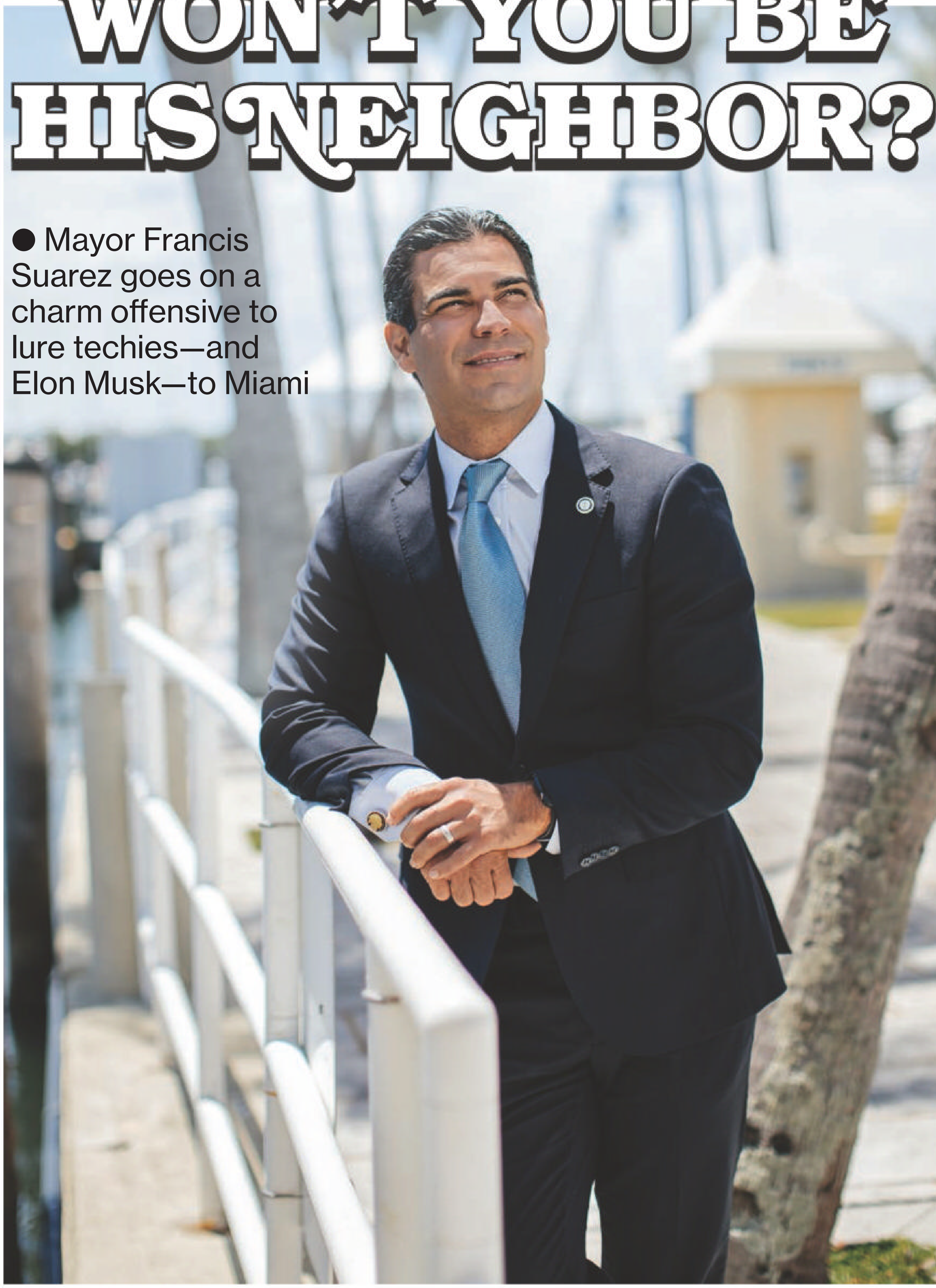


▼ Like many Brazilians, Alves has cut back on beef

VICTOR MORIYAMA/BLOOMBERG. DATA: BRAZILIAN MINISTRY OF AGRICULTURE, BRAZILIAN ASSOCIATION OF ANIMAL PROTEIN

WON'T YOU BE HIS NEIGHBOR?

● Mayor Francis Suarez goes on a charm offensive to lure techies—and Elon Musk—to Miami



PHOTOGRAPH BY ROSE MARIE CROMWELL FOR BLOOMBERG BUSINESSWEEK

The viral moment that turned Francis Suarez, the mayor of Miami, into a tech recruiter happened on Dec. 4, shortly before 9 p.m. Miami time. On Twitter, Delian Asparouhov, a Founders Fund venture capitalist, had mused: "ok guys hear me out, what if we move silicon valley to miami"?

"How can I help?" Suarez responded.

His tweet started bounding across the internet. Suarez printed T-shirts with the phrase, in *Miami Vice* pink and blue. A venture capitalist with Miami ties, Shervin Pishevar, papered a billboard with the mayor's face and a pitch—"Thinking about moving to Miami? DM me."—on the Bay Area stretch of U.S. Highway 101. Suarez

Edited by Amanda Kolson Hurley and Rodney Jefferson even started a YouTube talk show, *Cafecito Talk*, where he interviews Miami boosters and would-be migrants. (*Cafecito* is a Spanish word for coffee.)

Given that he's become Miami's most visible hype man—tweeting with Elon Musk at 3 a.m. about boring a tunnel under the Miami River—you'd never guess he has a relatively powerless job. Suarez, 43, doesn't personally control a budget or a major workforce and dedicates significant time to his side gig as a real estate lawyer. That's a relatively common arrangement in South Florida, where the tiered government structure generally means that the county mayor reigns supreme. And in Miami, a city manager, not the mayor, directs day-to-day municipal operations. Yet Suarez has slipped into so many buzzy narratives in the past year that his fame has become a power unto itself.

Although the Miami mayor's office is officially nonpartisan, Suarez is a moderate Republican who protested Donald Trump's border policies and criticized GOP Governor Ron DeSantis for his handling of the pandemic. A second-generation mayor (his Cuban-born father, Xavier Suarez, led the city through much of the 1980s and '90s), he captured national attention last March when he contracted one of the area's first known cases of Covid and gave dozens of interviews during his 18-day quarantine, including on *The View* and *The Rachel Maddow Show*.

The chisel-jawed Suarez has found a way to stay in the limelight. He tweets relentlessly and throughout the night about Miami's merits as a hub for industry; answers inquiries from seemingly everybody; and latches onto ideas, like the Musk tunnel, that generate headlines, even if the odds of their coming to fruition are long.

Tech and crypto leaders are listening. Sam Bankman-Fried, chief executive officer of FTX Crypto Derivatives Exchange and one of the world's largest crypto traders, says Suarez's efforts helped persuade him to pursue the pending $135 million branding rights deal for the Miami Heat basketball stadium. "One way to have impact on a community is to fill a role that has official authority," Bankman-Fried says. "Another way is by trying to lead in what you say, what you communicate and what you push for."

In other words, maybe sunny, low-tax Florida doesn't need new legislation to lure the next generation of innovators; it just needs better marketing. The notion that high-earning jobs in technology and finance could migrate to the Sunshine State took flight during the pandemic. Initially most of the talk centered on Wall Street, and it was Suarez who helped expand the pitch in earnest to Silicon Valley. He says he saw a window to bring better opportunities to an area known for its low-paying hospitality jobs and trade, but not cutting-edge entrepreneurship. South Florida has one of America's largest pockets of extreme wealth, with $30 million mansions and Ferrari dealerships up and down the coast, yet many of the state's billionaires are part-time residents and make their money elsewhere.

"Miami for many decades has been an intellectual talent exporter," says Suarez, who went to a local prep school and attended college and law school in Florida. "I have many, many friends who grew up, didn't go to school here, didn't come back."

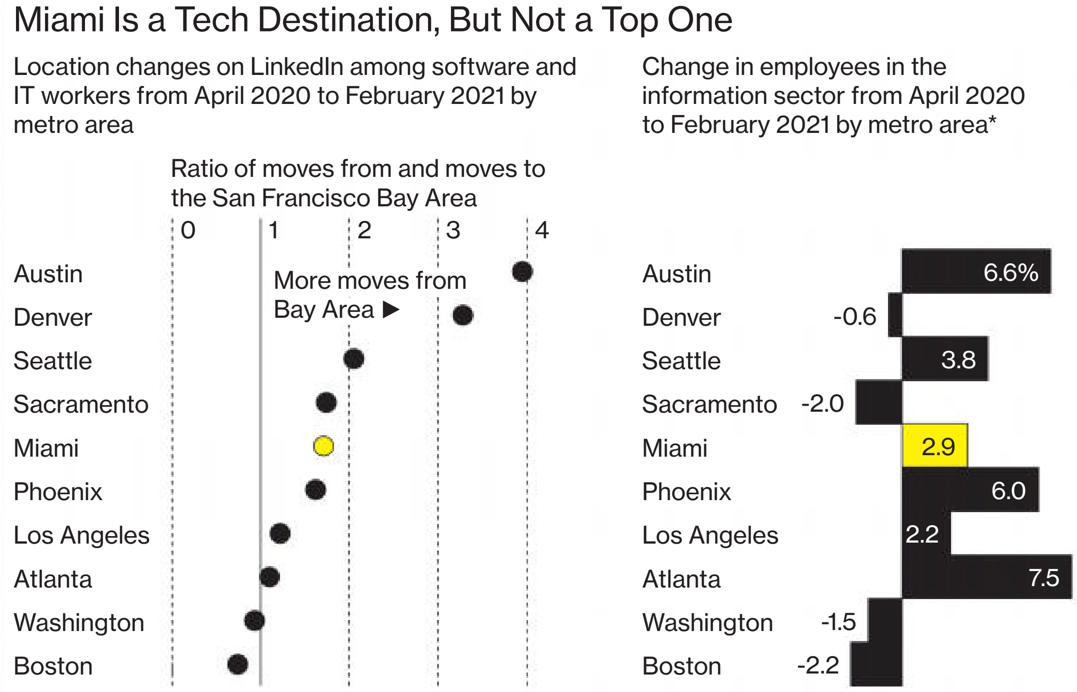
Still, it's far from clear that Silicon Valley is ready to move en masse to South Florida, much less to the City of Miami, a 468,000-person swath of the metropolitan area. The city is home to a thriving financial district and many cultural amenities, but some of the area's most popular neighborhoods for the wealthy are in separate jurisdictions such as Miami Beach and Coral Gables.

LinkedIn Corp. has proprietary data on migration based on changes to workers' profiles, and its principal economist Guy Berger says there has "definitely been a large percentage increase in tech migration to Miami" from the San Francisco Bay Area. Yet, he says, the total back-and-forth flow of such people between the Bay Area and greater Miami is still less than one-tenth what it is on average between San Francisco and New York, Los Angeles, or Seattle.

The hope—or fear—that the rich would leave high-tax states for ostensibly cheaper ones has been around a long time. Florida boosters predicted the state would lure large numbers of wealthy migrants after the Tax Cuts and Jobs Act of 2017, which capped deductions on state and local taxes and ▶

"Miami for many decades has been an intellectual talent exporter"

Miami Is a Tech Destination, But Not a Top One



*NOT SEASONALLY ADJUSTED; FEBRUARY DATA PRELIMINARY. SECTOR INCL. SOFTWARE AND OTHER PUBLISHING, MOTION PICTURES/SOUND, BROADCASTING, TELECOMS, WEB SEARCH, DATA PROCESSING, INFORMATION SERVICES. DATA: LINKEDIN, BUREAU OF LABOR STATISTICS

◀ made Florida an even better deal when compared with, say, New York. Yet lawmakers in Washington are now mulling rolling back that same change, and it's not even clear whether Florida ever saw much of a benefit. Many Wall Street financiers decamped to Florida after April 2020, but many have also started to return. Such industry clusters as Wall Street, Hollywood, and Silicon Valley take generations to build and aren't easily replaced.

There are doubts about Suarez's more revolutionary goals, too. He doesn't have a vote on the Miami City Commission, so he depends on alliances within the body. At a Feb. 11 meeting, he promoted a resolution to potentially pay some municipal workers in Bitcoin, accept taxes in the cryptocurrency, and maybe invest city funds in it.

The idea created a flurry of press, but the proposal was neutered when it arrived at the commission, whose members would only agree to look further into the matter at some unknown future date. As Commissioner Joe Carollo noted, but Suarez had failed to mention, it's illegal for local governments in Florida to invest their savings in assets as volatile as Bitcoin. "I'm going to tell you what the city did," Carollo says. "Nothing."

Carollo, a fellow Republican, has portrayed the mayor as naive for his pursuit of a deal with Musk's Boring Co. to build a tunnel to alleviate traffic between downtown Miami and the Brickell financial district. Suarez traveled last month to meet with Boring executives, but Carollo believes the project would cost a fortune. The water table is so high in South Florida that there are hardly any basements, let alone tunnels, save for the one at the Port of Miami.

"We're always open to innovation, but I'm not going after every shiny new thing," says Miami-Dade County Mayor Daniella Levine Cava, whose government has jurisdiction over area roads.

Suarez says his accomplishments speak for themselves. He points to SoftBank Group Corp.'s recent commitment to provide $100 million in funding to Miami area companies. On Bitcoin, he notes that the City of Miami would have already turned a significant profit had it invested in the surging cryptocurrency when he suggested. And he vigorously defends the tunnel idea, saying he's "very, very bullish" on the Musk technology. "Listen, you never can do anything innovative, you can never do anything special if you always find a way to doubt yourself out of it," he says. "Sometimes it's better to have a big idea and push the envelope."

Suarez faces an election in November, and so far he has scant competition. Assuming he wins, he'll also head the U.S. Conference of Mayors next year. He says he won't rule out running for governor of Florida at some point, but "I don't want to be presumptuous, and I have a reelection and I'm going to take that seriously."

Levine Cava says she celebrates the "welcome messages from Mayor Suarez." She oversees a much larger population and budget but has one-third of his Twitter followers. It was Suarez—not Levine Cava, a Democrat—who got invited to speak at the White House in February. —*Jonathan Levin and Michael Smith*

THE BOTTOM LINE Suarez's very public wooing of tech and crypto players to Miami is bearing fruit, but his powers to realize bolder ideas—like a Boring Co. tunnel under the city—are limited.

The Long Shadow Over MBS

● The economic goals of Saudi Arabia's crown prince are jeopardized by his own tainted image abroad

On Tahlia Street, a busy commercial boulevard in central Riyadh, a rotating digital billboard shows ads for oud fragrance, white boxer shorts, and a glittering diamond watch. Then comes an image of Crown Prince Mohammed bin Salman seated at a desk, with one of his latest soundbites: "Saudi Arabia plans to spend more in the next 10 years than it has in the past 300."

The poster went up hours after the prince unveiled new steps to bolster the economy on March 30. These were the latest in a series of initiatives since the beginning of the year that have reminded Saudis who's in charge of the kingdom. The subliminal message is that any mistakes from the past five years are firmly behind the 35-year-old prince.

Yet internationally, the Saudi heir has two stains on his record that he can't seem to make go away: the war in Yemen and the 2018 murder and dismemberment of critic and *Washington Post* columnist Jamal Khashoggi by Saudi agents at the Saudi consulate in Istanbul. With a less pro-Saudi White House, these threaten to undermine Prince Mohammed's economic transformation plan, which relies at least partly on Western money.

According to government figures published

BIN SALMAN: VALERY SHARIFULIN/TASS/GETTY IMAGES; KHASHOGGI: DENIS/REA/REDUX on March 31, foreign investment in Saudi Arabia reached a new high in the last quarter of 2020. Yet it was Egypt and India that topped the list of 10 countries awarded projects there, followed by the U.S. and U.K., the only Western nations on the list.

At an online event hosted by the Colorado Springs World Affairs Council on March 10, Fahad Nazer, the spokesman for the Saudi Embassy in Washington, urged participants to visit his country and invest to help the kingdom "move this exciting stage of our development forward." One attendee raised a red flag. "The things that you're talking about are exciting," he said. "But it's hard to get past Jamal Khashoggi."

President Joe Biden has made it clear the U.S. relationship with the kingdom won't be as cozy as it was under former President Donald Trump, emphasizing the need to reach out to King Salman rather than his son. Biden allowed the declassification of a U.S. intelligence report that implicated Prince Mohammed in the Khashoggi killing; the Saudi government rejected the finding as a "false and unacceptable assessment."

King Salman, however, has been conspicuous by the low profile he's kept recently. Although the monarch still chairs the weekly cabinet meeting and sends public messages to world leaders, his son is now very much the face of the country.

Indeed, Prince Mohammed, also known as MBS, has tried hard to shift the focus back onto Vision 2030, his transformative plan for the nation's future. His recent efforts range from working to reform the judiciary to calling heads of state to discuss the environment. He's also keen to play the role of statesman in a region that's not getting any less volatile. Like his father, he called Jordan's King Abdullah II to express solidarity after the country announced on April 3 the discovery of a conspiracy to destabilize the nation.

In Yemen, where Saudi Arabia led a war that caused the world's worst humanitarian crisis, the kingdom is spending hundreds of millions of dollars to provide food and health services, build schools, and aid farmers, making it the biggest donor to its neighbor. It also put a peace plan on the table last month that the Iran-backed Houthi rebels have yet to accept. Such efforts haven't obscured Saudi Arabia's role in the conflict. On its sixth anniversary in March, a coalition of human-rights groups initiated an awareness campaign highlighting what it called Prince Mohammed's "assault" on Yemen and dismissing Saudi financial relief as a whitewash tactic.

Some observers believe the prince has squandered goodwill from the West, which welcomed his changes to a society long governed by an austere strain of Sunni Islam and his plans to overhaul an economy long dependent on oil. "MBS would've been the West's darling had there not been Yemen and Khashoggi," says Ayham Kamel, head of the Middle East and North Africa at the political risk consultancy Eurasia Group. "Europe and the U.S. were charmed by his outlook on reforms. That damage is in some ways irreparable."

● Khashoggi

That could have an impact on attracting Western investment to a country where obstacles to doing business include an unpredictable judiciary (something the government is trying to change) and frequent delays in government payments. "Investors will only come if there are significant returns, especially given the PR issues," Kamel says. Prince Mohammed has said he expects 90% of Vision 2030 funding over the next 10 years to come from domestic sources.

The prince's reform efforts, as well as steps to improve the country's human-rights image such as the release of women's rights activist Loujain al-Hathloul from prison, appear to be attempts to mollify the Biden administration. A Saudi official says the kingdom's actions aren't related to changes in political leadership anywhere else in the world, but are rather in line with Vision 2030's objectives. The official, speaking on condition of anonymity, says U.S.-Saudi relations are historic and multidimensional and have continued to deepen.

To Gregory Gause, a professor of international affairs at Texas A&M University, Prince Mohammed remains "on probation," in the U.S.

◀ Prince Mohammed

at least. Biden's policy appears to give the Saudi leader room to repair his standing in Washington by seeking peace in Yemen and toeing the U.S. line in the region. In the meantime, says Gause, "I do not think he has been fully rehabilitated in the American context, or that Yemen and Jamal are behind him." —*Donna Abu-Nasr*

THE BOTTOM LINE Prince Mohammed is trying to overcome the damage to his international standing from the war in Yemen and Jamal Khashoggi's killing.

NICE GUYS FINISH LAST

HOW OXFORD AND ASTRAZENECA'S LOW-COST, NOT-FOR-PROFIT COVID VACCINE WENT FROM HOPE TO HESITANCY

BY STEPHANIE BAKER AND SUZI RING ILLUSTRATION BY NATHAN LEVASSEUR

Mene Pangalos, head of biopharmaceuticals research for AstraZeneca Plc, went to bed on Monday, March 22, feeling good for the first time in a while. After working around the clock through the weekend, he'd just announced better-than-expected interim results from the company's large U.S. vaccine trial: The shot was safe and 79% effective at preventing cases of symptomatic Covid-19. Positive news, at last, after months of questions about everything including safety and supply shortfalls.

But at around 5 the next morning, Pangalos was jolted out of bed in the U.K. by a call from AstraZeneca Chief Executive Officer Pascal Soriot, ringing from Australia to ask what on earth was happening. The U.S. National Institute of Allergy and Infectious Diseases (Niaid) had just issued a late-night statement announcing that the safety board overseeing the trial was concerned AstraZeneca "may have included outdated information" in its results, which "may have provided an incomplete view of the efficacy data." Niaid, which is part of the National Institutes of Health, urged the company to release up-to-date figures as soon as possible.

While they were asleep in Europe, Pangalos and his team had received a harsh email from the Data and Safety Monitoring Board, the independent committee of experts appointed by the NIH to oversee the trial. The DSMB accused the company of releasing "potentially misleading" figures, saying the data were "the most favorable for the study as opposed to the most recent and most complete." The experts added that "decisions like this are what erode public trust in the scientific process." Astra executives were stunned. No one had reached out to them to discuss the concerns first, and Niaid's decision to publicize the independent committee's critique of the interim results was unprecedented.

The contents of the DSMB's letter quickly leaked to the *Washington Post* and the *New York Times*. Within hours, Anthony Fauci, director of Niaid, was on *Good Morning America*, talking about the flap. "It really is unfortunate that this happened," he said. "This is really what you call an unforced error, because the fact is this is very likely a very good vaccine, and this kind of thing does nothing but really cast some doubt."

Astra had received approval the Friday before from the safety board to conduct its interim analysis, based on 141 verified Covid cases dating to Feb. 17. The board had advised the Astra team to be mindful of the unverified cases that had come in since then, to be sure they wouldn't produce a significantly different efficacy figure, according to people familiar with the discussions. The team had looked at the cases, but, believing that their potential effect on the efficacy number was negligible, they hadn't mentioned in their statement that the final percentage might change.

Now, with the DSMB's letter public knowledge, the trial team raced to review the additional 49 cases, a process that normally takes weeks. Two days later, AstraZeneca announced the updated results. The differences were statistically insignificant: Overall efficacy dropped 3 percentage points, to 76%, though it actually rose 5 percentage points in seniors, to 85%. The vaccine was 100% effective at preventing hospitalization and severe disease. This time, AstraZeneca was careful to note that there were still 14 more possible or probable Covid cases to be assessed, which could cause the numbers to fluctuate. The company's executives were deeply upset by the events of the week. "It's just hugely frustrating," one says. "Honestly, it breaks our hearts."

The week after the updated results came out, Fauci downplayed the drama. "I didn't question their data at all," he said when asked about the incident by *Bloomberg Businessweek* at a White House briefing on March 31. "This is a good vaccine that is going to have a very important role in the global response to this outbreak."

The story of the vaccine that AstraZeneca developed with the University of Oxford is marked by noble intentions, communication blunders, messy trials, manufacturing nightmares, and political and economic rivalry. Most seriously, the shot is facing a spate of reports that a small number of people who received it, most of them younger than 60, developed a rare form of cerebral blood clotting. The World Health Organization and British and European regulators said that they'd found a possible link between the vaccine and the clots but that the benefits of getting the shot outweigh the risks. The EU regulator has recommended that clotting be listed as a rare side effect, while the U.K. is advising that the vaccine ▶

◀ not be used on people under 30. Some governments have already halted the shot's use in younger people. Despite all the issues, many European Union leaders have been clamoring for doses, complaining that AstraZeneca has failed to meet its supply promises and even threatening to block vaccines made or bottled in the EU from being exported.

In the span of a year, Astra has gone from favored child to problem child in the family of coronavirus vaccines. "There's this little cloud that's followed it around everywhere it goes, which I think is slightly unfair," says John Bell, the Canadian-born Oxford professor of medicine overseeing relations between the university and AstraZeneca. "If people keep beating this vaccine up, nobody's going to have the confidence to use the darn thing, and then we've got a massive problem—because it's deployable, it's cheap, you can use it globally, and it's clearly highly effective."


AstraZeneca vaccination in Nigeria

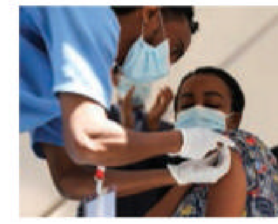
As Bell suggests, Astra's vaccine is more easily transported and stored than the mRNA-based vaccines from Moderna and Pfizer-BioNTech. The U.K. company has promised to deliver as many as 3 billion shots in 2021, selling them on a not-for-profit basis, at a few dollars a dose. Only the single-shot vaccine from Johnson & Johnson, which has also agreed to sell doses for no profit, is expected to make a comparable contribution to ending the pandemic, but it's far behind Astra's on production. By contrast the Pfizer-BioNTech vaccine is expected to bring in $15 billion in revenue this year, while Moderna Inc. is forecasting $18 billion for its shot. More than 135 million Astra doses have thus far been distributed around the world, and the shot has become the workhorse of Covax, the WHO-backed program that provides vaccines to low- and middle-income countries.

AstraZeneca and Oxford have had their share of bad luck, but they also made a series of missteps that derailed their front-runner status. "It's shocking that they made so many errors," says Ezekiel Emanuel, a medical ethics and health policy professor at the University of Pennsylvania who advised President Biden's Covid transition team. For all the blunders, the world desperately needs Astra's shot to end the pandemic. This is how it's gone wrong.

Last spring, scientists at Oxford were advancing quickly through lab and animal testing of their vaccine candidate, which they were planning to deliver in a single dose. They were under pressure to team up with a big pharmaceutical company, given that manufacturing at scale would require months of intensive planning and vast logistical capacity. Early talks with U.S.-based Merck & Co. ground to a halt after U.K. officials, wary that American nationalism could leave them without access to doses, said they wanted to keep development and manufacturing in British hands. GlaxoSmithKline Plc, a major U.K. vaccine developer, passed on the opportunity to join forces. That left the only other British player of any size, AstraZeneca.


Mexico

Astra was on a roll under Soriot, who'd fended off a $117 billion hostile bid from Pfizer Inc. in 2014 and developed a reputation as a miracle worker in getting new drugs, especially treatments for cancer, to market. When Bell spoke with Soriot last April, he said Oxford had two conditions: the vaccine had to be sold on a not-for-profit basis at least for the first year, and Astra had to help ensure the developing world got doses. Bell says Soriot didn't hesitate to agree, replying, "I'm completely with you." Astra would get a massive public relations coup and, down the road, lots more business if booster or annual shots proved necessary.


Ethiopia

Other than a nasal spray for flu, though, Astra had almost no experience in vaccines. "They're in this game for the first time, so they're making their way," Bell says. "They don't have five authoritative big guns in the vaccine world to stand up and say, 'Hey guys, pay attention to this. This is really good stuff.' "

Some potential for dysfunction was baked into the process from the start. By the end of April, when it reached the final partnership agreement with Astra, Oxford had already begun human trials, whose protocols would become quite complex. It had large Phase III trials set to start in the U.K. and Brazil, along with a smaller Phase I-II in South Africa. For the U.S. Phase III trial, Astra took charge, designing a straightforward two-arm protocol.

With the backing of the U.K. government, the partnership moved swiftly on manufacturing, building on the university's early work with Oxford Biomedica, a small nearby biotech company, to get domestic production off the ground. In mid-May, the British government announced it had preordered 100 million doses, and Operation Warp Speed, former President Donald Trump's vaccine program, pledged as much as $1.2 billion to accelerate the shot's development and secure 300 million doses for the U.S. Oxford soon started its Phase III trial in the U.K. Everything seemed to be coming along.

Out of the public eye, though, the scientists at Oxford realized they'd miscalculated the concentration of the vaccine, which had led some Phase III trial participants to receive a half-dose. Around the same time, the team decided to move from a one-shot to a two-shot regimen after seeing signs it would produce better protection, settling on a dosing interval of about four weeks. The U.K. regulator authorized them to continue with the half-dose group and follow up with a full dose, but the miscalculation and the decision to add a second shot meant the team would need to make more vaccine. That in turn delayed the second jab for a large number of volunteers.

Continuing with the half-dose group seemed justifiable to many of those in the loop, given that the pandemic was accelerating, a vaccine was urgently needed, and it's normal to try different dosage regimens, if not usually on the fly. But some U.S. officials heard about the changes to the protocol and thought, "What are these guys doing?" according to a former senior Trump administration figure. The moves undermined American confidence in the British developers—just

CLOCKWISE FROM TOP LEFT: AFOLABI SOTUNDE/REUTERS; TIKSA NEGERI/REUTERS; RANEEN SAWAFTA/REUTERS; LUIS ECHEVERRIA/REUTERS; PAVLO PALAMARCHUK/REUTERS; MARKO DJURICA/REUTERS; EDGARD GARRIDO/REUTERS as the NIH was working with AstraZeneca on setting up the U.S. Phase III trial.

Astra's team had been hoping to start the U.S. trial in July, which ended up being about the time Moderna and Pfizer began their Phase IIIs. But U.S. officials wanted to make sure manufacturing of the vaccine could be scaled up and tested before an expensive trial began, and that took longer than expected, according to three former senior officials. Also, the Food and Drug Administration and some Warp Speed officials were asking for detailed immune-response data in over 65s, people familiar with the situation say; Oxford had been slow to recruit older adults to its large U.K. trial. With the delays, AstraZeneca wasn't able to begin dosing volunteers in the U.S. until the end of August.

Only a week later, the health news service *Stat* reported that the U.S. trial had been paused after a volunteer in the U.K. experienced an unspecified illness. It soon emerged that vaccination had been suspended in all the partnership's global trials as the situation was investigated. It isn't uncommon for clinical trials to be halted as a precaution, especially in the large-scale final phase—it's a sign that safety is being taken seriously. But this wasn't a normal trial; it was one of the most closely watched scientific projects in history.


West Bank

The first reported pause to a coronavirus vaccine trial set off a media storm. Under huge pressure to divulge further details, the developers refused, citing participant confidentiality—standard practice with such events and one that usually goes unnoticed. A throwaway comment by Matt Hancock, the U.K. health secretary, then revealed that Oxford's Phase III trial had been paused over a safety concern once before.

During a subsequent private investor call, Soriot revealed some of the details journalists and scientists had been demanding. The participant was a woman who'd begun suffering from neurological symptoms consistent with transverse myelitis, an inflammation of the spinal cord that can be caused by a viral infection. Soriot said it was unclear whether this specific condition had been diagnosed and whether the vaccine was to blame. Again, the information leaked, and again, a storm ensued.


Serbia

Soriot's selective disclosure renewed the demands for details, which the company once more refused to divulge. The woman who suffered from the adverse reaction was complaining that her health was being dissected in the media around the world, according to people familiar with the situation. Releasing additional information about her condition before a full investigation was conducted could also have compromised the integrity of the trial and potentially encouraged other participants to report similar issues where none were occurring.

Regulators in Brazil and the U.K. cleared Oxford to resume its trial roughly a week after the pause began, but the U.S. kept the study there on hold for almost seven weeks as Pfizer and Moderna zipped ahead with theirs. American officials were asking Astra for detailed information on every neurological event in any participant who'd ever received the vaccine, according to people familiar with the request. Three former senior U.S. officials say they grew frustrated at how long Astra was taking to provide them the data they requested. The FDA had no desire to slow things down given the urgency of the pandemic, one former official says. Other companies were able to respond quickly to FDA requests, and several U.S. officials began to assume AstraZeneca and Oxford were having problems communicating.


Guatemala

Some working on the U.K. government's vaccine effort were baffled by the holdup. On Oct. 12, *Stat* reported that Johnson & Johnson had paused its trial because of an unexplained illness. Like AstraZeneca, the American company didn't announce the pause beforehand and declined to release details, citing patient privacy; it later revealed in a report to the FDA that a 25-year-old male volunteer had suffered blood clotting in his brain, resulting in cerebral hemorrhage. After concluding that the event was unrelated to the vaccine, J&J resumed its U.S. trial, saying it would start back up less than two weeks after the pause began.

By then some American officials had soured on the AstraZeneca vaccine, safe in the assumption they had Pfizer and Moderna in the bag, with Johnson & Johnson not far behind. "AstraZeneca looked like the gang that couldn't shoot straight," says the former senior Trump administration figure. "It was almost an attitude of: If they make it, they make it; if they don't, they don't. But we're not going to go out of our way to make AstraZeneca successful. That's for sure. They had fumbled the ball so many times."

By November, Pfizer and Moderna had produced a set of clear results for their vaccines in U.S. trials, showing efficacy of about 95%—better than anyone had dared hope for. When Oxford reported interim results from its Phase III U.K. and Brazil trials on Nov. 23, they were also good, but they looked messy by comparison.

Whereas Pfizer had enrolled more than 40,000 participants, and Moderna had more than 30,000, Oxford reported interim efficacy data on fewer than 12,000. Oxford also didn't produce a single efficacy figure, instead coming out with two that seemed counterintuitive—an issue that traced to the now-public fact that one group had been given a half-dose for their first shot. The vaccine was 62% effective in one cohort who got two full doses spaced about a month apart. Surprisingly, in the smaller group of about 2,700 people who'd received the half-dose for their first shot, the number rose to 90%.

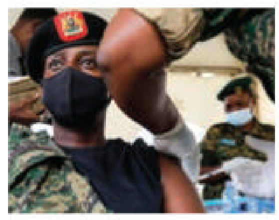

Ukraine

Initially, Oxford and AstraZeneca offered conflicting stories about what had happened with the dosing. Sarah Gilbert, the Oxford scientist who led the vaccine's development, explained it away as a function of experimentation. "We don't want to stick to a very low dose and discover we have an immune response that is too low," she told *Bloomberg News*. "On the other hand, we would like a vaccination regimen ▶

“WE MUST BE ABLE TO TRUST THE VACCINES.

◀ that’s well-tolerated.” The next day, Pangalos told Reuters the Oxford scientists had actually “underpredicted the dose by half.” He cast the lower dose’s relative success as “serendipity.”

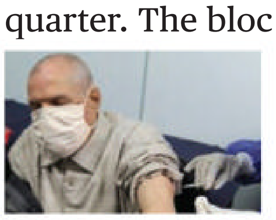
The muddled trial, coupled with Oxford and Astra’s inability to coherently explain what had happened, overshadowed the strong efficacy number for the smaller group in many people’s minds. As one former senior U.K. official says, it “wasn’t their finest hour.”


Uganda

Although relations between AstraZeneca and Oxford didn’t appear strained through all this, a common refrain emerged. When AstraZeneca executives talked about the U.K. trial, they would say, “Well, it’s Oxford’s trial. We had nothing to do with it.” When Oxford scientists were asked about delays to the U.S. trial, they would say, “Well, that’s AstraZeneca’s trial. We’re not involved.” Bell says the relationship is good. “We’re still in there swinging with AstraZeneca, trying to help. We’ve been fused at the hip from the beginning.”

The U.K. regulator authorized the Oxford vaccine on Dec. 30, recommending going as long as 12 weeks between shots. Its experts concluded that the higher efficacy number for participants who’d received the half dose for their initial shot likely owed to the increased interval before the second dose, rather than to the amount of the first one. Production in the U.K. was by then up and running at several sites. The country was preparing for a major rollout starting on Jan. 4, about a month into a national vaccination program that had begun with the shot from Pfizer-BioNTech. Oxford Biomedica had worked for months to iron out the kinks in the manufacturing process for the AstraZeneca shot, overcoming yield issues and learning to grow cell banks that would prove capable of producing 2 million doses a week. By early spring, Astra would account for a little more than half of all doses administered in the U.K., with data showing that it was driving down deaths and hospitalizations.

The rollout was much slower elsewhere in Europe. In late January, a few days before the European Medicines Agency granted its approval for Astra’s shot, the company announced that it would be able to deliver only 31 million of the 120 million doses it had originally planned to supply the EU in the first quarter. The bloc hadn’t signed its contract, for as many as 400 million doses, until the end of August, leaving European manufacturing months behind the U.K.’s. Output at Astra’s Belgian subcontractor was proving lower than expected, and the EMA wouldn’t grant authorization for another facility, in the Netherlands, to begin production until the end of March.


Egypt

News of the shortfall enraged officials in Brussels. Thierry Breton, a former businessman who serves as the EU’s internal market commissioner, tried to persuade his fellow Frenchman, Soriot, to boost deliveries, to no avail. Making the optics worse, Soriot wasn’t physically present in Europe. He’d been working from Sydney, where his family lives, since before Christmas. Breton told a French radio station he awoke every day at 4:30 a.m. to call Soriot. “I’m not criticizing him. Each of us has to manage this situation as best they can,” Breton said on Europe1 radio on March 14. “But you see, nearly every week I go to two or three factories. I’m not saying I know their factories better than they do, but I am on site.” (AstraZeneca says Soriot is working around the clock from Australia.)

In mid-March, European Commission President Ursula von der Leyen renewed an earlier threat to ban the export of all vaccines manufactured in the EU. Paranoia that Astra doses were being siphoned off from Europe to the U.K. crested a few days later, when Brussels ordered Italian leaders to have police raid a vial-filling factory in the town of Anagni that had 29 million doses on-site. The stock turned out to be destined for Europe and Covax.

The supply pressure came even as European leaders were raising efficacy and safety concerns about the vaccine. In early February, at least 10 European countries had restricted use of the shot in over 65s, given the lack of data for that group from Oxford’s Phase III trial. More bad news would follow from South Africa, where the Oxford trial showed the vaccine provided minimal protection against the dominant variant there. Then, in mid-March, Denmark, Norway, and Iceland announced they were temporarily suspending the Astra shot to investigate a rare form of blood clotting that had been detected in several vaccine recipients, at least one of whom had died. A few days later, Germany said it would suspend use of the shot, with several European countries following suit even as the EMA recommended continuing. Most resumed use after the agency reviewed the data again and concluded that the benefits of the shot far outweighed the risks, but it wasn’t long before more cases appeared. At the end of March, Canada halted AstraZeneca shots for people 55 and younger, and Germany reimposed its suspension for under 60s. “We must be able to trust the vaccines,” German Chancellor Angela Merkel said, looking exhausted. “These are findings we cannot ignore.”


Argentina

She was referring to 31 German cases of a form of clotting, known as cerebral venous sinus thrombosis (CVST), that had been reported out of about 2.7 million doses administered—an incidence rate higher than normal. Some of the cases were accompanied by low platelet levels; most involved younger and middle-aged women. Nine patients died.

The EMA investigated 86 cases of blood clots, 18 of them fatal, in Europe and elsewhere that had been reported as of March 22, out of 25 million people who’d received the vaccine. On April 7 the agency said that it had received a total of 222 reported cases of brain and abdominal clots and that the data didn’t indicate a cause or specific patient profile. The situation “clearly demonstrates one of the challenges posed by large-scale vaccination campaigns,” said


Philippines

...THESE ARE FINDINGS WE CANNOT IGNORE”

Emer Cooke, the EMA’s executive director. “When millions of people receive these vaccines, very rare events can occur that were not identified during the clinical trials.”

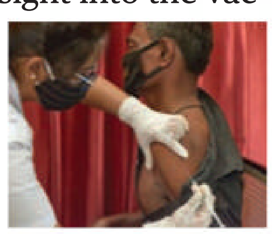
The UK regulator said the overall incidence of cerebral clots was about 4 cases for every 1 million people who’d received the vaccine. The reported risk in Europe is 1 in 100,000, according to the EMA.


Kenya

(The much lower number in the U.K. could be because the country has yet to start vaccinating under 50s, though the EMA has said there’s no evidence the clots are connected to age or gender.) The Johns Hopkins University School of Medicine estimates that normally 1 in every 200,000 people of all ages develop CVST in a given year.

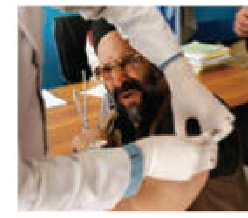
In an April 7 statement responding to the latest regulatory findings, AstraZeneca said it would be making recommended changes to the vaccine’s label, and it was “already working to understand the individual cases, epidemiology and possible mechanisms that could explain these extremely rare events.”

Any hope AstraZeneca executives may have harbored that their larger and more robust U.S. trial would reassure the world that their vaccine was safe and effective were dealt a major setback when the safety board’s letter leaked. The runup to the interim data release had been fraught—even by the standards of the pandemic. Astra was under pressure from European regulators, who wanted more insight into the vaccine’s efficacy in seniors, and then into the threat of clotting. Executives were also acutely aware of the heat the company had received in the past for not being forthcoming, and most importantly, Astra was under strict obligations, as a publicly traded company, to report material data quickly. On March 21, the day before the interim results were set to come out, executives got an emotional curveball when they learned that Astra’s head of oncology research, José Baselga, had suddenly died.


India

That same Sunday, AstraZeneca informed some U.S. officials about their assessment that the later cases wouldn’t appreciably change the results. In a video call attended by Fauci, NIH Director Francis Collins, and other U.S. health officials (but no one from the DSMB), the company presented its results and stepped everyone through the unvalidated additional cases, noting that the final efficacy number might drop by a couple of percentage points and would actually go up for the elderly. There was no pushback, according to people familiar with the discussion.

In announcing the interim results on Monday, Pangalos did mention that additional cases had come in, but Astra’s decision not to acknowledge in its statement how this might affect its efficacy figure stood in stark contrast to what Pfizer and Moderna had done months before. In Pfizer’s case, the initial estimate of 90% efficacy was upgraded two weeks later to 95%—a win on both the efficacy and public-relations fronts. The DSMB’s letter, by contrast, said that Astra’s efficacy could drop to between 69% and 74% once all the cases were validated—a calculation it didn’t share with the company until after it had issued its release. In itself, that wasn’t unusual; what was unusual was calling out the company publicly for its number. The DSMB is primarily responsible for reviewing safety data and deciding when a trial has met a threshold for efficacy. Final figures are normally decided by independent statisticians working with the company on pre-agreed terms, and disagreements with the DSMB are usually worked out behind closed doors.


Afghanistan

Polly Roy, a professor of virology at the London School of Hygiene and Tropical Medicine, says this was a case where precision should have been paramount for AstraZeneca. “They should not have said a particular number if they weren’t sure,” she says. “There’s nothing wrong with the vaccine itself. It’s the way they reported on the clinical trial. That was the wrong way to do it. Communication is the problem.”

Other experts say Niaid’s public intervention was unnecessary and extremely damaging. “It was grossly irresponsible for the National Institutes of Health to publish statements that there was something improper about the way the data had been collected and therefore you couldn’t trust it, which is how it will have been read no matter what it actually said,” says Peter English, former chair of the British Medical Association’s public health medicine committee. The inference, he adds, is “that things might have been terrible. This brings the whole vaccine into disrepute. It makes people think there’s something dodgy about it. It will affect confidence in the AstraZeneca vaccine but also vaccines in general.”

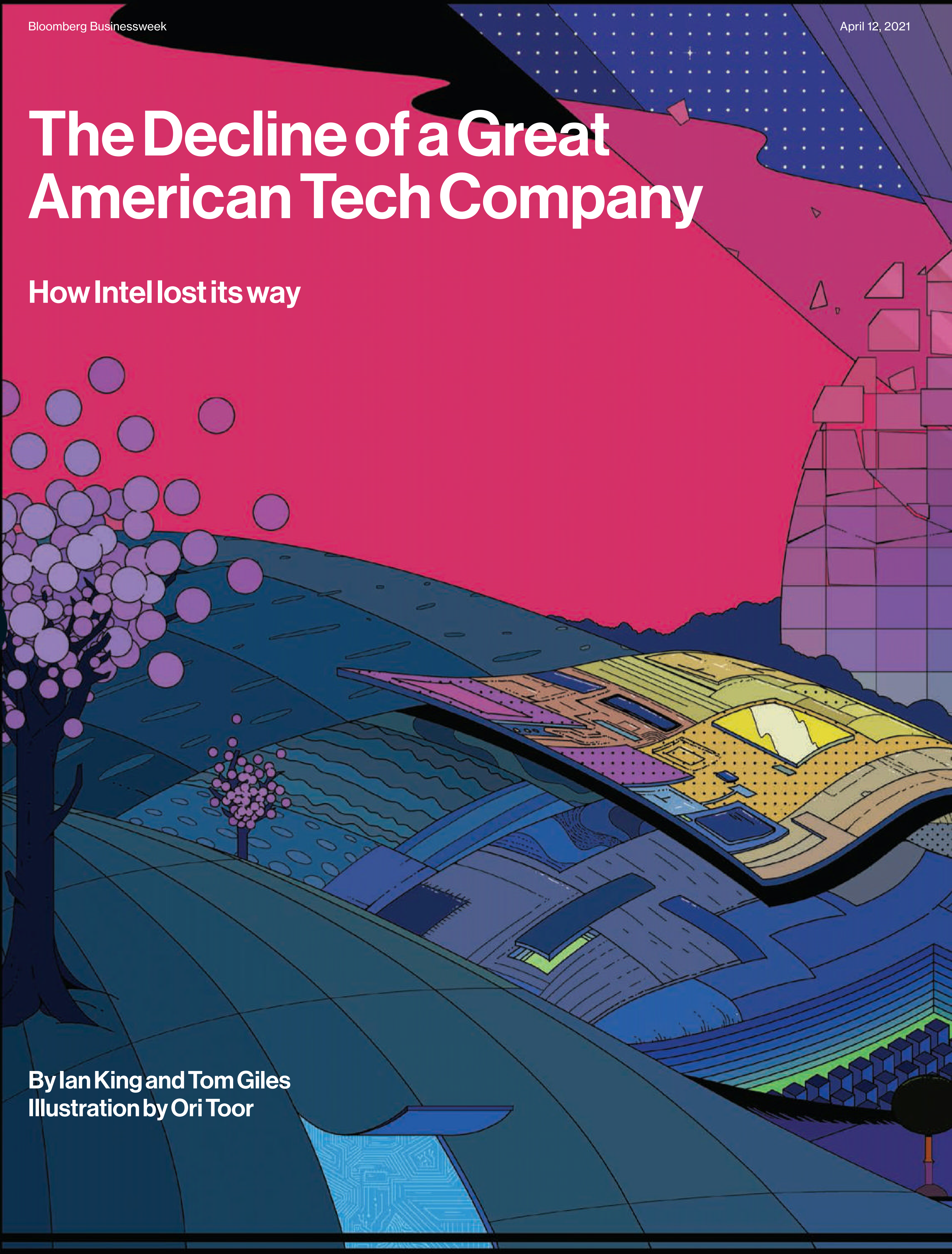
Astra’s next major hurdle will be to secure an emergency use authorization from the FDA. The company plans to submit data for review in the first half of April, but a final ruling could take weeks. Astra executives are under no illusion that the process will be smooth. They must continue to work with the DSMB, and they have one of the most complex datasets of any Covid vaccine developer, with thrombotic events and real-world evidence from millions of people vaccinated. They also got a new challenge at the end of March when one of their main subcontractors in the U.S., Emergent BioSolutions Inc., mixed up ingredients from Johnson & Johnson and AstraZeneca, a major manufacturing error. Emergent will now exclusively produce J&J doses while U.S. officials work to find AstraZeneca new manufacturing capacity.

Many people inside Astra are deeply distressed by the extent of the criticism they’ve taken while trying to lead the way to a nonprofit vaccine that could help end the pandemic. As one executive puts it when asked if they’d do it again: “Not in a million years. All we’ve had is grief.” B

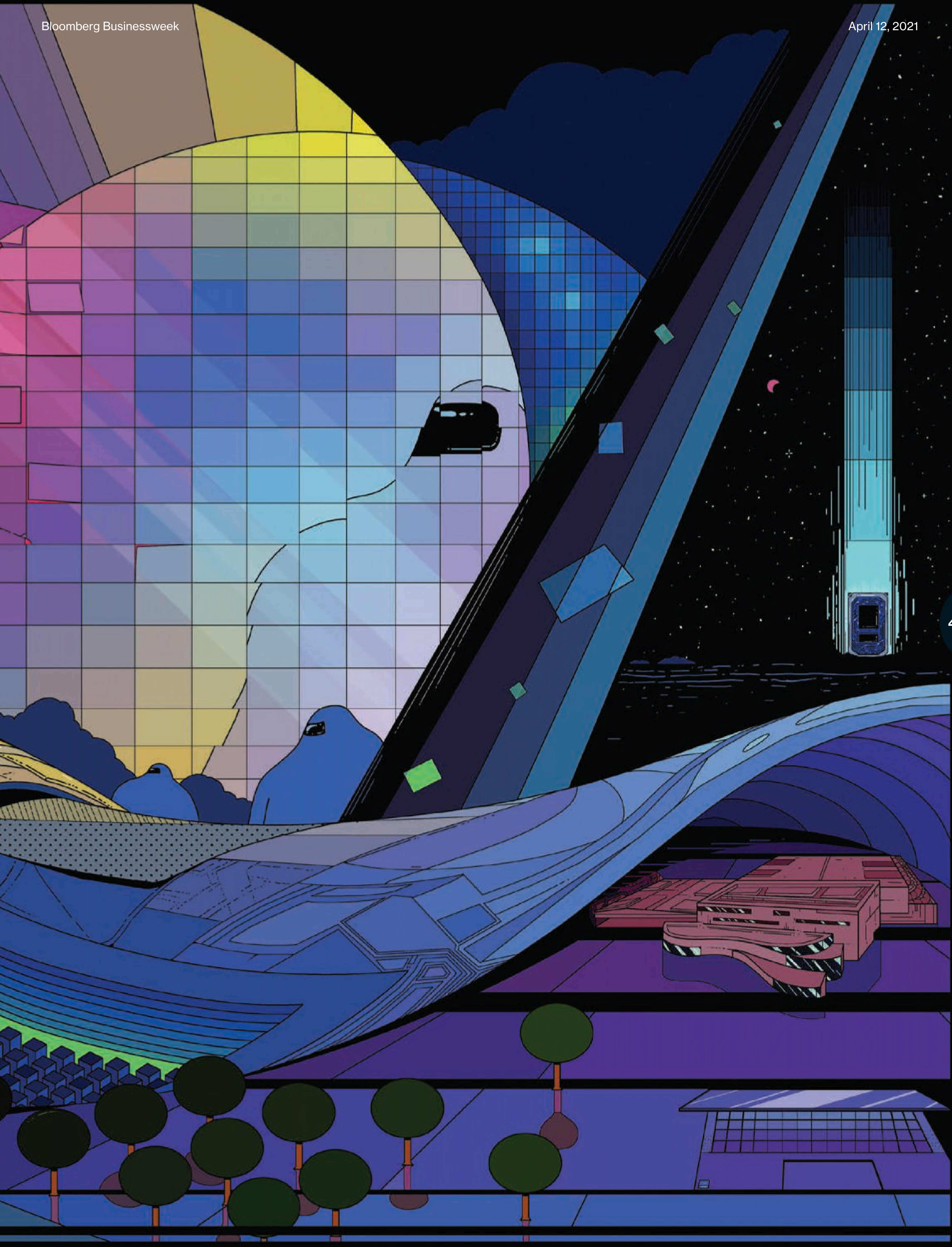
CLOCKWISE FROM TOP LEFT: HAJARAH NALWADDA/XINHUA/ZUMA PRESS; AGUSTIN MARCARIAN/REUTERS; MONICAH MWANGI/REUTERS; MOHAMMAD ISMAIL/REUTERS; SUPRABHAT DUTTA/SHUTTERSTOCK; LISA MARIE DAVID/REUTERS; MOHAMED ABD EL GHANY/REUTERS

The Decline of a Great American Tech Company

How Intel lost its way



By Ian King and Tom Giles
Illustration by Ori Toor



The statement, conveyed as the third bullet point of a quarterly earnings release, was both mind-numbingly technical and inscrutably terse—almost to the point of meaninglessness for anyone who was not a professional investor or analyst. "Accelerating 10nm product transition," it read, "7nm product transition delayed versus prior expectations."

To those who do make a living scrutinizing financial releases, this was disastrous. It meant that Intel Corp. was struggling to produce its latest and greatest chips. The company had promised it would be manufacturing chips with transistors that have dimensions as small as 7 nanometers, or 7 billionths of a meter, with 2021 as the most recent deadline. The smaller the transistors, the more you can cram together, which makes for faster or more efficient processors. The delay meant that Intel would be stuck selling an older generation of chips for another year.

Intel has been a jewel of American manufacturing since the late 1960s, when Robert Noyce and Gordon Moore started the company in Mountain View, Calif., and in doing so helped create the modern chip industry and Silicon Valley itself. The company, now based in Santa Clara, has suffered delays in the past, but Intel's engineers have always ensured each setback was short-lived.

By July 2020 things had changed. During the conference call that followed the earnings release, Intel's unassuming chief executive officer, Bob Swan, indicated that the company's futuristic chip fabrication plants—"fabs"—might never be able to catch up. Instead the company was considering using contractors to build the 7nm chips. "To the extent that we need to use somebody else's process technology, and we call those contingency plans, we will be prepared to do that," Swan said in response to the first question from an analyst.

His words were halting and coldly technical, but every analyst on the call heard this and thought the same thing: Holy crap. Swan's suggestion was possibly the most radical thing to happen to Intel in its 52-year history. Intel had climbed to the top of the more than $400 billion-a-year chipmaking industry by designing sophisticated processors and mastering the complicated techniques needed to produce hundreds of millions of them to power the world's computers—doing all that in-house.

This technical prowess made Intel the leader in chips and a key part of the mythology of 20th century American capitalism. Yes, most electronics were made in factories in Asia, but that was low-margin, low-wage work that the U.S. didn't want anyway. Intel's American factories, on the other hand, made the most sophisticated, highest-margin components for those devices. Presidents Bill Clinton, George W. Bush, and Barack Obama all visited Intel fabs, and "Intel Inside" was emblazoned on desktops and laptops the world over. During the 1990s, at the height of the company's cultural cachet, Intel ran television commercials featuring clean-room workers in full Tyvek, disco dancing to Wild Cherry's *Play That Funky Music*. The plan Swan suggested would repudiate that legacy and possibly damage the leadership of the U.S. in high-end manufacturing.

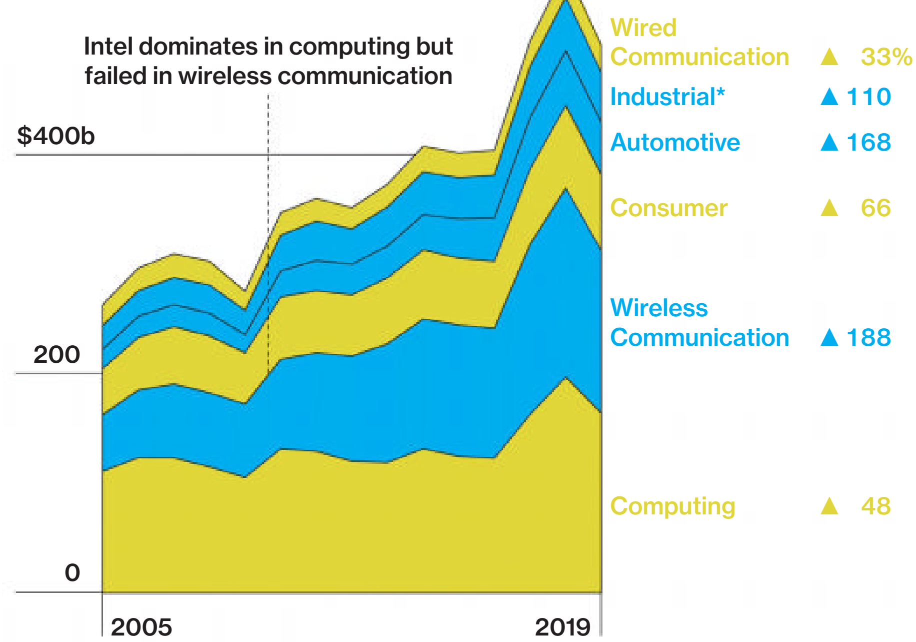
Before Swan could follow through on the outsourcing plan, the company changed course again, replacing him with Pat Gelsinger, who'd been Intel's chief technology officer and who was still very much a believer in its manufacturing prowess. In March he announced a plan to spend $20 billion on new U.S. factories that could make chips for other semiconductor companies that want to outsource their production. He presented this plan to make Intel into a contract manufacturer, or what's known as a foundry, as a statement of his turnaround ambitions. "Intel is back," Gelsinger told journalists. "The old Intel is the new Intel. We're going to be leaders in the market, and we're going to satisfy the new foundry customers, because the world needs more semiconductors, and we're going to step into that gap in a powerful and meaningful way."

Even today, even in its current diminished form—having lost the title of most valuable American chip company to Nvidia Corp., which designs graphics processors and outsources most of its manufacturing to Asia—Intel still controls about 80% of the computer processor market, with an even bigger share in servers, the powerful machines that run data centers. But Intel's biggest customers, including Amazon.com, Apple, and Microsoft, have all begun designing their own chips and hiring outsourced manufacturers to make them. Intel rival Advanced Micro Devices (AMD) Inc., another so-called fabless chip company, has been selling 7nm components for months. That's caused many to question whether, despite Gelsinger's promises of a restoration, the company can recover from its production stumbles. "Progress on the manufacturing side has utterly come off the rails," says JoAnne Feeney, a partner at Advisors Capital Management LLC and a longtime chip analyst.

Intel's predicament didn't come about overnight. It's been a consequence of a decade's worth of missteps—including a failure to break into chips for smartphones—and cultural decay that blinded the company to serious shortcomings, according to more than two dozen current and former employees,

WHO BUYS CHIPS?

Global semiconductor revenue by industry



*INCLUDES ENERGY, MEDICAL, MILITARY, AND AEROSPACE. DATA: IDC most of whom asked not to be identified for fear of retribution or jeopardizing their job prospects. It's also a function of global shifts that gave rise to Asian manufacturing giants such as Samsung Electronics Co. and Taiwan Semiconductor Manufacturing Co. These companies increasingly sit at the center of the industry, and it's their chips that are increasingly finding their way "inside" the most advanced devices.

Although founders Moore and Noyce were among those who created the first semiconductors back when the San Francisco Peninsula was better known for its almond orchards than for its silicon products, the person at the center of Intel's rise was Andy Grove. The Hungarian-born engineer was Moore and Noyce's first hire and served as the company's CEO from 1987 to 1998. Grove's Intel, which would influence a generation's worth of management thinking, prized discipline, intellectual honesty, and focus.

Grove was famously demanding, introducing a "Late List," which required employees who showed up for work after 8 a.m. to sign their name on a sheet of paper at the front desk, and a ranking system that placed all engineers in one of four performance categories. The ranking system, and many other of Grove's techniques, would be adopted by almost every major tech company, and Grove's approach to organizational discipline influenced bestselling business books such as *Radical Candor* and *Great by Choice*. In dealings with senior managers, he promoted "constructive confrontation," what he saw as an unvarnished frankness designed to ensure that problems were brought to light and resolved efficiently. In Grove-speak, employees were supposed to "disagree and commit."

This approach could make meetings at Intel a bit hostile—employees furtively referred to the "Hungarian Inquisition"—but it also meant that Grove was willing to listen to critics. He courted junior-level naysayers ("Cassandras," he called them) who learned to speak up about potential problems without fear of reprisal. "Mentoring with Andy Grove was like going to the dentist and not getting Novocain," Gelsinger recalled in an interview in 2016, shortly after Grove's death. He intended this as a compliment, praising Grove's "aggressive pursuit of the right answer."

During Grove's decade-long tenure, the most ambitious engineers competed for the distinction of being the CEO's "technical assistant." This role, which now exists at Amazon.com Inc. and Microsoft Corp., entailed menial tasks such as serving as the executive chauffeur and helping with Grove's schedule, but it also involved writing presentations and standing in for the CEO in high-level meetings. Many technical assistants went on to senior positions at Intel or at its competitors. Former CEO Paul Otellini was a technical assistant to Grove.

Part of the reason Grove's approach was so influential is that it resulted in impressively consistent technical and financial progress, which was so reliable it eventually came to be seen as something close to a law of nature. Grove's discipline ensured Intel chips became more powerful even as they became cheaper to make, in keeping with Moore's law,

SILICON VALLEY BEFORE INTEL

COURTESY SAN JOSE PUBLIC LIBRARY/CALIFORNIA ROOM

which predicted the pace of chip improvements and was named after the company's co-founder. Intel was one of the few American electronics makers to thrive in the 1980s and '90s as Japan, South Korea, and Taiwan emerged as manufacturing powerhouses.

Grove stayed on as chairman until 2005 and closely counseled company executives until his death, but even his formidable influence couldn't prevent one of Intel's biggest stumbles. In the mid-2000s, as Apple Inc. was preparing for the release of its new smartphone, Steve Jobs approached then-CEO Otellini about providing the chips for the iPhone. Intel already sold Apple the processors that ran its Macs. But Jobs made what Otellini considered a lowball offer, and Apple awarded the contract to Samsung. It later began designing the chips itself and eventually outsourced production to TSMC, a contract manufacturer in Taiwan that had been founded in 1987 and focused on catering to fabless semiconductor companies.

Intel made other attempts to gain a toehold in chips for smartphones. It acquired the division of Infineon Technologies AG that made processors for mobile phones for $1.4 billion in 2011, but the division struggled under intense competition from Qualcomm Technologies Inc., the market leader. It tried paying customers, such as Korea's LG Electronics Inc., to make devices based on its chips, though those never sold in significant volumes. Ultimately, according to several people with knowledge of Intel's strategy and operations, the company was never willing to divert its production and design resources away from PC and server chips, and its mobile efforts suffered as a result. Intel not only forfeited billions of dollars in revenue, but it also gave its competitors an opening to gain the manufacturing expertise that comes from making chips at such high volume and to exacting specifications. There are far more mobile phones than PCs and servers in the world, and the chips that run them ▶

◀ need to be energy efficient to preserve battery life. Landing Apple as a customer "became such a driver for TSMC," says Risto Pahukka, president of VLSI Research Inc. "The combination turned out to be very fruitful and is staying that way."

In 2010, Otellini's heir apparent, Sean Maloney, suffered a debilitating stroke, which was followed two years later by Otellini's sudden announcement that he was retiring. His replacement was Brian Krzanich, a 53-year-old veteran of the company, but one who had not been steeped in Grove's culture of relentless self-criticism. What Krzanich did have, according to people who worked with him, was an almost unshakable faith in Intel's engineering acumen, especially the acumen of the division he'd previously run with another executive, the technology and manufacturing group, which was responsible for formulating each new chip-production process.

In 2013, shortly after his appointment, Krzanich convened 250 of the chipmaker's senior-most managers in a hotel conference room near Intel's sprawling research and manufacturing campus in Hillsboro, Ore. For many in the room, it was the first opportunity to get a feel for what it would be like to work with him.

Krzanich used the speech to set some new ground rules. Senior managers, who'd been trying to find ways to spend time with the new boss, were told to stop asking if they could join Krzanich on one of his regular jogs around campus. "I like to run alone," attendees recall him saying. "And I don't like people in general." There was an awkward silence as the executives awaited a punch line that never came.

Over his five-year tenure, Krzanich reversed Grove's policy of embracing Cassandras. Instead he publicly humiliated executives with whom he disagreed, ignoring warnings that Intel was falling behind in its ability to manufacture key products. "Brian did not create an environment where people could bring him problems that could be worked on," one former executive says. "Limiting the truth is death for a complex company like Intel."

In the review meetings that his predecessors had used as forums for debate, Krzanich answered emails, shopped online, or left to make phone calls, say people who worked for him. Colleagues say this was his way of showing those presenting that he wasn't interested, had made up his mind already, or didn't value what they were saying. When he did participate it was often to sneer at presenters or verbally abuse them, sometimes telling experts they had no idea what they were talking about, according to a dozen sources. Krzanich did not respond to repeated requests for comment.

Krzanich reserved some of his harshest scorn for Aicha Evans, who ran Intel's mobile business and was one of the highest-ranking Black women in the chip industry. Evans was tasked with shifting production of a key product to Intel's plants from TSMC, which had manufactured mobile chips for Infineon, but she concluded that the transition wouldn't work. Intel's fabs were designed for high-performance server and PC chips, not processors that had to get by on limited battery life. In a detailed three-hour presentation, she outlined her concerns to Krzanich, Chairman Andy Bryant, and 10 other top executives. Her presentation, according to people who were in attendance, was thorough and compelling. TSMC should continue to manufacture the modems, she insisted.

But after she finished, Krzanich seemed not to have absorbed any of those specifics. Instead he raised his arm in the air and brought his fist down, pounding on the table. "F---ing shit, Aicha Evans," he shouted. "You don't understand Intel, and you don't have any f---ing balls."

She glared at him. "You're right," she said.

For a time it seemed that Krzanich's confidence in Intel's chipmaking strength was justified. In 2015 it became the first company to release a line of chips with 14nm transistors, an improvement from the previous generation's 22nm. But in early 2015 an engineer approached Krzanich with another warning: The company's next generation of chips, which would be based on a 10nm process and which were due to be released in 2017, was already six months behind schedule.

Krzanich responded just as he had to Evans, according to the engineer—with an expletive-laden tirade. The following year, two other engineers presented Krzanich with data showing an alarming trend in what's known as the yield curve for the forthcoming chip. A metric known as the error rate, or the percentage of faulty chips in a given production run, was not improving quickly enough. Also, a competitor, TSMC, might release its 10nm chips first, they noted. According to several witnesses, Krzanich told them, in effect, that they didn't know what they were talking about.

The six-month delay would eventually expand to three years, and it wasn't until 2020 that Intel released its 10nm chips. The lag caused Dell Technologies Inc., one of its biggest customers, to cut its full-year sales forecast by more than $1 billion. "Obviously we're not extraordinarily happy with them right now," said Dell Chief Financial Officer Tom Sweet at the time. In public statements, Krzanich continued to promise that the 7nm chips would arrive on time, a prediction that many inside the company already doubted.

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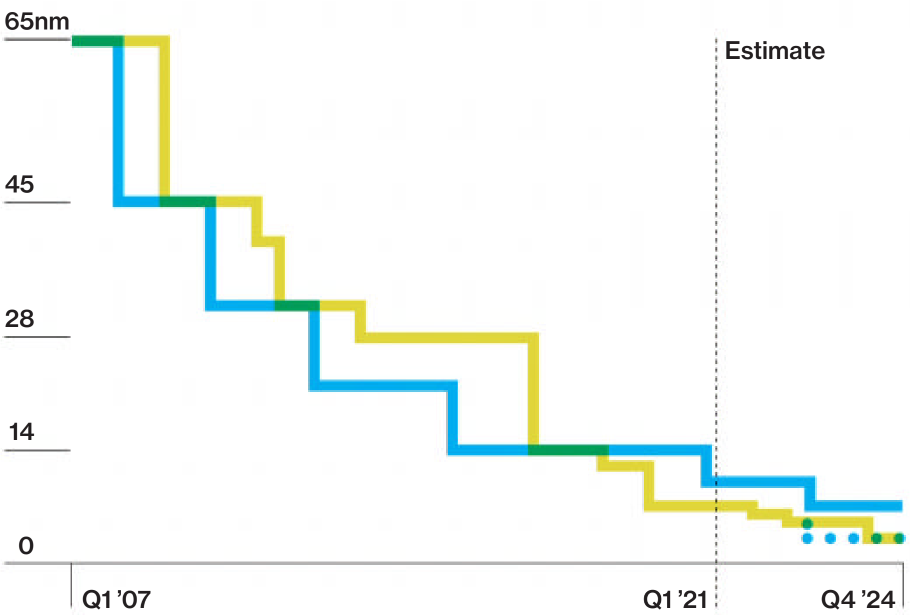
KRZANICH IN 2014

FALLING BEHIND

CPU process technology, size in nanometers

Intel AMD TSMC



DATA: BERNSTEIN

Intel forced out Krzanich in June 2018. The official reason was that he'd had an affair with a subordinate. But Intel had previously tolerated interoffice relationships among senior executives, and many executives speculated that the board had grown fed up with his performance and treatment of underlings.

Evans, the head of the mobile business, outlasted Krzanich. (She left in 2019 and became CEO of Zoox, the driverless-car maker that was sold to Amazon last year.) But by the time Krzanich departed, many of Intel's most senior executives had been forced out. These include former CFO Stacy Smith, who'd been in charge of operations; Kirk Skaugen, who ran the company's main PC chip business; and Renee James, Intel's president. Key engineering leaders had also left, such as Dadi Perlmutter, who was chief product officer; Rani Borkar, who was in charge of product development for some of Intel's most important chips; and Rony Friedman, who led a microprocessor design team. Together they had 200 years of experience at Intel.

The company's plight isn't exclusively a function of internal missteps. It also reflects the decades-long shift of manufacturing out of the U.S. to parts of the world that have undergone rapid industrialization and economic development, aided in part by government policies that encouraged an expansion of export production. One of the biggest beneficiaries of the change has been TSMC, based in Hsinchu, Taiwan, which pioneered outsourced manufacturing in chips. AMD, Intel's longtime rival, uses TSMC, as do Nvidia, Qualcomm, Broadcom, and many of Intel's biggest customers. Amazon Web Services designed an in-house server chip, Graviton, in 2018, which it used to replace some of Intel's Xeon server chips. Amazon has since announced other chips, all of them made by TSMC. Google and Microsoft also have in-house chip programs.

Even Intel's status as the company that powers high-end personal computers seems to be in jeopardy. Apple has begun designing chips for Mac laptops and desktops and, in November, unveiled three new computers boasting a central processor that its own engineers designed and TSMC manufactured. Apple plans a series of chips that will be used in higher-end Macs to be released as soon as this year, according to people with knowledge of the matter.

TSMC's power has been made plain by a global shortage of chips that's slowed auto manufacturing, with companies in Europe, Japan, and the U.S. all imploring TSMC to step up production. In February, President Joe Biden signed an executive order aimed at addressing the shortfall and lessening U.S. dependence on foreign countries. The semiconductor industry, meanwhile, has been pressing the federal government for tax breaks and other incentives to encourage domestic investments. That's on top of efforts already made, under President Trump, to slow Chinese advances in electronics and chipmaking. Declaring that Chinese companies pose a threat to U.S. national security, Trump's White House blacklisted the big Shanghai-based chipmaker Semiconductor Manufacturing International Corp., along with Huawei Technologies, ZTE, and other Chinese companies, denying them access to U.S. software and semiconductor designs.

This move may help Intel in the long run, but the immediate job of fixing the company lies squarely with Gelsinger and the team he assembles. Even before he formally started, Gelsinger began recruiting Intel executives who'd left under Krzanich. Sunil Shenoy, who departed in 2014, rejoined as a senior vice president of the group in charge of design engineering, and Glenn Hinton, who previously led the development of a key chip design, also returned.

On his first day, Gelsinger invoked the memory of Noyce, Moore, and Grove, reminding the staff in a memo that he was "inspired by the leadership" of Intel's founders. A few weeks earlier, in January, as he addressed Wall Street on a conference call, Gelsinger recalled a period in the 2000s when Intel lost, and then regained, market share in the server-chip market. "Great companies are able to come back from periods of difficulty and challenge, and they come back stronger, better, and more capable than ever," he said.

Gelsinger followed that assertion in March with his pledge to build new factories and break into the foundry business. But to succeed, Intel will need to rectify its manufacturing snags, get new fabs up and running—a feat that can take years—and, ultimately, figure out a way to balance the demands of a new set of customers with the already massive needs of its existing ones.

TSMC has a more than three-decade head start as a foundry. It's been producing 7nm chips since 2018, and Apple began making 5nm processors last year. Gelsinger's determination to have Intel regain its position of leadership is underlined by its $20 billion bet on the foundry business. But the company's plan to increase its capital expenditures by about 35% in 2021 puts it almost $10 billion behind what TSMC will spend this year. Money alone won't bring back the old Intel. Ⓑ

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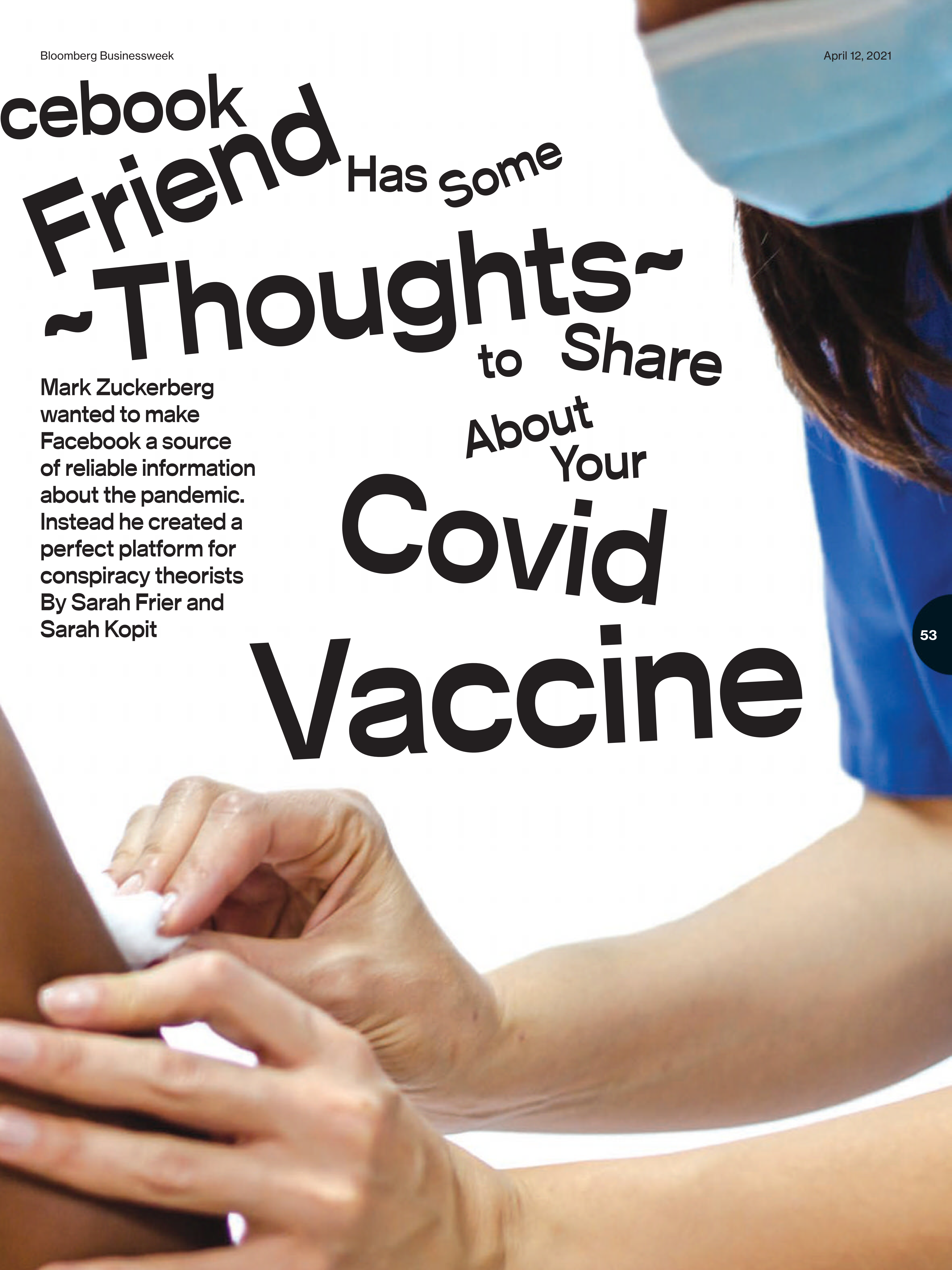


cebook Friend Has Some ~Thoughts~ to Share About Your Covid Vaccine

Mark Zuckerberg wanted to make Facebook a source of reliable information about the pandemic. Instead he created a perfect platform for conspiracy theorists

By Sarah Frier and Sarah Kopit

Kaleese Williams had mostly stayed off Facebook and Instagram before Covid-19 hit. But during the lockdown, the 37-year-old was stuck on her north Texas farm with her husband, their 3-year-old, and their chickens and goats. She was also cut off from a source of income. Williams sells essential oils for a multilevel marketing company in Utah called Young Living. She'd normally set up booths at conferences and other events, making a little money while socializing with passersby. "Quarantine is not a whole lot of fun," Williams says. "So I started thinking, 'What would be so wrong with me sharing on social media?' " Her plan was to take her essential oils business on Instagram, where she could sell to people she met there.

Williams decided to splurge on an online course called Ready Set Gram Pro. It promised to help her build a "highly engaged" community on the photo sharing app that would "generate consistent leads and sales." By watching web tutorials and participating in Zoom sessions, she learned tricks to attract potential customers to her profile—for instance, by commenting on the posts of popular wellness influencers.

As she built her following to more than 1,000 users, she became engrossed by Instagram, especially the parts of the app dedicated to natural living. Williams was already averse to traditional medicine after feeling bullied during a bout of cancer in 2017, during which she says her doctor failed to disclose that a treatment she underwent could cause infertility. Now she was spending more and more time consuming information about different forms of alternative medicine such as naturopathy and functional medicine.

That's where she first started to read about the Covid-19 vaccine. She came across posts based on unfounded rumors that claimed the Pfizer Inc. and Moderna Inc. shots were toxic, caused adverse reactions, and might have infertility risks. Before long she became convinced that the Food and Drug Administration-approved vaccines, which have few side effects and are almost entirely effective at preventing hospitalization or death from Covid, were not for her. "It's scary," she says. "I believe in the immune system. I do not believe in vaccine-induced herd immunity."

You'd think during the worst pandemic in a century virtually everyone would be desperate to get their hands on a vaccine that promises to help them get their life back. But you'd be underestimating the power of Facebook and Instagram to provide all the necessary tools for anti-vaccine activists and other wellness hucksters to suck in converts. Over the years, these opportunists have cultivated a strategy optimized for the social era. They drip anti-science skepticism into Facebook groups and Instagram stories and posts, where algorithms reward content that elicits strong emotional reactions, further amplifying the misinformation.

These social media influencers, legitimized by their sizable follower counts, had a full year to sow doubt about Covid vaccines before Facebook took significant action. They've exploited public confusion and mixed messaging from government and health officials on everything from masks to vaccine side effects and safety. Facebook's official stance is that it doesn't ban posts unless they "cause imminent harm"—a threshold the social network claims vaccine misinformation only crossed months into a global inoculation campaign.

Even as hesitancy persists and anti-vaccine lies continue to circulate online, Chief Executive Officer Mark Zuckerberg stalwartly defends Facebook Inc.'s actions. His critics argue the company hasn't done enough. "The content that your websites are still promoting, still recommending, and still sharing is one of the biggest reasons people are refusing the vaccine," Pennsylvania Representative Mike Doyle, a Democrat, said at a March 25 congressional hearing with Zuckerberg and his fellow social media CEOs. "And things haven't changed."

In October 2020 a group of wellness gurus with social media followings in the millions gathered virtually to discuss an historic opportunity. The world was months away from the Covid-19 immunization effort, with several vaccine makers signaling that they'd soon be seeking emergency use authorization from the FDA. These vaccine skeptics saw an opening to push a counternarrative.

In a series of discussions with the vibe of a sales conference, the speakers talked up the promise of the coming months. "All of the truths that we've been trying to broadcast for many, many years, there are people hearing it," said Robert F. Kennedy Jr., son of RFK, and a leading vaccine conspiracy theorist. "Those seeds are landing on very fertile ground."

For years, activists—some with medical credentials, some with none at all—had attracted followings, especially among moms of small children, by claiming, falsely, that routine measles and mumps shots can cause autism and other maladies. Although the vast majority of Americans have ignored this and continue to get their inoculations, measles, which the U.S. Centers for Disease Control and Prevention declared eradicated from the U.S. two decades ago, has made a comeback in recent years. Even slight decreases in vaccination rates can chip away at the herd immunity needed to keep certain viruses at bay, and in 2019, the U.S. saw a 300% increase in measles cases. Among the outbreaks' causes: "misinformation in the communities about safety" of the shots, according to the CDC.

With Covid, adults, not kids, were the first to be eligible for the shot. Still, vaccine skeptics targeted a group whose fears they knew well: young women. Last fall the groups started circulating on Facebook and Instagram a now-deleted blog post of unknown origin citing two doctors with an incorrect but frightening headline: "Head of Pfizer Research: Covid Vaccine Is Female Sterilization." It falsely claimed that the vaccine contained a spike protein that could block the creation of a placenta and make women infertile.

This claim was false, but it compounded real uncertainty. Pfizer and Moderna hadn't yet specifically tested their vaccines on pregnant or breastfeeding women, and the FDA's emergency use authorization doesn't cover pregnancy. The guidance from the American College of Obstetricians and Gynecologists only goes as far as saying that "vaccines should not be withheld from pregnant or lactating individuals." Even so, by February, more than 30,000 pregnant women had signed up for a U.S. government monitoring program after getting Covid shots, and so far there have been no red flags. More recent studies have found the vaccines are not only effective on pregnant women, but also the antibodies pass on to their newborns. And because pregnant women are at greater risk of dying of Covid, many doctors are recommending they get the shot anyway. "Women are confused," says Lori Metz, a licensed clinical social worker in New York who specializes in fertility. "Your doctor may say one thing, and then you read a blog that starts to pull on all these other fears."

This gray area was fertile terrain for anti-vaccine activists. In December, Del Bigtree, founder of the Informed Consent Action Network, shared the false post about sterilization with hundreds of thousands of his followers on Facebook and Instagram. The blog was subsequently shared on Facebook more than 25,000 times. "I am seeing this EVERYWHERE!" a woman named Emily wrote along with a screenshot of the fake Pfizer blog, which can still be found circulating on Facebook in multiple languages. "I am starting to believe this." Commenters flooded her post with more (completely false) "evidence" backing up the claim. Some said it proved another debunked conspiracy: that the Covid vaccine is part of the worldwide Bill Gates-funded depopulation effort.

The effects of this disinformation are already showing up in survey data. Of people who say they are not likely to get a vaccine, more than half of women in the U.S. are concerned about side effects, compared with 44% of men, according to a U.S. Census Bureau survey from March 3 to March 15. Many of the already eligible women are turning down the shot, according to surveys and interviews with over a dozen people. More than a third of nurses, a group that skews heavily female and was among those first offered shots, aren't confident the Covid-19 vaccine is safe and effective, according to the American Nurses Foundation. And a *Washington Post*-Kaiser Family Foundation poll in March found 18% of health-care workers don't plan on getting vaccinated.

The high rates of refusal and hesitancy among health-care workers is an alarming bellwether. The vaccines are largely considered the country's best shot at ending a pandemic that has killed more than half a million Americans and has caused a global financial crisis. Epidemiologists estimate vaccinating 70% to 85% of the U.S. population would trigger the herd immunity needed for a return to normalcy. If even high risk front-line workers who've seen the devastation of Covid firsthand don't want the shots, experts worry not enough of the general population will get theirs either, allowing the virus to continue circulating.

Kaleese Williams, on her north Texas farm, doesn't plan on getting a Covid vaccine. "It's scary," she says

Up against the internet memes and anecdotes, Pfizer has offered scientific jargon. "It has been incorrectly suggested that Covid-19 vaccines will cause infertility because of a very short amino acid sequence in the spike protein of SARS-CoV-2 virus that is shared with the placental protein, syncytin-1," it said in response to a news report on the rumor. "The sequence, however, is too short—four shared amino acids—to plausibly give rise to autoimmunity." It was perfectly accurate, but the misinformation was infinitely more shareable, says Karen Kornbluh, director of the German Marshall Fund of the United States Digital Innovation and Democracy Initiative. "The folks who are supporting the science have to get better at telling the story," she says.

In the first months of the Covid pandemic, Zuckerberg went through the motions of positioning himself, and by extension Facebook, as a source of good, science-based information. He hosted Anthony Fauci, the country's top infectious disease official, several times for live question-and-answer sessions and had his company develop a Covid-19 page with information on social distancing, testing, and masks.

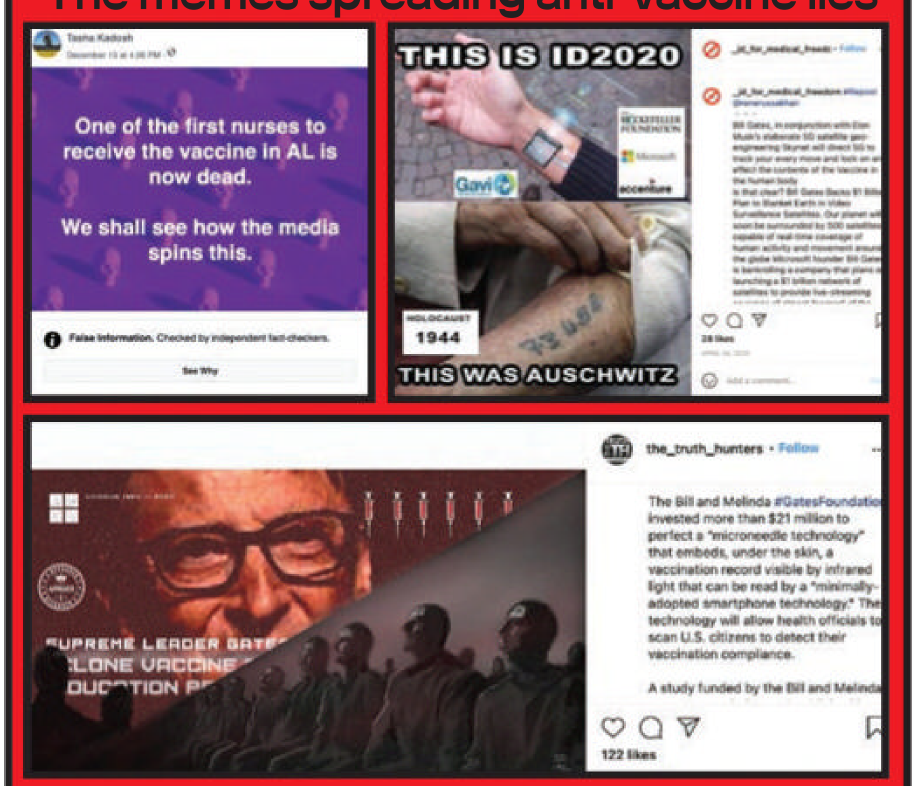
As for all that vaccine misinformation circulating on his platform, Zuckerberg as recently as September said he didn't think it was appropriate for his company to take most of it down. "If someone is pointing out a case where a vaccine caused harm or that they're worried about it—you know, ▶

PREVIOUS SPREAD: PHOTO ILLUSTRATION BY 731; PHOTO: GETTY IMAGES; THIS PAGE: PHOTOGRAPH BY LAURA BUCKMAN FOR BLOOMBERG BUSINESSWEEK

◀ that's a difficult thing to say from my perspective that you shouldn't be allowed to express at all," he told news site Axios. "There is a fine line between an important level of high energy around an important issue and something that can kind of tilt over into causing harm."

By Feb. 8, almost two months after vaccinations began in the U.S. and a year since the Covid-19 crisis started, Zuckerberg reversed himself and decided that misinformation was, in fact, causing harm. By that point, online skepticism was manifesting in real-world decisions to not take the shot. Facebook declared that Instagram accounts and Facebook groups that repeatedly shared false information about vaccines would be banned and that those advocating against inoculations would become less prominent in search results—a move that critics had urged for years.

The memes spreading anti-vaccine lies



Kennedy, Bigtree, and other big names lost their access to Facebook. But many others didn't. In a test search for "vaccine" on Instagram a few days after the announcement, the majority of the top 20 accounts offered up by the platform were explicitly vaccine-skeptical. The sixth in the list was called @antivaxxknowthefacts (profile: "Inject Veggies Not Vaccines"). The eighth was @anti.vaccine. The 12th, listed right before @covidvaccineinjury and @anti_vaccine_4_life, was @vaccinefreedom, the account of the 54,000-follower National Vaccine Information Center, the same group that sold tickets to the October conference where Kennedy spoke.

Facebook told *Bloomberg Businessweek* that since February it's removed 2 million pieces of anti-vaccine content that violated its policies. But by then many of these conspiracies had already made their way to people such as Williams on her north Texas farm and still continue to circulate in ways Facebook's automated cleanup tools can't as easily find, such as via screenshots, in comments, and in group messages.

Even worse, misinformation seeded by vaccine skeptics on Facebook was spreading in the real world—even into nursing schools. A nursing student from Houston says her clinical professor proudly declared to the class that she wasn't getting the vaccine. The person administering vaccines on campus was abstaining, too. One 28-year-old nurse in Southfield, Mich., says she declined her first opportunity for the vaccine because she's trying to have a baby. She'd seen the claims online, and "even if you're in the medical field," she says, "you just don't know."

Monika Bickert, a content policy executive at Facebook, defended the timing of the move on a call with reporters in February. She said the World Health Organization, the CDC, and other public health experts advised the social network to take stronger action, because misinformation was convincing people not to get the shot. That was the proof Facebook needed that content on its site was causing "real world harm." This was the same standard the social network used during the 2020 U.S. presidential election, when it refused to deactivate #StopTheSteal groups that were spreading the lie that President Donald Trump had won the election. Instead, Facebook stuck a note on their posts that Joe Biden had really won the race. On Jan. 6, violent rioters stormed the U.S. Capitol—an attack partially planned on the social network. Only then did Facebook start banning #StopTheSteal groups and suspend Trump's account.

Facebook's approach of allowing false content about vaccines to stay online and merely fact-checking it may be even less effectual than its attempts to rein in political misinformation and incitement. People who have already bought into conspiracies are unlikely to be swayed by a misinformation label, and the labels are easily ignored. Instagram users now see a pop-up when they search "vaccine" asking if they really want to see the results. It's readily dismissed with a tap.

At the heart of Facebook's misinformation problems is the design of Facebook itself. After the 2016 election, as a response to criticism of Facebook's growing role in political polarization, the company made a crucial change to the way its platform worked. Zuckerberg announced a new mission statement: To build community and bring the world closer together. That meant highlighting Groups, so people would bond over shared interests, instead of bickering about news. This change also helped Facebook boost revenue, by pushing more content into people's feeds. Before, users mostly saw what their friends or friends of friends posted; now anything shared in a group they belong to ends up in their feed, too, creating more space for ads.

Facebook's algorithm recommended groups to its users based on what people with similar interests tended to also like. So if you joined a group about vegan cooking, Facebook might recommend a group about natural medicine. If you joined that one, then Facebook might suggest another one about vaccine harm. And so users found communities, some of which propelled them deeper into misinformation rabbit holes. The social network uses similar mechanisms to personalize recommendations for Instagram accounts to follow. "Once you find somebody," Williams says, "you're able to find another."

At the same time, Facebook and Instagram also highlighted what it called "meaningful" conversations—posts that generated lots of comments very quickly. The change, meant to highlight pregnancy, engagement announcements, and other big life events, also boosted controversial, surprising, or scary content that stirred up debate, including anti-vaccine posts. Well-meaning people trying to debunk misinformation in the comments have instead helped it go viral by signaling to Facebook's algorithm that it should push the posts into more people's feeds.

Instagram was fertile ground in its own way. Health is one of the fastest-growing categories, and some of the biggest names on the platform live in a genre broadly known as wellness. A subgenre of those influencers, such as the ones Williams was drawn to, offer up pseudoscientific strategies for healthy living. Benign-sounding lifestyle choices (plant-based diets, detox teas) are served up to users next to questionable medical advice. When Covid hit, for example, some of these influencers claimed a healthy diet, exercise, and whatever supplements they were hawking were the best ways to avoid catching the virus.

Behind these claims, often, is a profit motive. The big names in the anti-vaccine movement, Bigtree and Kennedy among them, make money off speaking engagements, online webinars, or the sale of supplements. One Instagrammer sells $15 packs of stickers that say, "Vaccines can cause injury and death" and "I will never get a Covid-19 vaccine." Another hawks what she claims are Covid-busting workouts. A third, who says she is a naturopathic doctor, charges $295 for a vaccine consultation, or $49.97 for a webinar, and gives discounts on supplements and air purifiers to rid one's environment of "toxins." A legal disclaimer at the bottom of her website says the information is "for educational and informational purposes and is NOT medical advice." She has no disclaimer on her Instagram page.

Talk to doctors who've spent the last year in the Covid wards, and they'll say they're spending more and more time talking their patients out of something wildly untrue they read on Facebook. "I've had countless patients tell me that Covid isn't real and that it's no worse than the flu," says Ryan Marino, a medical toxicologist in Cleveland. Now people tell him they don't want the vaccine either—and not just young women; anti-vaccine activists have spread lies among other vulnerable groups, particularly Black communities. Marino is part of an informal cadre of health-care workers who spend what free time they have on social media attempting to fight bad information with good. Marino's medium of choice is Twitter, but there are doctors like him on Facebook, Instagram, and TikTok, too.

This is exactly the type of behavior Facebook says will overpower the vaccine misinformation rampant on its platforms. "Research shows that the best way to combat vaccine hesitancy is to connect people to reliable information from health experts," says Facebook spokesman Kevin McAlister, pointing to the company's Covid-19 Health Information Center. Studies have found that straight facts do little to shift opinions; personal stories from known sources work much better. At first Danielle Belardo thought, much like Facebook, that sharing science-based information would do the trick. When the virus started spreading in March, Belardo, then a cardiology fellow in Philadelphia, was reassigned to the Covid wards. She'd spend her days attending to patients, some on ventilators, others barely able to breathe on their own—all without the proper protective gear for herself. "It was really rough," she says. "I was going to work, seeing the virus, seeing the death, and then coming home to see a ton of misinformation online."

She already had a healthy Instagram following from posting about plant-based nutrition. At the beginning of the pandemic, she decided to use her platform to debunk false viral Covid-19 claims. Her early posts were technical, scientific, and aimed at setting the facts straight. Whenever she got harassment and angry commenters—which was a lot—she'd reply to the critics. "I was doing it wrong, and a lot of physicians were doing it wrong," she says. "We were highlighting posts that were false and linking right to them, directing higher traffic to those posts, boosting them in the algorithm."

Belardo, who's now director of cardiology at the Institute of Plant-Based Medicine in Newport Beach, Calif., no longer engages directly with lies, because that only calls further attention to them by the logic of Facebook and Instagram. Instead she tries to shares things that she knows will play well: memes, selfies, personal stories, and Q&A posts. She's been relatively successful. Her follower count has grown by tens of thousands of people. But her posts still draw plenty of anti-vaccine commenters, despite blocking anyone who harasses her.

Marino says he, too, is flooded with harassment and death threats—and not only online. People have shown up at his workplace; others have called the hospital where he works, trying to get him fired. "I've had patients accuse me of profiting off Covid, of only testing people because I get paid to make a diagnosis," he says. "Meanwhile the biggest key figures in the anti-vax movement have all done very well financially."

Despite their success building bigger followings, efforts like Belardo's and Marino's have yet to reach Williams. The algorithms show people more of what they want to see. "To be completely honest with you, I haven't seen doctors recommending the shot," Williams says. And even if she did, she says she wouldn't believe them. Ⓑ

"There is a fine line between an important level of high energy around an important issue and something that can kind of tilt over into causing harm"

Aerial view of the Langston Golf Course on the Anacostia River

COURSE CORRECTION

A plan to renovate public links in the U.S. capital aims to bring golf back to the community

By Michael Croley

April 12, 2021

Edited by Chris Rovzar

Businessweek.com

At the historic Langston Golf Course in Washington, D.C., the portable hand-washing stations are either broken or bone-dry. The asphalt cart paths, worn by time and use, are mostly chunks and dust. When I visited in February, a snow shovel lay beside the tee marker of the second hole for no apparent reason other than to clear, if you wished, what appeared to be an almost intentional ground cover of goose droppings over every brown blade of dormant Bermuda grass.

Yet for all this disrepair and neglect, dozens of golfers were walking the course that Saturday afternoon, letting out familiar groans over narrowly missed putts and cheers of joy from the simple pleasure of bending a small ball to one's will and skill.

Their bright outfits and clattering clubs created a vibrant atmosphere that was a testament to the course's overwhelming popularity: Between here and its sister properties, East Potomac Park and Rock Creek Park, Washington-area golfers average 120,000 rounds per year—a pace that matches the top resorts in the country, and at $25, is much less expensive.

But change is afoot. An all-star lineup of architects has signed on to pro bono renovate the city's municipal courses. Gil Hanse, best known for his course at the 2016 Summer Olympics in Rio de Janeiro, will turn Rock Creek Park into a 9-hole facility with a reimagined practice range. Tom Doak of Pacific Dunes fame, among others, will try to restore East Potomac Park's original 18-hole reversible design.

Beau Welling, who worked on upgrading the historic course at Stanford and has assisted on projects with Tiger Woods's TGR Design, is on board to redesign Langston. In addition to serving the community, Langston is slated to host the revived Howard University golf team, which received a donation from NBA star Stephen Curry to fund both men's and women's golf for six years. The land itself is promising, with open fairways, views of the Anacostia River, and a layout that plays across the river onto an island for three holes before jumping back to the mainland.

This push is being spearheaded by the National Links Trust (NLT), which in 2020 won a lease from the National Park Service and now runs all three courses. A 501(c)3 nonprofit, it was founded in 2017 by two industry insiders, Mike McCartin and Will Smith, and both have spent time working for Doak, one of the most influential designers of the past 30 years. McCartin and Smith say that if they can successfully transform the three courses, it could form a blueprint to upgrade municipal golf across America. Instead of a ramshackle collection of scrubby afterthoughts, the courses will be urban oases to welcome both new golfers as well as serve the longtime regulars.

The number of golfers in the U.S. has been declining for more than a decade, but 2020 was a resurgent year. Rounds were up almost 14%, with 60 million more played last year than in 2019. And the vast majority of that was at public facilities: The National Golf Foundation says of the almost 25 million on-course golfers, only about 2 million play at private venues.

There have been a few notable successful revamps of public courses over the past 20 years, such as the Black Course at Bethpage State Park in New York and TPC Harding Park in San Francisco. But those sought to host a major tournament, an

Members celebrate the 10th anniversary of the Wake-Robin Golf Club in D.C. in 1947

PREVIOUS PAGE: COURTESY NATIONAL PARK SERVICE. THIS SPREAD: WAKE-ROBIN: NATIONAL PARK SERVICE. CHARLESTON: COURTESY FRIED EGG GOLF. WINTER PARK: COURTESY RILEY JOHNS

MUNIS WITH MAJOR APPEAL

▲ **CHARLESTON MUNICIPAL**
Drawing inspiration from nearby private courses—Yeamans Hall Club and the Country Club of Charleston, both designed by Seth Raynor—architect Troy Miller renovated this South Carolina course to reflect those layouts and stay true to its 1929-era heritage while also fixing its susceptibility to the area's ever-moving tidal marshes. Locals pay about a third of what out-of-towners dole out, a fee structure that should help the course maintain financial stability and serve the public good.

GOAT HILL PARK
Golf apparel pioneer John Ashworth marshaled a groundswell of public support to save his neighborhood muni in Oceanside, Calif. Now granted a 50-year lease to run the course adjacent to Interstate 5 in San Diego County, Ashworth says they've spent $5 million on capital improvements in the past seven years. New additions: a driving range and a 3-hole kids course, called the Playground, which is free to parents and children. In 2020 the course hosted 42,000 rounds in 11 months (about 125 a day).

LIONS MUNICIPAL
This course in Austin holds the distinction of being the first one desegregated in the South and is listed on the National Register of Historic Places. The Muny Conservancy was created in 2019 to raise funds and work with the University of Texas to purchase the course; it's being spearheaded by Ben Crenshaw, the former Masters champion who grew up three blocks away. The course is a 141-acre wildlife sanctuary on a water recharge zone, with hundreds of heritage oak trees.

WINTER PARK GOLF COURSE ▼
A postage stamp inside a postage stamp, this course has a compact footprint that takes you past two churches, houses, and a cemetery in this small suburb just north of Orlando. Originally built in 1914 and renovated in 2016, the 9-hole gem has been used as inspiration for what municipal layouts should be—fun—and how you don't need a lot of acreage to create interesting golf that can captivate golfers both new and old. At only 2,480 yards, the par-35 is a true walk in the park.

aspiration that comes with its own trade-off: PGA Tour-quality facilities demand expensive tour-quality turf and year-round maintenance. "If a segment of the golfers pays $200 [as greens fees], they expect a $200 experience," McCartin says, which "can take away from the golf course feeling like a welcoming place for people just taking up the game." What the NLT is aiming for is a maintenance plan that's feasible on a city budget.

But cheap green fees don't generate the kind of capital necessary to make improvements, and there is little political will to contribute to a park that's perceived to benefit only elitists. "Public golf, particularly municipally owned golf, faces real challenges," says Jay Blasi, a golf course architect in California. "The courses were built a long time ago as an amenity for the community with good intentions and were often well designed and on interesting pieces of land. But municipalities don't know how to manage golf courses, and they're competing with other public services for funding."

The mentality is best explained by Andy Johnson, who runs the influential golf design website the Fried Egg. "Imagine you tell me you don't like coffee, but I love coffee and I want you to love coffee," he says. "Now imagine the first place I take you for a cup of coffee is a gas station at 10 p.m. That's what municipal golf in this country has become."

Andy Staples, a course architect in Arizona, wrote a white paper in 2016 on how to improve municipal golf facilities, saying it was time "to innovate or die" instead of being satisfied with the status quo. "There is tremendous opportunity to reinvent the perception of municipal golf in America," he says, but warns that there's "a municipal golf mentality," where complacency overrules any desire to advance the operational model.

Langston has some history on its side. Built in 1939 to serve the Black golfing community, it became a catalyst for civil rights in 1941 after members protested the lack of maintenance and staffing by playing a round at the White-only East Potomac Park under the protection of park police, fending off hecklers and insults. The news reached Secretary of the Interior Harold Ickes, who ordered all national parks—and thus the city's municipal courses—opened to all.

In the decades since, Langston has emerged as not only a place to play and be introduced to the game but also where locals stop in for lunch and catch up with friends. "For me it felt like a barbershop," says Earl Cooper, co-founder of the Eastside Golf apparel brand. As a junior player he competed at Langston and says there was a palpable camaraderie. "One time we were leaving, and Lee Elder [a four-time PGA Tour winner and the first Black man to play in the Masters Tournament] was in the parking lot. It wasn't anything planned. It was just a place where he wanted to be. That resonated with me as a kid."

The NLT declined to say how much money has been raised, but it's been aided by two $50,000 donations—one from Mike Keiser, the famed resort developer, and another from venture capitalist Zach Nelson. "Our priority is to protect the inclusive culture that has developed and ensure these courses remain the gateways to golf for the D.C. community," McCartin says.

Renovations for the clubhouse and range are planned to start this winter, pending permits from the NPS. Until then, Wendell Haskins, former senior director of diversity and multicultural initiatives at the PGA of America, says the key is for the local community to have a stake. "You need Black people, women, and other minority groups to be part of this economy," he says. "That's often grossly overlooked."

Cooper, who's been named to *Golf Digest*'s Best Young Teacher list since 2016, says his hope for the NLT is that it will keep prices low for the kinds of players who play golf now. So far, the NLT concurs. "Good golf doesn't have to be expensive golf," McCartin says.

A Light-Gray Sunshiny Day

How to bring Pantone's colors of the year into harmony in your home

By Monica Khemsurov Photographs by Janelle Jones

BICOCA TABLE LAMP
Marset's battery-operated lamp has a magnet you can attach to the bottom so you can place it on angled metal surfaces. *$245; lightology.com*

TUBO BOOKENDS
Made of powder-coated steel, these bookends give a nod to colorful piping in architecture like the Centre Pompidou. *$45 each; biritestudio.com*

ROLY POLY ARMCHAIR
This spin on Faye Toogood's 2014 design uses rugged Casentino cloth, which has been around since the Middle Ages. *$1,500; duplexdsgn.com*

CROCHET PILLOW
Fringe rules in this cotton-blend cushion handmade in New York by Huldra of Norway. *$180; comingsoonnewyork.com*

VASO CHICO TUMBLERS
These short glasses are made in Mexico using locally sourced recycled glass and alternative energy. *$18 each; shop.lizziefortunato.com*

PROP STYLIST: JJ CHAN

Way back in the Before Times of December 2019, artist Maurizio Cattelan duct-taped a banana to a wall at Art Basel Miami Beach, called it *Comedian*, and sold it for $120,000.

The usual harrumphing ensued, but given the more serious events of 2020, the episode faded from collective memory. At least until Pantone LLC, the company best known for its fan deck of color swatches that graphic designers and printers use, announced that its "colors of the year" for 2021 were 17-5104 and 13-0647—or what the rest of us know as gray and yellow, respectively. The duct-taped banana was trending again.

Ultimate gray and Illuminating yellow, as the colors are officially known, mark a departure from the company's usual picks, which tend to feature a single inoffensive tone such as Honeysuckle, Living coral, and Classic blue. The union of the two colors "highlights how different elements come together to support one another," said Leatrice Eiseman, executive director of the Pantone Color Institute, when the decision was announced in December. "Practical and rock solid but at the same time warming and optimistic." If you'd like to incorporate the hues into your home décor, here are some ideas.

STILL MUGS
Grab a set of handblown glass mugs that come in smoked gray; the glass handle is in another color. *$35 for a set of two; beambk.com*

CENTERPIECE VASE
Designed in Italy by Swiss-born artist Christiane Perrochon, this stoneware vase is hand-thrown and -glazed. *$1,120; marchsf.com*

OBLIQUE DESK LAMP
It's ideal for work-from-home spaces. Belgian designer Vincent van Duysen matches his spare ethos with a warm tone. *$395; usa.flos.com*

1 INCH RECLAIMED CHAIR
Jasper Morrison's stacking chair, with a 1-inch thick seat, is 31 inches tall and 90% industrial waste and lumberyard leftovers. *$195; emeco.net*

MISTER BOUCLE PILLOW
Each of Jeanette Reza's chunky wool cushions comes as one long tubular shape; you tie them up however you wish. *$150; jiujiedecor.com*

The Tart Of the Sea

Chefs are fighting for this tiny plum from a single farm in Cornwall, England

By Mark Ellwood
Photograph by Catherine Losing

It was in the 1730s, perhaps, that this story starts, all thanks to a few scurvy-fearing Portuguese seamen who'd sailed north to the English Channel to help fight the French. They needed their vitamin C, and preserved plums were the preferred source. After the stones were tossed overboard, they'd wash up on England's southwestern coast.

The region, marked by high humidity, low soil pH, and reliably misty mornings, was ideal for the far-from-home fruit. The stones took root and grew into trees bearing small, tart, and bright-flavored fruit that locals named after their parish: Kea plums. In Portugal the same species of trees began to die out; today the only place in the world where they flourish is a single valley in Cornwall, only 20 acres on the grounds of the Tregothnan country estate.

The trees are an odd sight, all haphazard and gnarled, with a fruit yield about a quarter lower than those of your typical supermarket plum. The Kea plum's season is shorter, too, only a few weeks in mid- to late summer. Attempts to commercialize them across England have failed. "We've never seen them become orchards anywhere else. They just sit there, looking a bit like a specimen," says Jonathon Jones, Tregothnan's gardener turned retail operation head.

A green-thumbed noble family has owned the estate since the Middle Ages. Tregothnan produces its own brand of tea—the U.K.'s first outdoor ornamental camellias were planted here in the late 18th century—and it sells whatever Kea plums the locals haven't hoarded. Jones recalls that when he first arrived in the area, he always heard the harvest was bad. "Then I'd come down unannounced and find this orderly queue of people lined up, buying plums," he says, "almost a black market."

The orchards were accessible only by boat until roughly 60 years ago. Broader access and awareness made neighbors fiercely protective. Slowly, Jones earned the trust of locals, bringing experts to help shore up the orchards and keep the trees—which live for 100 years or so, he estimates—healthy and fruiting. His team also secured some commercial opportunities, notably with Fortnum & Mason, which is releasing a Kea plum glacé in time for Christmas to accompany a festive cheese board. "They're known for being particularly tart, so you don't want to eat the fruit raw," says confectionery buyer Sophie Young.

Chef Adam Bristow of the nearby Pig at Harlyn Bay restaurant is another fan: "They have a fantastic history as part of the fabric of Cornwall and a uniquely deep, sharp, but bitter flavor." Tregothnan sells them directly to the public, either frozen or as jars of jam for "a proper Cornish cream tea," Jones says, beaming. **B**

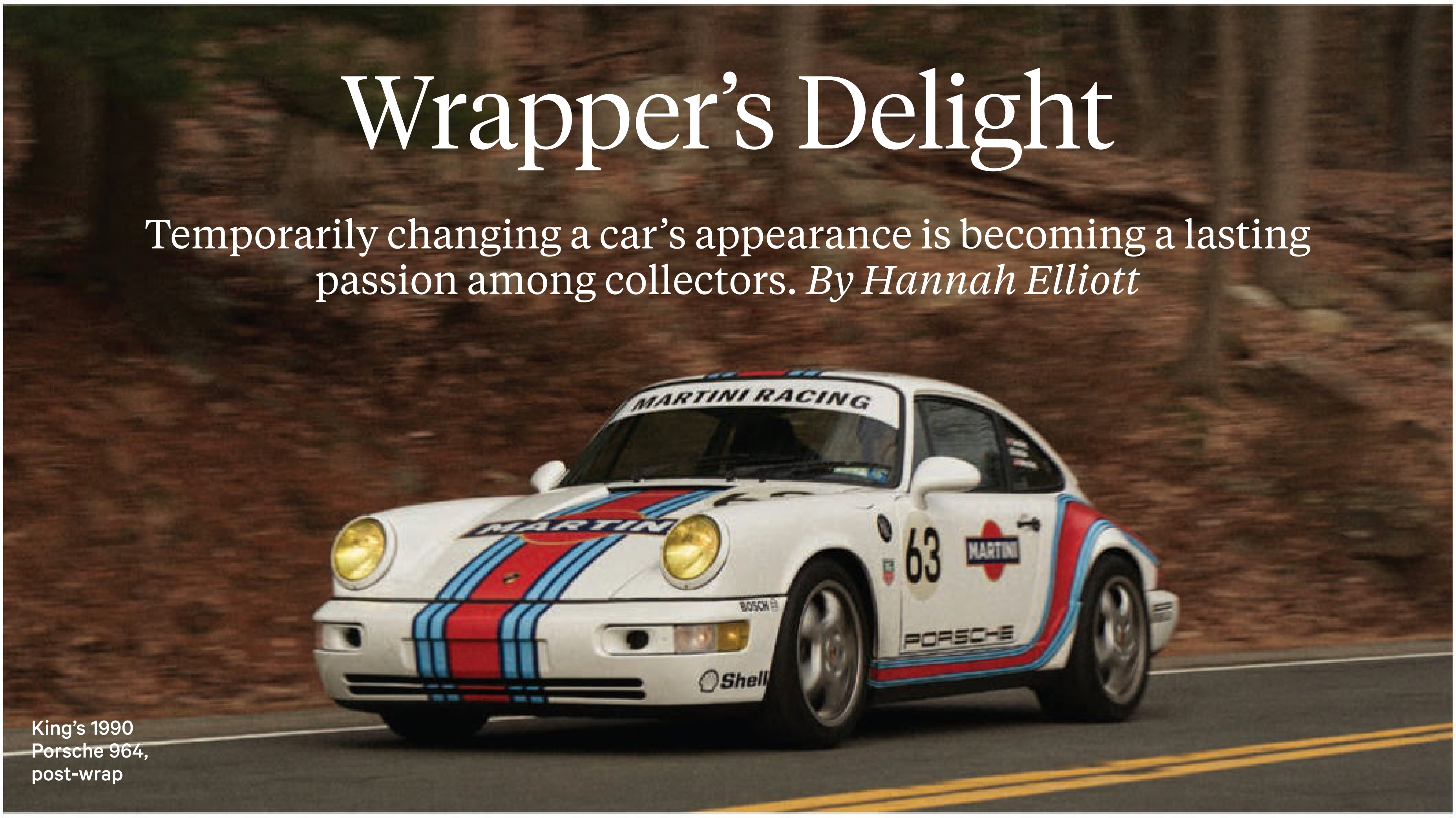
KEA PLUM COMPOTE

Chef Bristow's tart compote works great on chocolate mousse and is delicious with good vanilla ice cream.

In a saucepan, combine 1 lb halved and pitted Kea plums or wild plums, 1¼ cups dark brown sugar, ½ cup water, 1 small piece of star anise, and ½ stick cinnamon. Cook over moderate heat until the water has evaporated and a syrup forms. Pour into a cold bowl and let cool, then fish out the spices. Refrigerate for as long as two weeks. Makes about 3 cups.

Wrapper's Delight

Temporarily changing a car's appearance is becoming a lasting passion among collectors. *By Hannah Elliott*



King's 1990 Porsche 964, post-wrap

Tony King, known to some as Champagne Tony, was planning to join a family road trip from Denver to the West Coast, and he wanted to make a splash. The Englishman, who owns Manhattan marketing firm King & Partners, took his slate-gray Porsche 964 from 1990 and wrapped it in the bold blue and red stripes of Martini Racing from the 1970s. In addition to instantly turning the car into an eye-catcher, the wrap would protect the factory paint while it crossed the Rockies. All the fun, less of the worry.

"I had always wanted a Martini car," King says. The caravan was canceled because of coronavirus concerns, but "we had so much fun driving around and seeing people's reactions," he says. "Then one day I woke up and thought, 'I want it gray again,' and had it all taken off. Easy."

Car wraps get a bad rap thanks to the chameleon BMWs that peacocked through South Beach and on Rodeo Drive in the early 2000s, as well as the questionable taste of celebrities such as Justin Bieber and his new matte-salmon-pink-wrapped Lamborghini Urus SUV and his chrome-all-over Fisker Karma. Then there's the Nissan 240SX that rapper T-Pain covered to look like a pickle from the cartoon *Rick and Morty*.

But these days, temporary customized car coverings—painstakingly applied through sprays, or panel by panel by technicians who might spend four months on a single vehicle—are also being embraced by serious car enthusiasts and can be difficult to tell from a factory paint job.

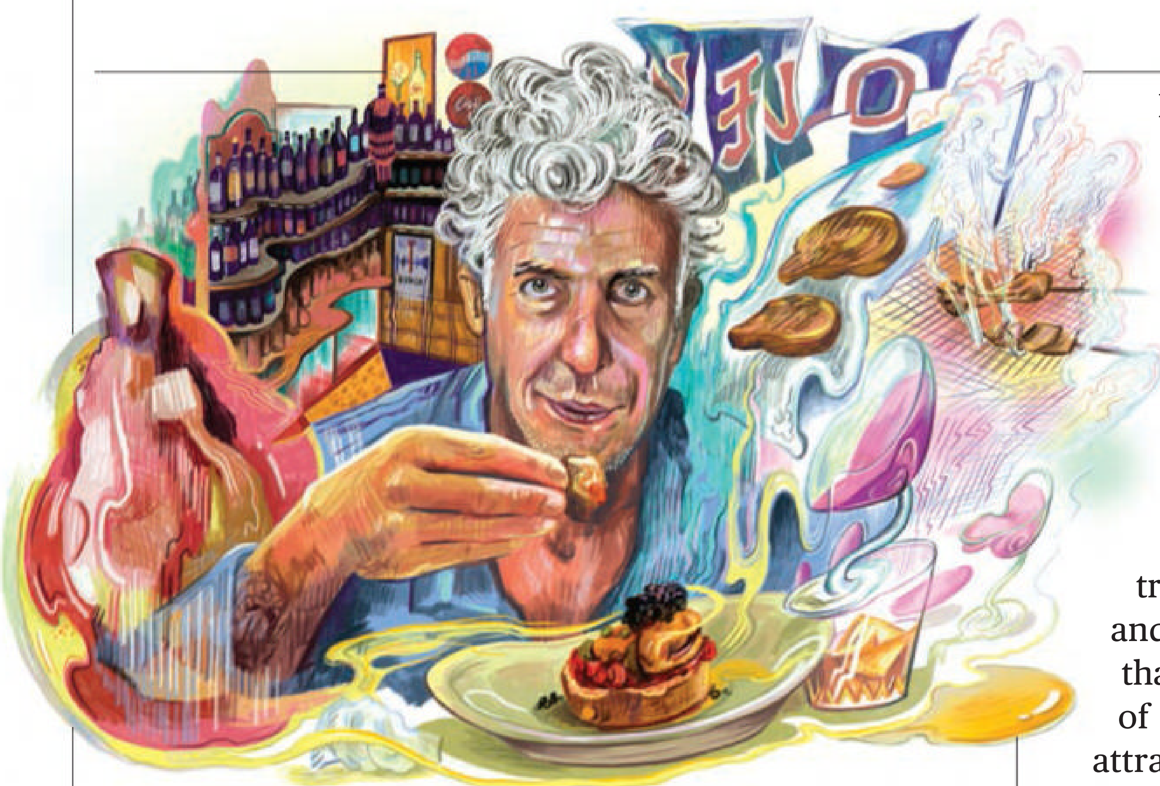
Goodrich Corp. invented vinyl chloride in 1926, a flexible material that could be made adhesive, in any color; the U.S. Air Force quickly adopted it for putting graphics on airplanes. Expensive at the time, it wasn't commonly seen on cars until the 1990s, when German taxi drivers started using it to cover their vehicles in a state-mandated beige hue. By then, too, they'd become cheaper than painting and repainting the cab, which can still cost $10,000 to $20,000 for the best jobs, including clear coat protection. The trend grew, pushed by new, less expensive temporary coatings such as AutoFlex and Plasti Dip, paint-like plastics from the '70s. (Most are made by Avery Dennison Corp. and 3M Co.) Because the vinyl doesn't bond to the car's paint (imagine how saran wrap sticks to a bowl's edge), it can peel off easily with no damage.

Buoyed by publicity stunts such as LeBron James wrapping his Lamborghini Aventador roadster in green floral to match the inside of his new line of Nike shoes in 2013, wrapping entered the culture at large. By 2018 pros like Yianni Charalambous covered vehicles as mundane as the Range Rover Sport in a satin black for Harry Styles. A celebrity in his own right, Charalambous has his own customization show on Amazon Prime and more than 1.7 million followers on social media.

Business is booming. Seth Rose, who founded Art of Wrap on Long Island, N.Y., in 2011, estimates he'll transform more than 100 vehicles in 2021. The work runs from simple $5,000 jobs to a $60,000 number on a McLaren 720S to a $160,000 project on a Lamborghini Huracán. The last requires three workers and features carbon elements and LED enhancement on the car's underside so it will glow. "The business has exploded," agrees Gino Sepe, who founded Vader Werks in Los Angeles in 2012. Sepe has seen the number of vehicles that pass through his shop double since early 2020.

The life span of the treatment is roughly three years, and though tempting, it's not DIY-friendly. Land mines such as bubbling, creasing, warping, and sagging abound. Says Rose: "You get what you pay for." B

HARRISON BOYCE



Travels With Tony

A posthumous book by Anthony Bourdain serves as an enticing reminder of what it was like to fearlessly tour the world's food cultures

By Kate Krader

"Did the world need another travel guide, and did we need to write it?" asks Laurie Woolever.

The question arose in March 2017, as she and the late Anthony Bourdain considered a guidebook that would catalog the world as seen through the famed chef and CNN host's penetrating eyes. With his expanding roster of TV and publishing contracts, his co-author wondered, had the universe reached "peak Bourdain"?

No, she decided. "Maybe the world could use another travel guide, full of Tony's acid wit and thoughtful observations and a few sly revelations of the mysterious contours of his battered heart."

Woolever paints a vivid picture of eventually brainstorming the book on a single day a year later, in March 2018, sitting in a cloud of smoke at Bourdain's dining room table. He had styled his Manhattan apartment as an homage to his favorite hotel suite at the Chateau Marmont in Los Angeles. She emerged smelling like she'd been out on the town in New York, before the city's indoor smoking ban. Her head was filled with ideas for essays, such as one about the countries that had banned Bourdain—most famously, Azerbaijan, for traveling to the contentious Nagorno-Karabakh region.

It's this feeling of being in the room with Bourdain that makes *World Travel: An Irreverent Guide* (Ecco, April 20; $28) so tantalizing. As someone who knew him for many years, I saw the effect he had when he sat down at a restaurant: The place would snap into the very best incarnation of itself. His book of idiosyncratic tourism advice through cities in 43 countries provides that sense of intimacy. Sure, it evokes familiar, well-worn travel guides such as *Let's Go*. It even includes "Arrival and Getting Around" tips for each place, information that's readily available on innumerable websites. Most of the featured restaurants, hotels, and odd tourist attractions won't surprise anyone who has watched a marathon of Bourdain's *Parts Unknown* or *No Reservations* series or knows local food scenes in general.

But the fact is, *World Travel* is the closest you'll ever get to hearing from Bourdain again. It's wonderful to have him in your head when you walk into, say, Horumonyaki Dojo for all the barbecued organ meats in Osaka, which he calls the city of excess and the true culinary heart of Japan. Or to conjure him up while at Keens Steakhouse in Manhattan, when you cut into "a mammoth slab of bleeding roast beef, to be accompanied only, but only, by creamed spinach and maybe some hash browns."

His ability to sell a place is direct and singular. On the venerable Barcelona tapas bar Quimet & Quimet, where he recommends the anchovy and mussel sandwich, he notes, "If I lived across the street from this place, I'd quit my job and just hang out here all day, until all the money was gone."

On Jerusalem: "First, look around. It's like everybody says. It's pretty. It's awesome. It's urban, sophisticated, hip, like Southern California, only nicer. Then you see the young draftees on the streets and you start to get the idea." And when he was asked what is the greatest food city in the world, as he often was, he'd reply: "I always say that no one can say you're wrong if you say Hong Kong."

Yes, it has the trappings of a standard guidebook. But even the straightforward way the book dives in alphabetically by country feels like an adventure, a delightful surprise as you turn the page from Vienna (Austria) to Bhutan.

Disclosure: I not only knew Bourdain, I revered him. A dozen years ago he told me that before he visited a place, he liked to read fiction about it. For instance, *Under the Volcano* before getting on a plane to Mexico.

World Travel is nonfiction and probably not a book Bourdain himself would've consulted before exploring a place. But at a time when traveling abroad continues to feel like a fairy tale, thumbing through a book of recommendations that may or may not be outdated by the time you get through customs is still a bit like consuming a novel before a trip. It colors in the edges of a place and leaves you to discover what's there for yourself, guided by a knowing voice.

ILLUSTRATION BY GEL JAMLANG

Smooth Operator

A Lazarus tool takes the rough edges out of woodworking

Photograph by Frank Frances

"A plane," says Mateo Panzica, "has to be reliable 100% of the time." Taken as a statement about aircraft, it seems self-evident. But if you're talking about woodworking, as he is, it requires more explanation. Panzica's Lazarus Handplane Co. specializes in exquisitely wrought implements for smoothing and shaping wood to a finer finish than mere sandpaper produces. His compact mouse planes, which start at $435, can shave ribbons of wood as if you were peeling a carrot. The $1,800 Bevel Up Smooth Plane (pictured) weighs a hefty 5 pounds, 6 ounces, thanks to its brass and stainless-steel body, and is built to avoid "chatter," those marks left when microvibrations in the blades of lesser planes tear out minuscule strips of wood grain. When that happens after hours of methodical labor, he says, "you've just defeated yourself."

THE COMPETITION

• Lie-Nielsen Toolworks Inc. has existed at the intersection of quality and affordability for decades. Its $175 No. 60-1/2 Adjustable Mouth Block Plane is a workbench workhorse, perfect for someone who wants to get serious in the shop.

• John Economaki's designs for Bridge City Tool Works are radical, beautiful, and functional. The $769 HP-9v2 Dual Angle Block Plane adjusts for both general use and end-grain work and features a guide fence to help less able woodworkers improve accuracy.

• For mortise and tenon work, where space is tight, a narrowbodied piece such as Woodcraft Supply LLC's $170 Woodriver #92 Medium Shoulder Plane can prove essential. The design is based on the Victorian-era tools of Edward Preston & Sons.

THE CASE

Whether you're a novice woodworker or a professional, the traits that make a hand plane effective are mass, materials, and meticulousness. Products from Louisville's Lazarus have a surfeit of each. Panzica's art school and timber-frame construction background inform their creation, resulting in a tool designed to look gorgeous and work immaculately. Exotic hardwoods are a tradition in high-end planes, and Lazarus's handles might be cocobolo, bubinga, or, as shown, a Gabon ebony that's been French-polished—a time-consuming but worthwhile shellacking method. "There's no modern equivalent that's as abrasive-resistant or as durable," Panzica says. What you're getting is a beautiful tool, reliable 100% of the time. *$1,800; lazarus handplane.com*

Technology Means Everything, and Nothing

By Alex Webb

Has the descriptor "technology" exhausted its usefulness? Facebook, DoorDash, and Qualcomm are all, in day-to-day parlance, tech companies. But they're very different businesses. The first earns its money by selling advertising space, the second is a food delivery business, and the third makes semiconductors. Facebook and DoorDash have heaps of proprietary software, but Qualcomm is the only company whose actual product is technology.

It's become a catchall that companies are all too willing to co-opt if it lends some luster. There are now manifold offspring: adtech, biotech, cleantech, fintech, foodtech, proptech, and more. As each subsumes the industry it serves, perhaps we can start to drop the "-tech" suffix.

The meaning wasn't always so expansive. Until the 1930s, in line with its ancient Greek etymology, it applied primarily to the study of the technical arts, according to the historian Eric Schatzberg. Hence the Massachusetts Institute of Technology was founded in 1861 to study and teach applied science and engineering rather than to study and teach "technology."

But English lacked an equivalent to the French *technique* and German *Technik*. The English word "technique" hadn't caught up with the innovations of the Industrial Revolution, and it still applied solely to the way in which an artist or artisan performed a skill. So where we might talk about oil painting as an artistic technique in English, Lufthansa Technik is the engineering division that maintains and repairs the eponymous German airline's fleet of planes.

In the absence of an appropriate term, social theorists in the early 20th century started lending the word "technology" a broader definition that made it synonymous with the practices and principles of the industries it studied. Then, in the 1920s, the historian Charles Beard began prominently associating technology with progress, the final ingredient in our modern-day understanding of the term.

Technology has accelerated into every corner of the economy over the past 30 years. A word that already encompassed manufacturing, industry, invention, applied science, and the machine was slapped on any company that wanted to associate itself with rapid growth. The S&P 500 now has 74 information technology companies that collectively account for 25% of the index's weighting, up from the 35 that represented just 6.6% of weighting in 1990. The subsectors, which span semiconductors, IT services, and software, are a more helpful way of understanding the companies involved.

We need a more nuanced way to talk about cutting-edge innovation. Describing a firm as a technology company tells you nothing about its business. Because when everything is technology, it becomes a classification that's devoid of meaning. Ⓑ —*Webb is the European tech columnist for Bloomberg Opinion*

ILLUSTRATION BY GEORGE WYLESOL

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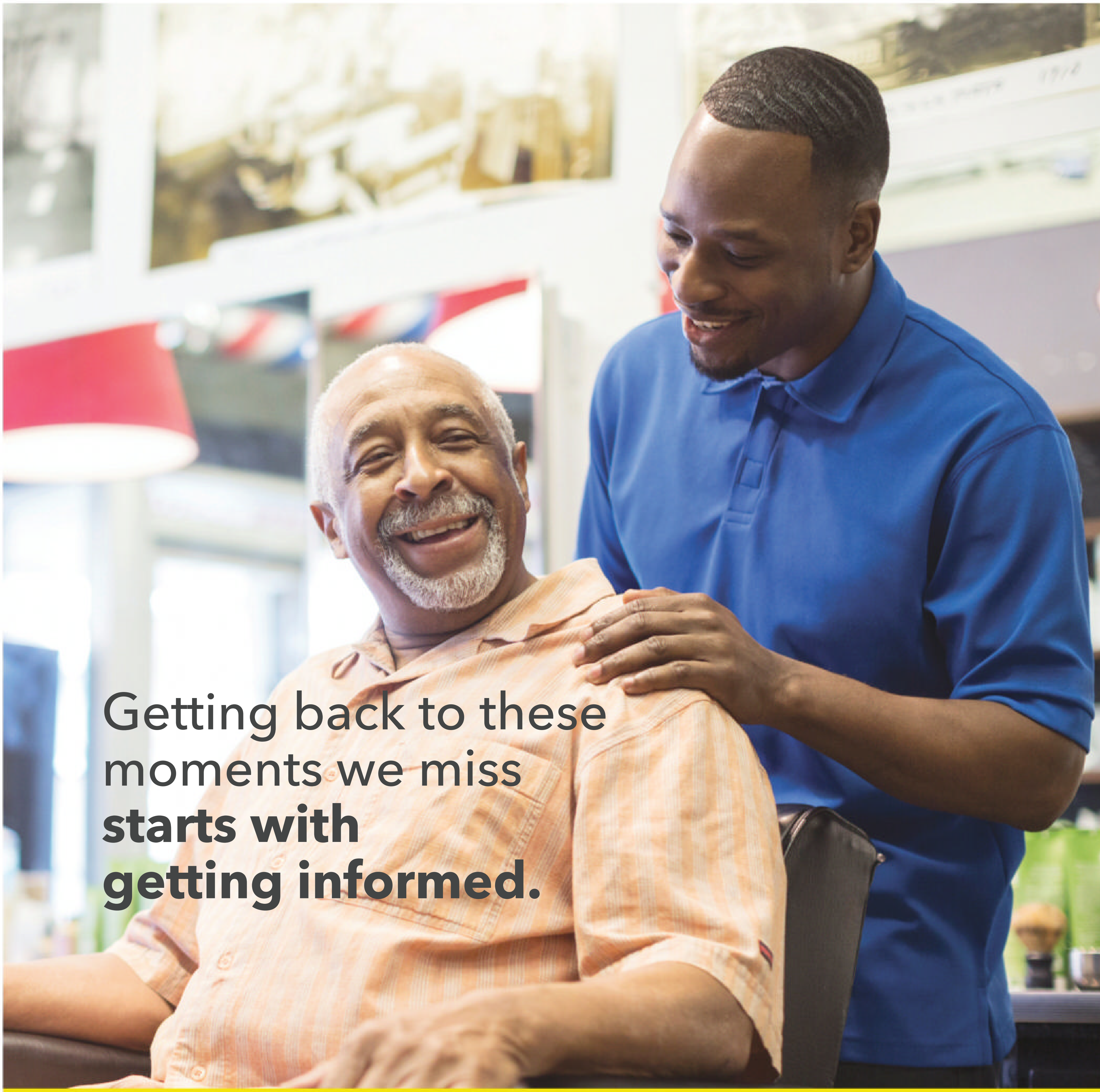

IT'S UP TO YOU
COVID-19 VACCINATION

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