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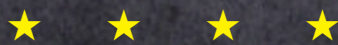
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USA VS CHINA



TOO BAD TRUMP IS FIGHTING THE
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FEATURE

30

The Wrong Trade War

By choosing to fight on steel and aluminum, Trump is giving China a pass on lucrative, life-altering technologies of the future—including AI.

BY BILL POWELL

DUELING FOR DOLLARS

China's aggressive plans to become a dominant player in aerospace, robotics, computer chips and biotechnology are causing consternation in Washington—except, apparently, at the White House.

COVER CREDIT

Photo illustration by Justin Metz for Newsweek



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Debbie Harry and band celebrate the anniversary of their breakout hit, and a first trip to Cuba.



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GOING CIRCULAR:

HOW GLOBAL BUSINESS IS EMBRACING THE CIRCULAR ECONOMY

Research by Newsweek Vantage finds that the concept of a circular economy has gone from relative obscurity to the corporate boardroom in just a few years. In a survey of 317 senior executives from large corporations around the world, fully 98% were familiar with the concept. Thirty percent said their company had a circular strategy, and over three-quarters plan on adopting targets to make their products, processes or business models more circular in the coming five years.

Beyond sustainability

The circular economy aims to extend the life of all the goods and materials being bought, sold, used and discarded daily, throughout our societies, in order to curb extraction, pollution and waste. It is increasingly seen as a vital tool in the fight against crises such as climate change, resource scarcity and marine litter.

But our research finds that the benefits go beyond meeting sustainability goals. An overwhelming majority of executives (95%) from across functions said they saw the transition to a circular economy as a positive for their organization, citing access to new markets, improved competitiveness, enhanced image and higher revenues among the leading perks.

Circular strategies

Yet our findings—which are also based on in-depth interviews with executives of major companies, circular start-ups and other experts—confirm that going circular does not happen overnight. It requires a complete product and business model rethink. Lack of know-how, technology and partners were the main challenges cited by survey respondents.

Our research indicates that companies are prioritizing the following strategies and business models:

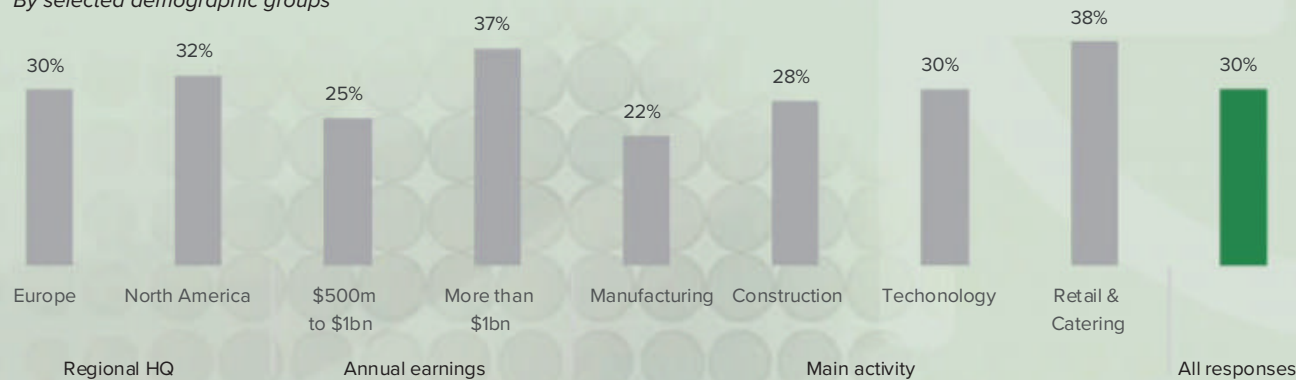
- REduce.** Using design and manufacturing technology to lower material, energy and waste footprints.
- REuse.** Offering subscription, leasing or sharing models, rather than basing business on one-off sales.
- REmake.** Designing products that can be more easily repaired or “remanufactured” into new products.
- REcover.** Turning by-products into new products or adding recycled content to products and packaging.
- REnew.** Substituting renewable for finite materials and focusing more on sustainable sourcing.

This report delves into the circular transition, with unique data and insights on how companies are adapting their products, processes and businesses. It features examples spanning different sectors—from large companies conducting circular pilots to smaller innovators developing technical solutions and disruptive new services.

We investigate the key ingredients companies need to make circularity work—including a list of eight things companies can do to accelerate their own transition. And we look at the role other stakeholders—such as science, finance, governments and consumer groups—can play.

As one company executive predicts, the circular economy is going to *be the economy*. This is a must-read for any organization that wants to be part of it.

Share of organizations with a goal to “adopt circular economy practices”
By selected demographic groups



Newsweek Vantage online survey, October 2018. Responses: 317.

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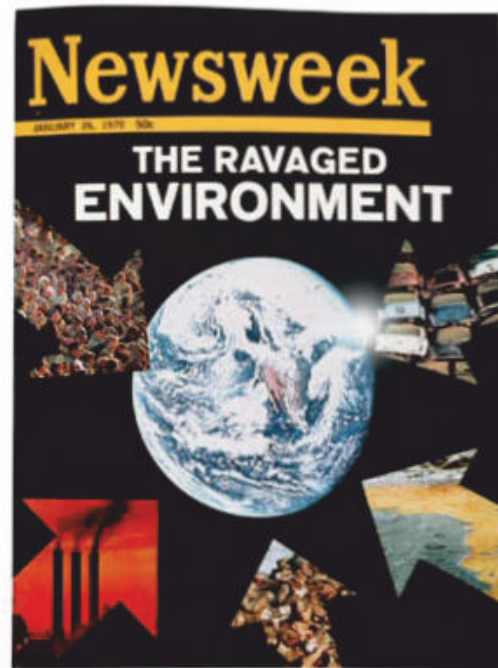
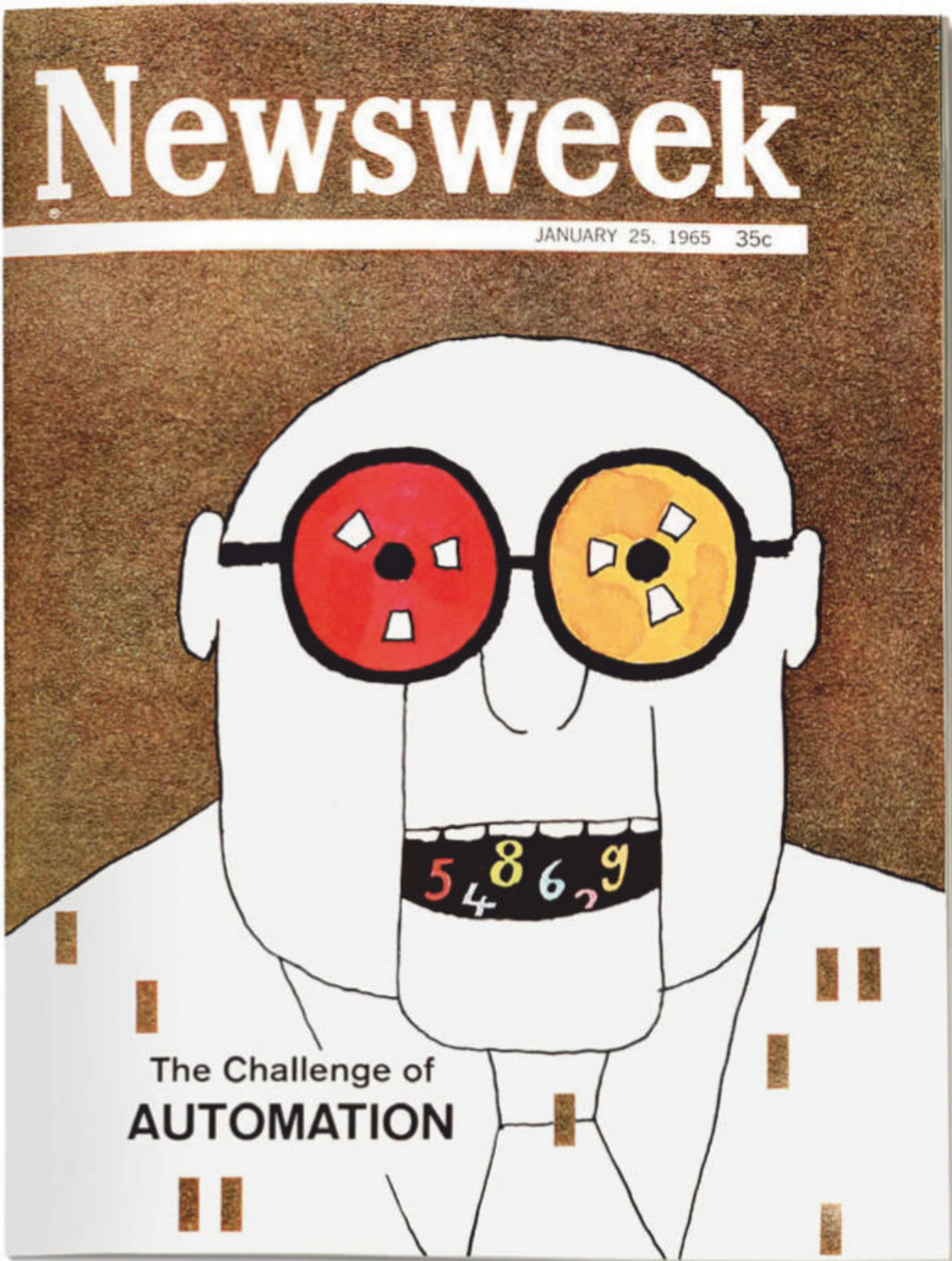
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1965

“Businessmen love it. Workers fear it. The government frets and investigates and wonders what to do about it,” *Newsweek* said of technology’s swift rise. It left society at an inflection point. For manufacturers, the possibilities in industry seemed boundless, but the fret over joblessness loomed large: 35,000 jobs were vanishing each week in the United States. Some things never change—in fact, they multiply. Over 40 years later and the fretting continues, with now millions of jobs disappearing thanks to automation and artificial intelligence.



1970

An economic and industrial renaissance was causing Americans to begin to “take stock of what full production does to their quality of life.” The big “issue of the ’70s,” the report said, was ushering in the Age of Conservation, where ecology and pollution were “daily headlines.” The ’80s put a stop to that, and here we are again.



2007

U.S. troops had a mission to stabilize and rebuild the Iraqi capital of Baghdad, reduced to rubble by sectarian warfare. The conflict, *Newsweek* wrote, “reshaped Iraq in all sorts of malevolent ways, forging the future by poisoning the next generation”—ultimately opening the door for “violence to beget violence around the world for years to come.”

LEFT: NEWSWEEK; TOP RIGHT: NASA; WAYNE MILLER/MAGNUM; BILL STRODE/LOUISVILLE COURIER JOURNAL; HENRY GROSSMAN; BURK UZZLE/MAGNUM; ROBERT PERRON; BOTTOM RIGHT: KHALID MOHAMMED/AP

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MOGADISHU, SOMALIA

Arcade Fire

People sift through the remains of the Bakara Market on January 11 after an overnight fire. It's Mogadishu's biggest marketplace and has been scorched by blazes before. The narrow and difficult-to-navigate streets of Somalia's capital pose a challenge to its small fire brigade.

→ MOHAMED ABDIWAHAB





ICA REGION, PERU

Off-Off-Road

Spanish driver Nani Roma and co-driver Alexandre Haro Bravo compete during Stage 2 of the Dakar 2019 between Pisco and San Juan de Marcona on January 8. Open to professional and amateur drivers, the endurance event requires competitors to traverse dunes, rocks and mud, sometimes covering distances of 500 miles or more per day. French driver Sébastien Loeb and co-driver Daniel Elena won the stage.

📷 → FRANCK FIFE



DENVER

Horns Aplenty

Longhorn steers lead the National Western Stock Show Kick-Off Parade up 17th Avenue on January 10. The parade marks the start of the premier livestock, rodeo and horse show in the United States, now in its 113th year.

📷 → JASON CONNOLLY

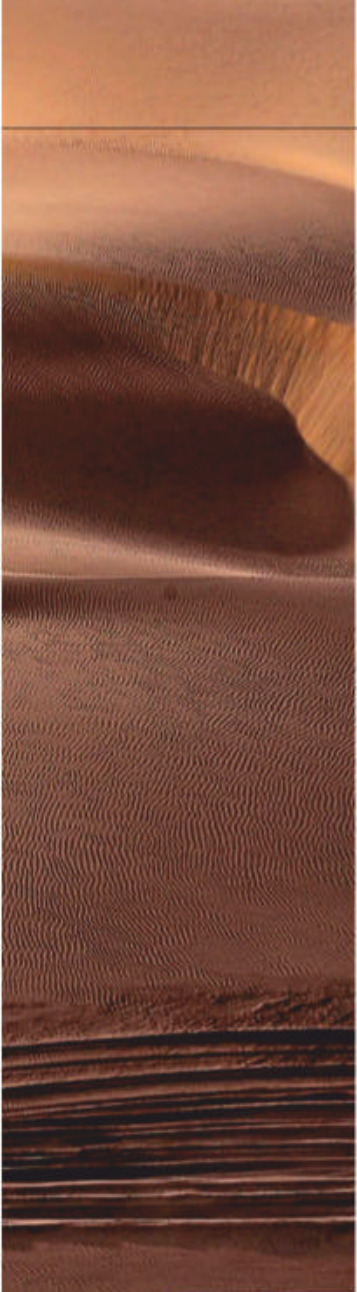


GUWAHATI, INDIA

Rock the Vote

Activists burn effigies of Prime Minister Narendra Modi on January 8, after the country's lower house of Parliament passed legislation that would grant citizenship to members of certain non-Muslim religious minorities. Ostensibly advanced to protect Hindus, Christians and Sikhs who have settled in the country, the measure has drawn criticism for excluding Muslims—a blatant move, they say, for Modi to grow his Hindu base before May's general election. The bill now heads to the upper chamber, where it faces resistance from the opposition Congress party.

📷 → BIJU BORO



CLOCKWISE FROM LEFT: FRANCK FIFE/AFP/GETTY; JASON CONNOLLY/AFP/GETTY; BIJU BORO/AFP/GETTY

DEAD RECKONING
Badawi's death speaks to the worsening plight of U.S. counterterrorism abroad: America has fewer allies in the most troubled parts of the world than it did after 9/11.

SOURCE IMAGE COURTESY OF FBI; TOP RIGHT: KONRAD WOTHE/GETTY

"We're going to impeach the [expletive]." » P.14



SPYTALK

Dangerous Liaisons

The killing of Jamal al-Badawi is little cause for celebration, veteran counterterrorism officials say

↑ WHEN REPORTS ARRIVED IN EARLY JANUARY that Jamal al-Badawi, a long-sought Al-Qaeda militant, had been incinerated in a U.S. airstrike in Yemen on New Year's Day, President Donald Trump let out a whoop.

"Our GREAT MILITARY has delivered justice for the heroes lost and wounded in the cowardly attack on the USS *Cole*," Trump tweeted on January 6. Badawi, at large for over a decade, had quarter-backed the October 12, 2000, attack on the guided-missile destroyer with an explosives-laden boat as it lay at anchor in the Yemeni port of Aden.

The Pentagon had taken nearly a week to verify the news, perhaps keeping in mind that many a top terrorism target, including Osama bin Laden and Islamic State leader Abu Omar al-Baghdadi, were once declared dead, only to pop up later. "U.S. forces are still assessing the results of the strike following a deliberate process to confirm his death," a spokesman for U.S. Central Command had said. Days later, however, Al-Qaeda in the Arabian Peninsula, the Yemeni-based organization whose membership has quadrupled in recent years, eulogized Badawi as "a martyr" who had indeed died from "a Crusader drone strike."

The demise of Badawi, held responsible for the death of 17 sailors and the wounding of 40 more aboard the *Cole*, came as bittersweet revenge for the Pentagon, CIA and FBI. They had hunted him following his repeated escapes from Yemeni prisons in 2003 and 2006, as well as after he was released by authorities in 2007 on a promise he would refrain from further violence.

"I dealt with Jamal Badawi for a long time," tweeted former FBI special agent Ali Soufan, who cracked the top bin Laden lieutenant way back in 2001 through a skillful, nonviolent interrogation, only to see him back on the street again and again. "We had to hunt/arrest him few times because he kept 'escaping' from his Yemeni jail." Soufan wrote, "He won't be escaping anymore."

Former officials say the end of Badawi marks a victory despite the time it took. "The important thing is that American intelligence and the U.S. military ultimately stayed on the case and delivered," says George

Little, a former spokesman for CIA Director and later Defense Secretary Leon Panetta. "It's always a plus when we get someone who has been out of the newspapers for years," adds Daniel Benjamin, the State Department's

BY

JEFF STEIN
@SpyTalker

coordinator for terrorism in Barack Obama's second term, "because it sends the signal that we do not forget."

But to Benjamin and several other former officials, Badawi's belated death also spoke to the worsening plight of U.S. counterterrorism missions abroad: America has fewer friends in the most troubled parts of the world than it did after the September 11, 2001, attacks on the World Trade Center and Pentagon.

"There's no question that a much more chaotic situation has developed, especially in Yemen," Panetta tells *Newsweek*. "To conduct really effective counterterrorism relations requires good relationships with [local] counterparts. It's become much more hit-and-miss now."

Badawi's time at large "underscores the difficulty in locating senior Al-Qaeda leaders not only there but in Pakistan, Syria, North Africa and East Africa, despite the use of all our available intelligence assets to find them," says Martin Reardon, a former senior FBI special agent who spent years pursuing terrorists. "It's also worth noting that in the countries where Al-Qaeda is most active—Yemen, Pakistan and Syria in particular—large swaths of ungoverned territory is under their control."

Pakistan sheltered bin Laden for a decade and continues to support the Afghan Taliban and other groups fighting the U.S.-backed Kabul government, which is riddled with enemy spies and "insider" agents. In October, a Taliban gunman nearly killed the U.S. and NATO commander there, General Austin Miller. In U.S.-backed Iraq, the regime's Shiite paramilitary groups are allied with Iran. Turkey, a titular NATO ally, is vowing to destroy U.S.-backed Kurds that have led the fight against the Islamic State militant group (ISIS). Jordan is growing

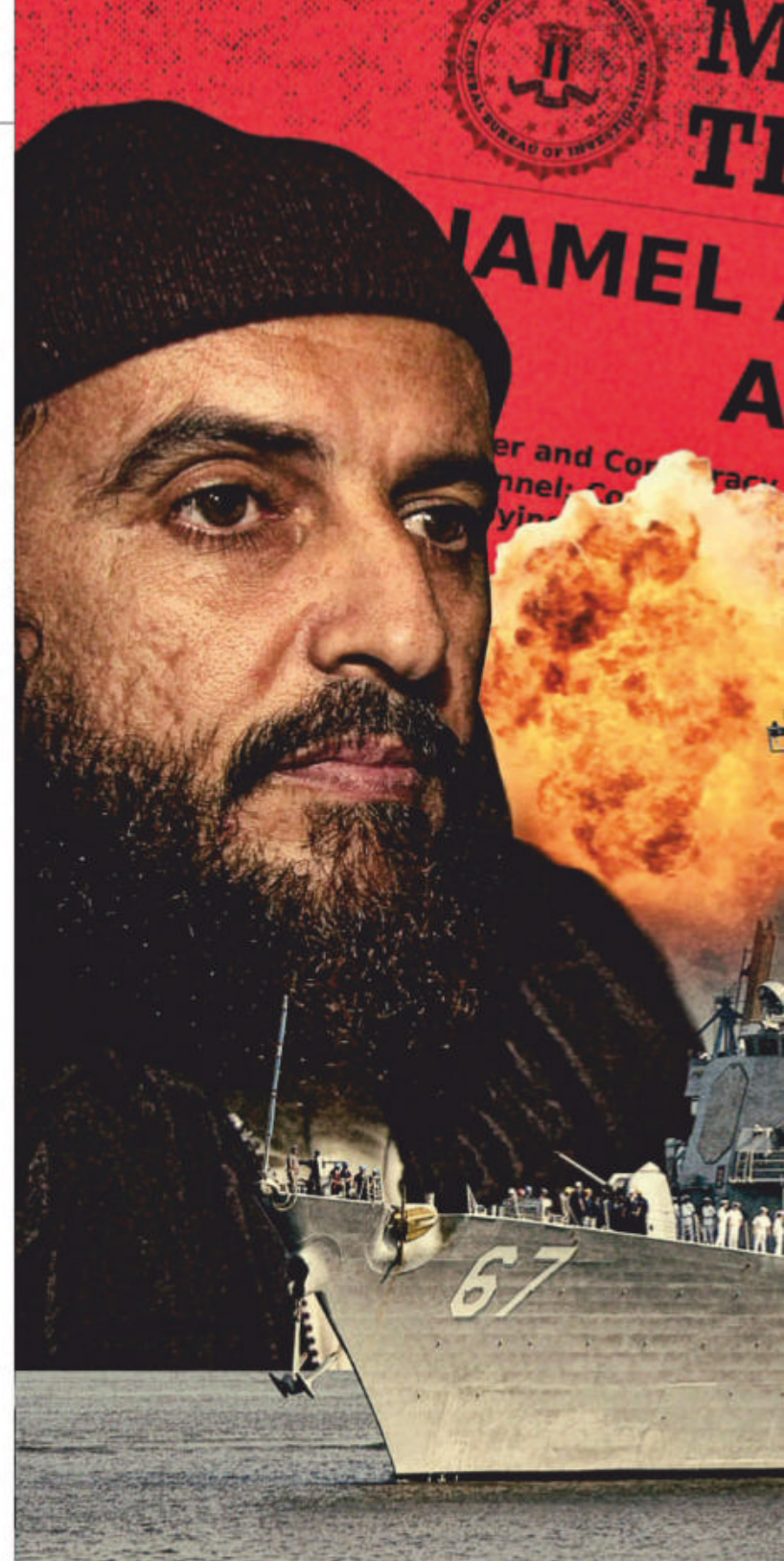
restless over the Trump administration's embrace of Israel's hard-line policies against the Palestinians.

It was also Jordan's intelligence service that a decade ago gave the CIA an agent who pretended to have infiltrated bin Laden's inner circle. On December 30, 2009, he was welcomed into a CIA base in Afghanistan wearing a concealed suicide vest and blew himself up, killing seven Americans, a Jordanian and an Afghan, as well as seriously wounding six others.

Over 17 years after the U.S. invaded Afghanistan in pursuit of bin Laden, and almost 16 years after its tragically mistaken invasion of Iraq to get rid of Saddam Hussein and his nonexistent weapons of mass destruction, the region is more dangerous than ever to Americans on the ground.

Obama, like his predecessors, put "a premium on partnerships—training and equipping our allies and friends' forces to be the pointy end of the spear so that U.S. forces need not play that role," says Edward "Ned" Price, his former national security aide. But a major strategic problem for Washington, then as now, is that many of its longtime regional intelligence allies, like Egypt, have infamous records of repression and brutality, not to mention corruption. Jailing dissidents, human rights activists and journalists has turned pris-

"The bad news is that the conditions that made it possible for Al-Qaeda to take root...all of those things still exist."



ons into universities for jihad; Ayman al-Zawahiri, the onetime surgeon held in Tora Prison, on the outskirts of Cairo, became a founder of Al-Qaeda (and remains at large, likely in Pakistan). U.S. partnerships with such regimes have helped Islamic militants rebrand themselves as global revolutionaries in an arc from Indonesia through the Middle East to West Africa.

Regimes like those in Saudi Arabia and Yemen (under Ali Abdullah Saleh, assassinated in 2017) long ago learned how to play both sides of the street with their American partner, aiding Islamic extremists with one hand while arresting them with the other. "In Yemen, it wasn't ideology



FUEL TO FIRE Trump's Muslim ban has made it harder to make new friends in the Middle East. The "isolating message that we don't want to work with Muslim countries" aids ISIS in recruiting.

about exiting Syria within 90 days and Afghanistan by 2020 further unsettled allies: "Nobody knows if we're going to be there tomorrow."

All of which "makes it harder for security services to be seen as partnering with Americans in joint training or operations," says Price. These partnerships, Monaco told *Intelligence Matters*, are "critical to being able to take the fight to the terrorists abroad before they come here."

There are workarounds for the U.S. in dicey places like Pakistan, Jordan, Lebanon and Somalia, where CIA and clandestine Pentagon teams can try to mount so-called unilateral intelligence operations, kept secret from host authorities. But they are difficult and dangerous, and exposure can strain alliances to the breaking point.

Price notes that "there are very few around the world who we'd consider consistently reliable" partners. But he insists that many have gotten better, citing "Somalia, Nigeria and other parts of West and North Africa." In the end, he says, "improvement tends to be the name of the game."

Robert McFadden, a 30-year Naval Criminal Investigative Service counterterrorism vet, spent two months interviewing Badawi when he was imprisoned in 2007. He isn't so optimistic, but he'll settle for wiping out an Al-Qaeda kingpin who had continued to plot attacks against the U.S.

"Though an airstrike doesn't do anything about terrorism's incubators," McFadden says, "it does show that if you remain in the jihad life, violence will be lurking." Justice delayed, he adds, is better than no justice at all. ■

that was the problem" in keeping Badawi in prison, says Benjamin, now director of the John Sloan Dickey Center for International Understanding at Dartmouth, "just the unstoppable urge of Saleh to diddle us."

"A reliable ally is a great asset," former M15 and M16 counterterrorism officer Richard Barrett tells *Newsweek*. "But an unpredictable or manipulative one can be worse than no ally at all."

Lisa Monaco, a veteran Justice Department national security official who rose to chief counterterrorism adviser to Obama, sounded deeply gloomy in a recent interview about U.S. prospects in the region. "The bad news is that the conditions that

made it possible for Al-Qaeda to take root, that made it possible for ISIS to expand and occupy the territory to recruit and radicalize, all of those things still exist in the Middle East [and] other regions," she told former CIA Deputy Director Michael Morell on CBS's *Intelligence Matters* podcast. "And those things are not going away. In fact, they're getting worse—if you look at places like Yemen."

Trump's Muslim ban has made it harder to make new friends in the region, she says. "It sends an isolating message that we don't want to work with Muslim countries and that fuels ISIS recruiting." Panetta says that Trump's impulsive statements

POLITICS

Great Expectations

A new class of fiery progressives is taking Congress by storm. But some Democrats worry their own party is the one that could feel the burn

DEMOCRATS HAVE ENTERED THE Great Expectations era.

The 116th Congress, with its diverse, female and feisty class of new House members, is offering up some of the progressive wing's wildest dreams. Alexandra Ocasio-Cortez has already broached a crowd-pleasing, eat-the-rich 70 percent tax on multimillionaires to pay for stopping climate change. Others are reveling—profanely—in the possibility of ousting a president. “We’re going to go in there, and we’re going to impeach the motherfucker,” Representative Rashida Tlaib told a crowd.

The progressives are unabashedly communitarian and social justice warriors, arriving in D.C. as a new socialism, some-

where to the left of Senator Elizabeth Warren, is ascendant. According to a Gallup poll in August, Americans aged 18 to 29 are as positive about socialism (51 percent) as they are about capitalism (45 percent), a 12-point decline for the c-word in the two years since President Donald Trump got elected.

So is the ghost of Franklin Delano Roosevelt inspiring the new House to put the poor to work with federal dollars, building infrastructure and fighting climate change, all the while infused with post-millennial concepts of inclusivity and intersectionality?

Maybe. Maybe not.

The House Democrats have an ambitious agenda that includes doing

something about climate change, saving the Affordable Care Act (if not expanding it into “Medicare-for-All”), lowering drug prices, expanding gun control, funding infrastructure, saving the Deferred Action for Childhood Arrivals program, strengthening voting rights protections and, last but not least, addressing public corruption.

But most political analysts—and even some of the new members themselves—put low odds on the likelihood that, if the House does pass legislation on those matters before 2020, the proposals will become the law of the land. Whatever they do must squeeze by the Republican-controlled Senate. And then there is that matter of the Trum-

pian signature to consider.

New House Speaker Nancy Pelosi is already pulling some deft maneuvers clearly inspired by the demands of this left flank, sassing Trump about giving him “a dollar” for the wall while clearly aiming for a kind of bipartisanship that the House Republicans never bothered with—and that the fire-breathing newcomers might not prefer either.

In her first-day speech, she quoted Ronald Reagan and then George H.W. Bush, to thundering silence from Republicans. At one point, she turned to the right side of the aisle and said mildly, “You don’t applaud for Ronald Reagan?”



Steve Israel, a former House member who represented New York’s 3rd District for 16 years until 2017 and led the campaign committee charged with electing Democrats to the lower chamber, tells *Newsweek* the new majority will need to maintain progressive fervor and excitement while not freaking out the purple-district middle Democrats, who will need to expand their electoral power in two years.

“On the one hand, you have this new progressive and restless energy,” he says. “On the other hand, the majority grew in more moderate districts as well. So this new majority is a melding of Brooklyn, New York, which is bright blue, and Brooklyn, Iowa,



NEW DAY RISING Progressives are pushing for aggressive action. At left: Members are sworn in to the House during the opening session of the 116th Congress on January 3.

which is more purple and which was a Republican area with now a Democratic member of Congress. What that means is that developing consensus and a coherent legislative agenda won't be easy—but will be critical.”

This kind of talk irritates the progressive, news-making, dancing and swearing edge of new House members, who are already forming a caucus within the Congressional Progressive Caucus (CPC). They were not sent to Washington to play by the old rules. They are not, however, the Tea Party class of 2010, with a friendly GOP leader over in the Senate (although they do have a Donald Trump to fight, as the conservatives had their Barack

Obama). Nor are they the Newt Gingrich revolution of 1994, with a socialist version of the Contract With America.

The closest thing the progressive Democrats have to the organization of House conservatives of yore is

“Climate change will be hard enough to solve without adding other contentious issues to the solution mix.”

the Justice Democrats, a progressive, Bernie Sanders–connected PAC that takes no corporate money. The Justice Dems recruited and supported Ocasio-Cortez and successfully backed three incumbents and three other new members, for a total of seven wins, and openly hopes to build a left-wing version of the notoriously stubborn Freedom Caucus.

“Whatever relationship emerges between newly elected firebrands and the CPC, a disciplined caucus with enough numbers to withhold votes as a bloc can push the limits of political possibility,” wrote Waleed Shahid, a spokesman for the Justice Democrats, in *The Nation* in October 2018.

Alexandra Rojas, executive director of the Justice Democrats, acknowledges that with the Republican Senate and Trump in the White House, passing legislation could be a challenge. But changing the law is second to the aim of changing the message.

“What this new majority can focus on is building a movement around big ideas that Democrats are going to look for in 2020,” Rojas says, ticking off climate change, “Medicare-for-All,” limiting corporate money in politics and ending mass incarceration.

Progressives, she says, have shifted the political landscape in a short time. As an example, Rojas points out how Bernie Sanders’s run for president in 2016 made “Medicare-for-All” a common rallying cry. She also cited the fact that the House now has a subcommittee on climate change, prompted, in part, by Ocasio-Cortez’s activism; in December, the new representative led a protest into Pelosi’s office to demand

a special committee on that issue.

Of all the topics on the agenda, this is probably the single most likely one to move beyond proposal and into action, because it unifies Democrats and potentially attracts Republicans in the Senate who can be persuaded to see business opportunities in a Green New Deal. But Ocasio-Cortez went on *60 Minutes* and proposed a whopping 70 percent marginal tax on annual incomes above \$10 million to help pay for it. (The current top tax rate is 37 percent.) Only about 16,000 households fall into that category, mostly movie stars, hedge funds wizards and athletes, but conservatives went into full battle mode, warning that the new Democrats would soon be coming for the hard-earned wallets of regular working Americans. The jury's still out on whether the suggestion pleased the Democratic base or frightened away independent Trump-loathers and moderate Democrats.

Instead of installing a new climate committee, Pelosi offered up a "Climate Crisis" subcommittee, chaired by veteran lawmaker Karen Castor.

Progressive hard-liners saw that as a sop, mainly because a subcommittee has less power. "This committee... sounds about as useful as a screen door on a submarine," Corbin Trent, a spokesman for Ocasio-Cortez, told *The Hill* in early January.

Castor tells *Newsweek* the committee's mandate will be "pressing for urgent action" on reducing carbon while seeking bipartisan consensus for a national policy. "I think our committee will be the conscience on climate, and every bill that goes to the floor will be scrutinized about whether it sets us on the right track," she says.

A climate change lobbyist, watching from the wings after two years in the wilderness, applauded the new subcommittee but fretted over

Ocasio-Cortez's 70 percent tax on the superrich. "They should really decouple climate change from their views on social justice and income inequality. Climate change will be hard enough to solve without adding other contentious issues to the solution mix," the lobbyist says, adding that the word *crisis* in the committee's name also might be divisive, an easy target for Republicans who sneer at "alarmism."

Castor, who represents coastal Tampa, says the naming was apt. "When monster Hurricane Irma was bearing down on my state, I had to pack up my pictures and photo albums and park the car on the third floor of a parking garage," she says. "Extreme weather, flooding, fires—we are in a crisis!"

House watchers suggest that the 116th Congress might also have a chance at denting public corruption. House Resolution 1, the first bill introduced this year, is a sweeping proposal aimed at money in politics, voting reforms and ethics. Those issues have broad bipartisan support in many states and localities, according to Aaron Scherb, legislative affairs director at government watchdog Common Cause. "I think a lot of the reforms at the national level will help advance the ball for when there is a more favorable political climate after 2020," he says.

As the new House settles in, though, Pelosi has her job cut out for her. She

will certainly feel pressure to not let the new progressive members veer too far left ahead of the presidential candidates in the Senate. But they have already had an effect on that conversation. Senator Cory Booker, Rojas claims, stopped taking corporate PAC money because of the new purity creed which the House's new left adheres to. (The New Jersey lawmaker, who in 2014 received the most Wall Street money of any member of Congress, credited his constituents and the End Citizens United PAC for his decision.)

The new progressives make up a tiny percentage of the 435-member House, but their audacity has attracted a great portion of attention. It remains to be seen whether they can operate with the lockstep discipline of the right wing's right flank. On the first day, the CPC gave in on a basic rule, called "pay-as-you-go." Instituted by the Republicans and loathed by progressive Democrats, the measure requires every bill that would cost money to describe where that money would come from.

Only three Democrats, Ocasio-Cortez among them, voted against it.

Point for Pelosi. Israel says the new speaker can not only manage the factions; she also can harness them to make things happen. She pushed Obamacare through in 2010, he says, "when everybody thought it was dead," and she also produced enough Democratic votes in 2008 to get through President George W. Bush's controversial Troubled Asset Relief Program, which progressives still view as a windfall for bankers.

"She is Toscanini conducting a jazz band, and that's why her election as speaker was imperative," Israel says. "If anybody is the glue who can keep these fragments together, it is Nancy Pelosi." ■

“What this new majority can focus on is building a movement around big ideas that Democrats are going to look for in 2020.”



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TAIWAN: The New Benchmark of Quality Through Innovation

Viewed by many in the past merely as a former high-tech success story, Taiwan has recently transformed its industries through a collective commitment to quality and looks set to become a major global force in the area of innovation and R&D for many years to come.

In Taiwan these days, few things are prized as highly as innovation. Yet it wasn't always this way — predominantly seen as an original equipment manufacturer (OEM) base that lacked its own creative spark, Taiwan made its name in the 1980s as the world's high-tech powerhouse, before the decline of profits and rise of competition at the turn of the century forced Taiwan's economy into a state of self-contemplation. However, thanks to concerted public and private sector emphasis on innovation over the past decade, companies across the board now have good reason to be optimistic about Taiwan's future. In the coming years, Taiwan looks set to take full advantage of more than 30 years of expertise acquired in the high-tech industry to drive global innovation and become a nurturing environment for ambitious local and international startups alike.

SEMICONDUCTORS

The bedrock of Taiwan's export-led economy has traditionally been the semiconductor industry. Despite increasingly consolidated attempts to chip away at its dominance, Taiwan still reigns supreme: with sales of US\$84.4 billion in 2017, Taiwan remains the largest semiconductor foundry manufacturing economy in the world. Through innovation, the Taiwan Semiconductor Manufacturing Company (TSMC) remains confident that

Taiwan will retain a five to seven year lead in the industry over its competitors. As **TSMC Chairman Dr. Mark Liu** states, "our vision is to unleash innovation for the world." Given that the world's most powerful chips are for the first time now being made by **TSMC** rather than Intel, its vision is bearing fruit.

The need to stay ahead of the curve is a dominant theme that comes up early into conversation with any senior figure in the business. **President & CEO of Silicon Motion, Wallace Kou**, sees 5G as a crucial development that will transform data storage by 2020: "when 5G comes, service delivery will be a hundred times faster. Technology, storage and connectivity growth will be huge." R&D, in Mr. Kou's eyes, is therefore very important. "If we don't stay ahead of the competition, why would big scale and multinational companies want to invest in Taiwan?"

Gary Chang, President & CEO of Wah Lee Group, also speaks of the necessity to be "continuously seeking next generation materials", seeing 5G as a crucial example despite its "many technical barriers." Even though it can often take five to ten years to develop the next generation of projects, R&D developments leave him "hopeful and optimistic about the future." It is hard not to agree with these sentiments given the fact that Google and Microsoft among others have chosen to set up R&D centers in

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Taiwan, which will only serve to further foster the prevailing culture of collaboration and innovation on the island.

Dr. Collin Wang, Chairman of Machvision sees the situation similarly: “our future is R&D and innovation. AI is the most important part of R&D: we can use it to solve many problems such as inspecting design quality. Some defects are very hard to identify with current technology, but AI has been very effective for us.” For such reasons, Taiwanese companies have firmly embraced recent tech phenomena and have aimed to include concepts such as AI into its operations where possible, in order to derive even the most minuscule of competitive advantages.

INNOVATION ACROSS THE BOARD

The push towards R&D and innovation is not exclusive to the semiconductor industry – when Taiwan’s exports were markedly hit after the 2008 financial downturn, there was widespread realization that Taiwan needed to strive towards something which many thought to be almost impossible: diversification. 2009 saw the introduction of the Presidential Innovation Awards, aimed at encouraging Taiwan to diversify its slowly faltering high-tech business. In the decade since, officials and investors alike have



taken their new mission seriously, boosted by a number of innovation-focused programs. The 2016 Asia Silicon Valley Development Plan, for example, focuses on upgrading Taiwan’s startup and entrepreneurship ecosystem, building a complete IoT supply chain by integrating hardware advantages into software applications, and developing applications based on smart logistics, smart transport and smart healthcare.

In addition, the government’s early 2018 announcement that it will spend US\$540 million in AI research over the next five years, alongside Microsoft’s accompanying US\$34 million investment into an AI hub in Taipei, shows that officials and investors alike are not simply feigning interest. Green shoots of opportunity continue to appear in Taiwan, cultivated largely by an improving investment climate where new legislation continues to lift many prohibitive legal barriers which have allowed R&D

processes to be accelerated, as well as assisting new startups. It is, therefore, of little surprise that Taiwan has seen phenomenal growth in the fields of artificial intelligence, cryptocurrency and blockchain.

Dr. Steve J.P. Hsu of Genovior Biotech echoes this sentiment: “I think one of our biggest advantages is that our regulation is in line with that of Europe and the US.”

Industry leaders look set to take advantage of such favorable conditions: **Dr. Genda Hu, Chairman & Founder of FocalTech Systems** agrees that “high-tech provides an answer” and that the government’s original investment in technology and innovation was “extremely important in order to sustain such a large population with these kinds of living standards and prosperity on such a small island.”

Dr. Wen-Hsing Hsu talks about how his fingerprint technology company, **Startek Engineering**, is “always looking to innovate.” From creating quicker and more powerful sensors to implementing sensors in new capacities such as in Smart City projects, the company is increasingly looking to “set a processing and data standard.”

There’s a sense that innovation should supersede the conservative values of hierarchy and order still in place if Taiwan is to be serious about its aspirations of becoming an innovation hub. As **Jane Liu, CEO & Founder of New Deantronics** puts it: “We want to coach the younger generation to think outside of the box when it comes to automation design and innovation in order to be competitive and produce consistently high quality products.” These efforts are now paying dividends. The island has been at the World Economic Forum (WEF)’s “Innovation-driven stage” since 2011, and in WEF’s Global Competitiveness Report, Taiwan was ranked 11th globally and 3rd in Asia, just behind Japan and Singapore. In terms of company R&D investment levels, Taiwan was ranked 10th globally.

A recent key addition to the innovation arena in Taiwan has been the **Artificial Intelligent Manufacturing Systems (AIMS) Research Center** – set up last year – which is focused on developing AI for manufacturing and is looking to support the migration and digital transformation of Taiwan’s industries as well as providing companies with innovation assistance. As Director **Dr. Chen-Fu Chien** explains, **AIMS Research Center** has two goals: “one is to bridge new technology and existing industries, the other is to incubate startups.”

The other widely held belief is that innovation should help Taiwan focus on producing quality rather than quantity. It should mark a clear break from the low-grade, mass-produced products Taiwan was once known for and which can now be produced cheaper elsewhere. As **FocalTech’s**

Genda Hu states, “Taiwan is in a transition period. 20 years ago people considered ‘Made in Taiwan’ something cheap and low quality. Nowadays, this perception has changed and many people consider products made in Taiwan as good quality.”

BIOTECHNOLOGY AND MEDICAL INNOVATION

Taiwan’s progress in software has been beneficial for its burgeoning medical innovation and biotechnology sectors. In 1984, no Taiwanese biotech company was listed on a stock exchange; today, Taiwan boasts more than 100 listed firms with a combined value of almost US\$25 billion. Whereas 20 years ago, Taiwan had no lab offering capabilities in toxicology, biosafety, and drug metabolism and pharmacokinetics, several private companies now offer these services. The sector recorded sales of

“Quality is a major focus in Taiwan, not just in biotech but across other industries.”

Dr. Herbert Wu, President of DCB

US\$2.4 billion in 2008, but by 2016 this had risen to US\$7.3 billion. Government officials don’t expect it to stop there - **Dr. Herbert Wu, President of the Development Center for Biotechnology (DCB)** expects things to “start accelerating very quickly.” “We have had five brand new drugs approved in Taiwan in the past – that two of them were approved by the Taiwanese FDA before the US FDA shows that the competence and confidence is there. Quality is a major focus in Taiwan, not just in biotech but across other industries”, he comments.

New drug development has been encouraged by the widening of opportunities and incentives. As **Dr. Ko-Chung Lin Founder & CEO of PharmaEssentia** reflects, “40 years ago it was thought that small companies could not make new drugs. People believed only the big companies like GlaxoSmithKline could create new drugs.” But, as **Dr. Herbert Wu** explains, “something that is now being encouraged is entrepreneurship. Previously, there were very clear lines – a scholar was a scholar and an entrepreneur was an entrepreneur. But we realized that if we loosened restrictions, and let scholars focus on problem solving, then scholars and scientists could also become entrepreneurs.” It is this culture of entrepreneurial freedom and academic-enterprise partnerships which has enabled Taiwan to carve out its own niche in biotechnology. As **Jane Liu of New Deantronics** points out, Taiwan has a “major position in glucose monitors, blood pressure monitors, and electronic thermometers. Now we need to think about how to move that up to the next level.”

For **SynCore Biotechnology’s Dr. Yita Lee**, success has been due to “the accessibility and the



quality of the medical centers, which mean that we can do quality clinical trials here.” Infrastructural development has certainly helped: Taipei’s National Biotechnology Research Park joins other recently created biotech institutions such as toxicology facilities, clinical batch manufacturing facilities, and locally set up contract research organizations.

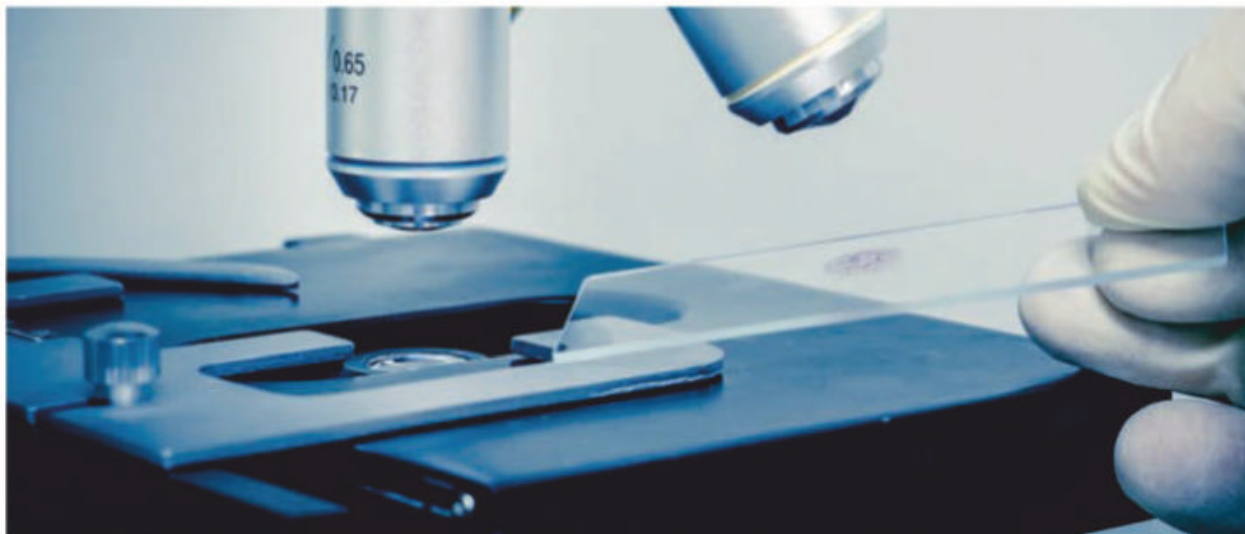
However, experts don’t shy away from the progress that still has to be made if biotech in Taiwan is to catch up to the US. Regulatory issues still hamper production: as **Dr. Ko-Chung Lin of PharmaEssentia** puts it, “it’s not too difficult now to get initial funding if you have a good idea, but the highly regulated system which we have is unlikely to produce innovation.” As a result, third and fourth round funding can be hard to come by for the time being, although **Dr. Herbert Wu** remains confident that the **DCB** can “play a vocal role and interact with the FDA to improve the regulatory environment.”

Consumer products don’t face the same hurdles and have been an increasingly profitable market for the companies involved. **Dyaco International’s** Sole treadmills, for example, “have been very successful”, according to **Chairman Michael Lin**. In a partnership with Philips, **Dyaco** is currently developing a range of ultra-sensitive, rehab-friendly treadmills which, he claims, “Phillips think they are the best products they have seen so far in the market.”

HUMAN CAPITAL

It is Taiwan’s enviably well-educated talent pool that made its push towards innovation possible. Taiwan has over 150 universities and an abundance of well-trained graduates, 25% of whom study Engineering. Business leaders are always quick to bring up Taiwan’s impressive human capital. **Silicon Motion’s Wallace Kou** for example states that “Taiwan has developed many talented people in the past thirty years, not just in high-tech but in biotechnology as well”, something he claims to be “good timing”, given that “the United States and others are looking for talented countries to develop innovative technology.” **Dr. Mark Liu of TSMC** states that Taiwan has a “highly educated population – virtually unheard of in this part of the world.”

However, in recent times, officials have begun to see academia-industry collaboration as more crucial than simply having high numbers of graduates. **Dr. Thu-Hua Liu, President of Ming Chi University of Technology**, is on board with improving industry links: “we aim to match evolving industry needs with individual student capabilities so that there is a good fit.”



The university has also started ‘design thinking’, where academics from different backgrounds and departments come together to work and learn from each other in the form of an interactive workshop. Dr. Liu feels that “such cross-disciplinary collaboration will be the way forward.”

These types of ventures will go a long way in addressing the criticisms of those who label the Taiwanese education system as too rigid, and too focused on mathematics and science to yield the creativity necessary to fuel innovation.

Mr. C.K. Yang, Chairman of Electronic Commerce Universal shares the viewpoint of Dr. Liu with regards the optimal use of the nation’s talent: “What is Taiwan’s niche for our development? I would say R&D, intellectual capital. We try to put good students and intellectual capital in the right place at the right time.” Taiwan has clearly realized the need to play to its strengths and this has been reflected in its education system which now ensures a steady flow of capable graduates towards the sectors which are in most need.

“ Taiwan has a lot of potential in terms of branding, but we just have to expand our horizons

Cher Wang, Chairwoman, CEO & President of HTC

However, some Taiwanese companies are looking to attract new talent and new ideas from further afield to help in their bid to stay ahead of the curve. **Dr. Peter Kunhsi Tsai, General Manager of iMEDIPLUS** explains how his company aims to recruit talent with the needs of the US market in mind: “Taiwan needs to recruit lots of engineers from all over the world – we will recruit engineers in the U.S., especially in Silicon Valley.”

“MADE IN TAIWAN”

If Taiwan is to fulfill its potential, it needs to have more faith in its own identity. As **Dr. Yita Lee of SynCoreBio** puts it, “Taiwan has had an identity

crisis due to a slowdown in growth and a lack of global recognition.” The lack of an international presence stems from Taiwan’s failure to focus on branding and marketing during its growth period; while the likes of Samsung and Apple now reap the benefits of worldwide recognition, Taiwan’s brands normally rely on product quality - or links with foreign multinationals - for their market presence. However, there has been a sweeping, collective effort across the board through public-private partnerships, legislation reform as well as ambitious attempts to turn Taiwan into a welcoming, knowledge-sharing environment – where innovation is championed and treasured – that is proving so attractive for investors and is allowing Taiwan to position itself as an international brand of innovation.

The process – based on a commitment to excellence and quality – has not been easy, but Taiwan as a brand appears to be on the right track towards the recognition it deserves. **Bob M.S. Wong, Chairman of CMC Magnetics** believes that “Taiwan has replaced Japan as a symbol of high-quality; our technology and R&D always ensure that our products are better and last longer.”

It is important to note that Taiwan is not only promoting and facilitating local-based startups, but also budding companies from far and beyond. It is the vision of many tech leaders in Taiwan to turn the island into a blockchain tech hotbed where Taiwanese and international companies can collaborate, share ideas and grow together. **Cher Wang, Chairwoman, CEO & President of HTC**, shares this vision: “Taiwan has a lot of potential in terms of branding, but we just have to expand our horizons, we cannot just keep our brands confined to this small island. There are 4.4 billion people between China and Europe, which is a huge opportunity for Taiwan.”

It is, therefore, no surprise that corporate giants like Amazon have been suitably impressed by Taiwan’s commitment to nurturing an environment where innovation is allowed and encouraged to flourish that they decided to set up its first innovation center in New Taipei City. Given the fact that Taiwan





plans to establish a 12,000m² blockchain economic zone in New Taipei City along with a new incubation center – which will house 200 startups – there has never been a better time for entrepreneurs and companies specializing in these areas to invest in the ‘Beautiful Island’.

There is little doubt that Amazon’s innovation hub working together in harmony with the incubation center, along with other organizations, will provide the region with endless spin-off benefits in terms of attracting talent, creating jobs, providing access to new markets as well as boosting Taiwan’s brand.

Whatever their thoughts on the current situation, a majority of business leaders are optimistic about the future of both Taiwan and their businesses. **Jason Lin, Chairman & CEO of United Orthopedic Corporation** reveals that they have a dozen projects in the pipeline, saying “for the first half of 2018, we delivered over 33% of sales growth compared

to last year. I am optimistic that the next five years will see significant growth for us.” **E&R Engineering Corporation’s President, K.S. Chen**, sees the future similarly: “a lot of new technologies are coming. There will be a lot of new opportunities in automotive technology, super high speed computers, and 5G applications. Taiwan can provide these services.”


WELL-EQUIPPED FOR A HEALTHY FUTURE

While we continue to see a strong desire to expand horizons behind Taiwan in order to achieve exponential growth, there is, however, an overarching acknowledgment that this growth should be of benefit to Taiwan as a nation and society, and not just for each respective company. “We do not just want to treat illnesses, we want to also help in the area of prevention – that is very important to us; we feel a very big responsibility to take care of our community”, says **Chairwoman Yu-Mei Chang** when asked about the connection between her company, **Ten-Chen Medical Group**, and the surrounding community. It is quite refreshing that, in a time of ever-increasing globalization, some companies still strive to make a tangible, positive impact in their local communities. This vision is shared by **Dr. Lloyd Hsu of Green Transit** – a company specializing in self-driving buses – who remarks how “A lot of rural areas don’t provide transportation services right now. With this new technology of the self-driving bus, we try to merge

everybody together to provide better service to the public.”

Naturally, each of these key industries in Taiwan – be it technology, medical care, semiconductor or biotechnology – has its own unique dynamic but one thing is for sure, it would be foolhardy to discuss their growth without alluding to the solid foundations laid by Taiwan in recent years to facilitate such prosperity: innovation, education, legislation and a willingness and desire to collaborate with international companies in order to inject new energy, investment and ideas into the island. “In order to compete in the area of new drug development, we need to become more flexible in terms of getting support and entering into partnerships”, answers **Dr. C.Y Cheng, Chairman & President of Formosa Laboratories**, when asked about opportunities for future growth. This aligns with the feelings of **Chi-Mau Sheih, President of Chunghwa Telecom**, who believes that the company “has to be at the forefront of technology, especially in terms of 5G, ILT and IoT. That’s why we partner with international and national companies in different areas.”

It is this open-minded, welcoming nature and collective mentality of Taiwan that is sure to help solidify its reputation as one of the most attractive investment destinations in Asia for the coming years.

Together, it has been possible. 

Ten-Chen Medical Group — Committed to Intelligent Healthcare and Smart Hospitals

With the sixth-lowest birthrate in the world, per the latest CIA World Factbook, giving rise to an aging population where approximately 30% is accounted for by citizens over the age of 55 years, there is little wonder that there has been a substantial increase in efforts across the board in Taiwan to develop a comprehensive framework to cater for the future healthcare needs of its elderly citizens.



Yu-Mei Chang, Chairwoman

While many healthcare companies in Taiwan have been focusing on the macro-level, **Ten-Chen Medical Group (TCMG)**, 天成醫療體系, has directed its energy and resources closer to home – in the southern Tao Yuan area. Founded in 1991, Ten-Chen Medical Group functions within a family-oriented environment while operating in line with its core values: health, love and compassion.

These community-focused hospitals are not only committed to professional medical treatment using the latest advanced medical technology, they also aim to promote healthy living and community integration. Such efforts have not gone unnoticed – TCMG has received a national healthcare quality award from the Central Government as well as an award recognizing their community service efforts.

Fundamental to this success has been the unwavering efforts and support from Company Chairwoman & President, Chang Yu-Mei, who has been



heavily involved in each stage of the company’s growth, right down to the interior design chosen in the hospital. Her entrepreneurial spirit as well as the commitment to “being your good neighbor” is evident in every facet of the medical group.

While continuing to honor its traditional values, TCMG is a company which embraces technological advances and champions innovation as a way to further serve the needs of its communities – something which is becoming even more crucial due to

the current manpower shortage the medical industry currently faces in Taiwan. This is evident in their daycare centers where GPS watches allow medical staff to monitor the status and wellbeing of the elderly – a task which would ordinarily require significant resources in terms of nurses and time taken to carry out.

Looking ahead to the future, TCMG seeks to continue to develop in the area of medical innovation and intelligent healthcare – they plan to unveil a new, ambitious smart hospital in the next two years which will integrate medical care for the elderly while also offering a designated space for retirement living.

Along with its Golden Age Long-Term Care Institutions, 金色年代樂齡長照機構, TCMG is set to increase efforts to transform the attitude and mindset of citizens with regards to healthy living, because we all know that prevention is better than cure. ■

天成醫療體系 Ten-Chen Medical Group 金色年代樂齡長照機構 Golden Age Long-Term Care Institutions



Taipei, Taiwan



Chiayi, Taiwan



Nevada, USA

New Deantronics – From Concept to Finished Device, Globally

New Deantronics (ND) is a medical/surgical device developer and manufacturer founded in San Francisco, California in 1985 with engineering and manufacturing operations in Taiwan. Offering solutions to the medical device industry globally, ND's spectrum of services includes design, development, manufacturing, packaging, sterilization, regulatory and other support services. ND is US FDA registered, CE Mark approved, and ISO 13485 accredited, working closely with physicians and medical professionals to assist them in their endeavors to advance healthcare and quality of life. These efforts have allowed ND to foster long-standing partnerships with a diverse customer base ranging from emerging medical technology start-ups to some of the world's leading medical device companies.

ND is focused on a culture of integrity and responsibility to continue meeting the demands of regulatory requirements and customers, along with growing its business in ways that positively impact the communities where ND operates and serves. ND's approach involves a combination of continuous improvement, investments in innovation, rigorous traceability, reducing its environmental footprint through sustainable practices, and ensuring the quality and reliability of its products for the safety and well-being of patients.

From a modest beginning, ND currently operates from a 250,000 sq. ft. unit, employing over 700 people, including an R&D team of 50+ engineers. ND develops solutions for a wide range of medical disciplines, including general surgery, neurosurgery, cardiology, orthopedics and aesthetics.

Looking ahead to 2019, ND is adding a new 450,000 sq. ft. purpose-built facility with manufacturing, sterilization, and "direct to distribution" service in Chiayi, Taiwan. Global Expansion 2020 USA is the establishment of a major facility in Greater Reno-Sparks, Nevada. The campus will include R&D, manufacturing, R4R and warehousing facilities. R4R ("Return for Repair") supports capital equipment exchange and repair services for electronic consoles such as electrosurgical generators, ultrasound instrumentation and other products.

Innovation: The U.S. facility will house a Medical Device Incubation Center to foster and support innovation. ■

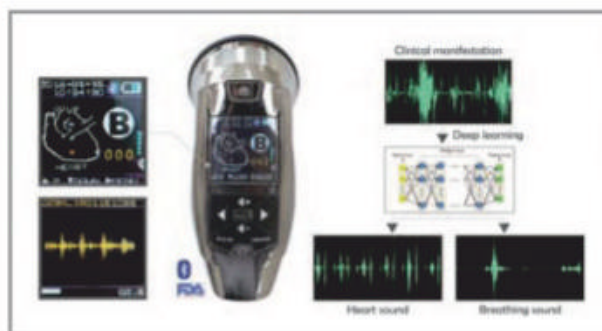


iMEDIPUS – Leading The Way in Cardiac Care with AI

According to the American Heart Association, cardiovascular disease accounts for over 836,000 deaths each year in the United States, which equates to approximately one in every three deaths and it has been proven that this type of disease claims more lives each year than all forms of cancer and chronic lower respiratory disease combined. More specifically, heart disease is the primary cause of death in the United States, accounting for over 365,000 deaths each year. Early detection is imperative for heart-related illnesses and the need for improved and more innovative detection devices is growing daily.

Fortunately for the cardiac care sector, since its inception in 2013, iMEDIPUS – a Taiwan-based company which has grown exponentially in the area of advanced medical electronics companies, using world-class research and development facilities – has demonstrated its desire and willingness to serve the ever-changing needs of the biotechnology sector. It is this commitment to excellence and continuous improvement which has allowed the company to position itself at the forefront of innovation in the sector.

iMEDIPUS prides itself as being the pioneer of the development of digital auscultation systems and is dedicated to combining its digital health experience with artificial intelligence in order to create an integrated system which allows for AI in diagnosis and screening while also aiming to incorporate this AI in blockchain which will, in turn, form the basis of big data to assist doctors in diagnosis.



Reference: T.-E. Chen et al., "S1 and S2 heart sound recognition using deep natural networks", IEEE Trans. Biomed. Eng., vol. 64, no. 2, pp. 372-380, Feb. 2016

iMEDIPUS has succeeded in creating its own brand, CARDIART®, by bringing together well-known international cardiologists, emergency physicians, and acoustic specialists to develop its unique U.S. FDA-certified stethoscope which has been acknowledged for its excellent sound quality and accuracy. Moreover, iMEDIPUS also boasts its top-of-the-range Wireless 12-Lead Electrocardiograph Monitor which has been proven to be

the most effective way to detect abnormal heart rhythms and also allows for instant Bluetooth transmission where the electrocardiogram can be sent to mobile devices for immediate reviewing.

All iMEDIPUS products have undergone rigorous medical trials to ensure accuracy and patient well-being and a significant part of this research and development is carried out at its facility in Silicon Valley. Furthermore, the company is also keen to co-operate with its clients in order to develop customized solutions with high-quality products.

iMEDIPUS is recruiting doctors, specialists on the cutting edge of electronic components, and professionals of global marketing and would encourage any interested patients, in addition to international business partners, to get in contact at www.imediplus.com or via email at info@imediplus.com ■



SynCore Biotechnology – Pioneering Solutions for Patients

SynCore Biotechnology (SynCoreBio) is leading the fight against pancreatic cancer. With the lowest survival rate of all 22 common cancers, pancreatic cancer will cause roughly 44,330 deaths this year in the U.S. alone. Owing to the lack of symptoms produced in the early stages, pancreatic cancer is often undetected until advanced progression, making it notoriously difficult to treat.

However, SynCoreBio – a Taiwan-based biotech company dedicated to acquiring, developing and commercializing novel therapeutics which tackle significant, unmet patient needs – is close to making a breakthrough.

Born in 2008 out of Sinphar Group and the National Health Research Institute (NHRI), SynCoreBio leveraged the more than 30 years of R&D, manufacturing and global commercialization expertise held by its founders to develop a comprehensive portfolio of pipeline drugs in the area of oncology, ophthalmology, dermatology and infectious diseases. Its motto of “Professionalism, innovation, and respect for life” emphasizes SynCoreBio’s approach to drug development, whilst its innovative products have received a number of awards: most notably the Gold Medal at the 2012 Taiwan Healthcare and Agricultural Biotech Industries Innovation and Excellence Awards. SynCoreBio

encourages collaboration and identifies strategic alliances in building a portfolio of marketed products under development that provide investors and shareholders with a diversified, long-term revenue stream. As the global market for pancreatic cancer is set to reach US\$4.2B by 2025, SynCoreBio is seeking to secure commercialization partners for its lead oncology asset, SB05, outside of Taiwan.

Awarded BioTaiwan’s 2018 ‘Innovation of the Year’ award for its potential in combatting pancreatic cancer, SB05 is a cationic liposome embedded with the cytostatic drug paclitaxel. Its positively charged liposomes attack newly developing, negatively charged endothelial cells required by tumoral blood vessels as they divide, enabling SB05 to inhibit the cancer’s growth without affecting the endothelial cells of inactivated and healthy tissue.

Having received Investigational New Drug (IND) clearance by the U.S. FDA and the French ANSM to

conduct a Phase III Clinical Trial for SB05, SynCoreBio will open clinical trial sites in 10 countries with approvals in Taiwan, South Korea, Israel, Russia and Hungary. The trial is anticipated to be completed by the fourth quarter of 2020 and will mark an important milestone in the improvement of treatment for pancreatic cancer patients around the world.

SynCoreBio’s clinical trial is currently open for patient recruitment and would encourage any interested patients, in addition to international business partners, to get into contact at www.syncorebio.com or via email at BD@syncorebio.com. ■



SynCoreBio

Chunghwa Telecom – Leading 5G Development in Taiwan

Taiwan’s largest integrated telecommunications services company has the vision of building a world-class 5G industry chain in Taiwan that is at the forefront of global development and commercial deployment.

Following the inauguration of the “CHT Pilot Team for the Taiwan 5G Alliance” on January 29, 2018 to accelerate 5G deployment, Chunghwa Telecom announced strategic partnerships with Nokia and Ericsson at the Mobile World Congress in Barcelona, Spain. Chunghwa Telecom and Nokia will jointly build 5G trial network at designated sites in 2019.

“Taiwan has played an important role in the global development of the information and communication industries. As a leading telecommunication service provider in Taiwan, we have committed ourselves to assisting Taiwan’s public and private sectors to upgrade, transform, and combine diversified ICT capabilities while accelerating the innovative momentum of software and content in Taiwan. We will establish Taiwan as an important player in the global 5G

value chain,” stated Mr. Yu Cheng, Chairman and CEO of Chunghwa Telecom.

Chunghwa Telecom plans to build a 5G trial network at the Chunghwa Telecom Laboratories in Taoyuan to verify key 5G technologies and applications services as well as interoperability between 4G and 5G networks. By working with Nokia, they will be able to complete the 5G trial network by late 2018 to provide a great 5G test and development platform for the CHT Pilot Team. The combination of the international industry leader’s technologies and Chunghwa Telecom’s solid R&D capabilities will give Taiwan an upper hand in 5G development.

To ensure the success of these developments, Chunghwa Telecom recently announced the construction of a high performance submarine cable which will connect Singapore, Thailand, Cambodia, Vietnam, Hong Kong, Mainland China, Korea and

Japan to Taiwan by 2020, meaning that the intensive bandwidth demands to come will be met. There can be no doubt that, thanks to its competitive advantages in network infrastructure, IDC, and CDN, Chunghwa Telecom will continue to drive digital innovation and consolidate its market leading position.

The company will continue to actively participate in the government’s national initiatives, including DIGI+, The Infrastructure Plan, The Asia Silicon Valley Development Plan, smart cities and IoT. With Chunghwa Telecom’s network infrastructure and extensive experience in providing ICT services, the company will help improve industrial competitiveness in Taiwan. ■



Yu Cheng, Chairman & CEO



ECom – At the Forefront of FinTech Development

Interview with Mr. C.K. Yang, Chairman of Electronic Commerce Universal Inc.

Could you please comment on the YouTube video “Google’s Titan Key could be better” and how it could be improved?



As safety and security are everything in the on-line processing world, we agree with Google that a hardware solution is much better than software passwords to provide complete protections from security concerns. While Google’s Titan Key is on the right track in addressing security challenges by using chip technology for ID authentication, it still is not 100% safe in the wireless transmission environment. It could still be vulnerable to hacking, viruses, misleading computer programs or “Trojan Horses”, phishing, pharming or ransomware, just to name a few.

We believe that the Titan Key could be improved if it is designed and modified with two ports — one that uses a USB interface linking to a Personal Computer, Notebook, or Smart TV, and the other one that uses a Micro USB/Type C connection to mobile phones, tablets or VR. With the Software Development Kit (SDK), an “improved” Titan Key could run on cross-platform and cross-operating system, available for devices running on Windows, Mac OS, Linux, and Android operating systems. It also won’t be limited by the constraints of many telecom service providers.

In addition to this, we believe that the ideal type of dual-port device with chips should achieve three things: personalized, effective ID verification, and efficient in its transaction with “Session” encrypted protection. By doing so, mobile transactions would be much more secure. Other functions like mobile payments and medical services could also be integrated into this seamless ecosystem.

For all these reasons, our company, ECom, has developed a “Master Key” product that incorporates all these functions with our invention patents. Together, we can succeed and work seamlessly with Google’s Titan Key.

Our Master Key is created to be user-friendly while offering complete security protection, consistent with Google’s Titan Key but with improvements.

User Identity Verification (UIV) is essential for online processing because trusted transaction authentication is a must in commerce. Could you elaborate on this?

I would like to echo Kirk Yang, ECom’s chief senior advisor, a former top-ranked Wall Street technology analyst and managing director at Citi and Barclays, in saying that in the worldwide wireless environments, online UIV could make identity authentication, personal data protection and access control security a reality, and should be compatible on various electronic devices to perform transactions like mobile payment.

Any useful payment methodology needs patents and legal compliance, as intellectual property rights play a crucial role. This is why ECom’s Master Key gives you a crucial advantage in the online secure transaction world, as it is consistent with Google’s Titan Key hardware solution.

Could you describe your Master Key design? What makes it unique in offering online security and protection?

Our Master Key is created to be user-friendly while offering complete security protection. This is achieved by using two chips inside, one for ID authentication, and the other for security protection. This personalized key is also one-of-a-kind. By using it, all transactions are well-protected and safe from being falsified or copied.

Our Master Key has a large capacity for personal data storage, and is accessible only to its owners. It identifies a person’s true identity with high security, allowing the user to perform secure transactions anytime and anywhere. All your personal data such as IDs, digital photos and videos, banking transactions, medical records, prescriptions, tickets, etc. are confidentially stored with different passwords and access control. Unauthorized access and leakage is impossible, your privacy is completely protected by the Master Key. This is that “mobile service at your fingertips”. ■

TOGETHER WE CAN SUCCEED

The Master Key allows personal data such as IDs, digital photos, medical records, and banking transactions to be confidentially stored with different passwords and access control, making unauthorized access and leakage impossible, consistent with Google’s Titan Key but with improvements.

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A Fintech Company



BY THE NUMBERS

The Moon

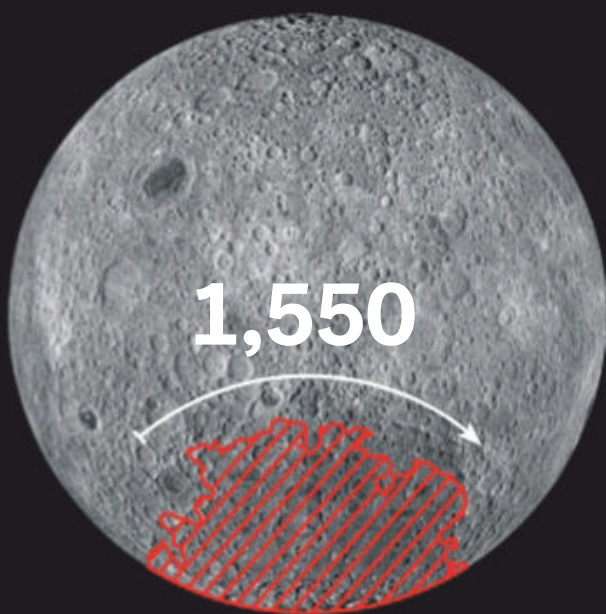
Interest in Earth's only natural satellite is running high now that China's Chang'e 4 has landed on the far side. China plans a sample-return mission later this year and hopes to put astronauts on the ground by 2036. Many countries and entrepreneurs are interested in mining the moon for helium-3, a potential source of clean energy, and ice that could be converted to rocket fuel for a trip onward to Mars.



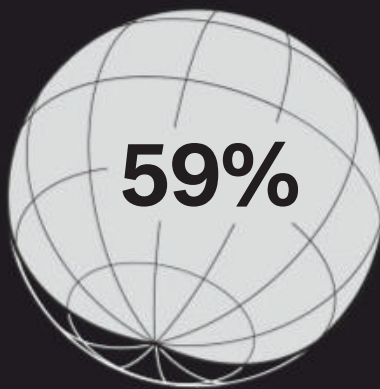
220,400

Amount of fuel, in pounds, to power vehicles leaving the lunar surface from a base.

27 → Number of days it takes for the moon to rotate on its axis—the same time it takes to orbit the Earth, which is why we always see the same side.

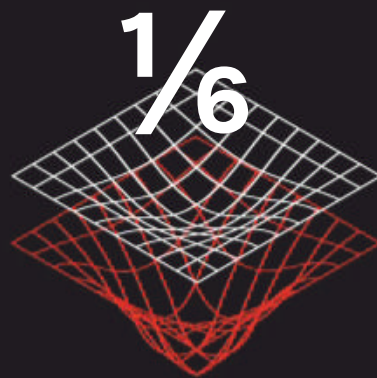


Number of miles across the South Pole-Aitken Basin, the largest and oldest crater on the moon.



59%

Portion of the moon's surface we can see from Earth.



The moon's gravity, compared with Earth's.

30

Percentage of the lunar "regolith" in the cold, dark bottom of some craters that is made up of ice.



Years since the last person walked on the moon (in 1972).



FROM LEFT: NASA; PARAMETER/GETTY; ICONS: LUERATSATICHOB/GETTY



APOLLO 12

Pete Conrad
Alan Bean

APOLLO 15

David Scott
James Irwin

APOLLO 14

Alan Shepard
Edgar Mitchell

APOLLO 17

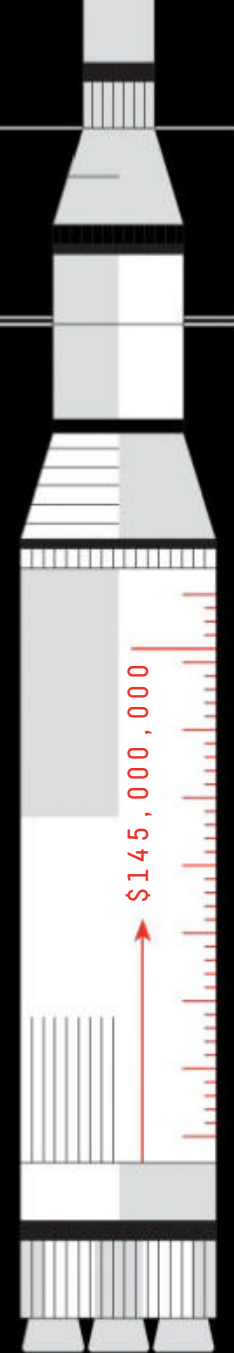
Eugene Cernan
Harrison Schmitt

APOLLO 16

John Young
Charles Duke

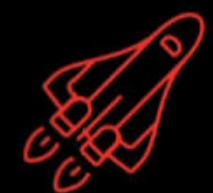
Apollo 11
NEIL ARMSTRONG
BUZZ ALDRIN

12 → Number of astronauts who have walked on the moon; 24 have orbited it.



\$145 BILLION

Amount spent, in 2018 money, on the Apollo program (\$25.4 billion in 1973). By comparison, the U.S. has spent \$100 billion on the International Space Station.



\$1,360

The price of 1 pound of rocket fuel delivered to a spaceship in low-Earth orbit.

OPINION

A Cure for Anti-Vaxxers

Health professionals need to consider better ways of informing parents about vaccinating children

➤ IN A WORLD OF POST-TRUTH politics, more and more parents are concerned that the health risks of vaccines outweigh their benefits. Too many people believe, for instance, that the MMR (measles, mumps and rubella) vaccine could be linked with autism, despite numerous scientific studies to the contrary. A growing anti-vaccine movement, in which parents opt out of vaccinations for their children, has led

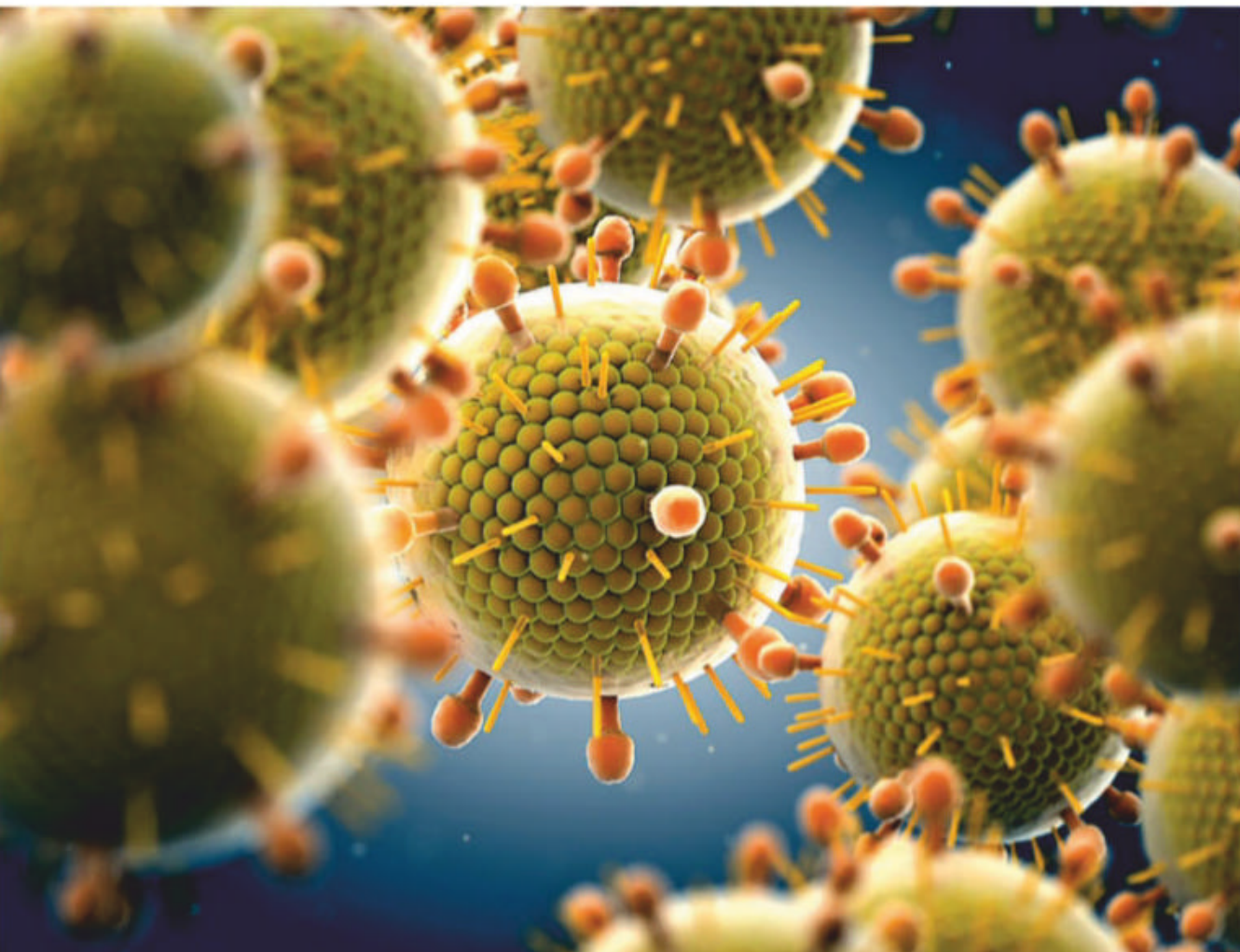
to dangerous outbreaks of whooping cough, measles and other preventable diseases.

To counter misleading and outright false information on vaccines, health experts must find better ways to explain to the public why we know that vaccines are relatively safe and helpful to society.

At present, pediatricians don't bring up the topic of childhood immunizations until the first week after

BY

BARBARA RATH



childbirth. That's the worst possible time for new parents, who have to worry about keeping their baby safe and well-fed, eliminating any potential dangers in the home and navigating opinionated grandparents—all while being sleep-deprived. In addition, health care systems often do not reimburse pediatricians adequately for lengthy consultations, which means that well-child visits are frequently too brief to get all questions answered. Research by the Vienna Vaccine Safety Initiative (ViVI) international think tank and the School of Design Thinking in Potsdam, Germany, confirms that the current timing of such talks reduces their effectiveness.

GIVE IT YOUR BEST SHOT The ideal time to discuss vaccinations with parents is during pregnancy, but most doctors do it the first week after childbirth, when parents can be most stressed.



A better time for doctors to discuss vaccines is during pregnancy, when parents are typically less busy and tired and therefore better able to ask questions, seek information and make up their minds.

To restore trust in vaccines and immunization, physicians need to reconsider how health care communication is organized. Developing a more effective way of sharing information with parents requires “design thinking”—a technique that emulates how a product designer approaches the development of a new tool by focusing on the ultimate consumer.

We used this technique at ViVI, looking closely at clinics and emergency rooms from the viewpoint of a patient, and found that time currently wasted in waiting rooms could be used for health education. Parents frequently come to the clinic

As vaccination rates drop, diseases that had almost been defeated are starting to make a comeback.

or doctor’s office with questions that could be answered before the appointment begins. New digital tools could help convey information about vaccines and immunization, allowing both patients and doctors to make better use of the office visit.

Vaccination records are another area that needs attention. A recent review showed that records are complex, are aimed at health care professionals and lack established international standards, which com-

plicates the lives of families moving between countries. Vaccination records can also be lost or destroyed, especially in times of medical emergencies or sudden dislocation.

But vaccination records offer a powerful way to help parents become equal partners with doctors in the health care of their children. To standardize patients’ immunization records, some countries are now routinely using the World Health Organization’s International Certificate of Vaccination, which parents typically keep and pass on to children as they grow up. The ViVI team took this development a step further by creating a mobile app, the VAccApp, that helps parents and older children update their vaccination records. The app also helps them learn about the purpose and timing of immunizations and keep track of vaccines administered to members of their family.

Studies show that users of the app were better equipped during office visits to ask questions and that their doctors received more accurate information from patients, compared with a group trying to recall immunizations from memory.

As vaccination rates drop, diseases that were almost extinct are starting to make a comeback. We must restore trust in scientific information and dispel myths about vaccinations to ensure the health of future generations. **M**

→ **Barbara Rath** is co-founder and chair of the Vienna Vaccine Safety Initiative. She is an honorary professor at the U.K.’s University of Nottingham School of Medicine, research director at the University of Bourgogne-Franche-Comté in France and board member with the International Society for Influenza and Other Respiratory Viruses.



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INNOVATORS:

**The
Creative
Class *of*
2019**

IN ASSOCIATION WITH

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INNOVATORS:

“Without change, there is no innovation, creativity or incentive for improvement,” said physicist William Pollard. “Those who initiate change will have a better opportunity to manage the change that is inevitable.”

That’s especially true in the 21st century, as accepted practices quickly become outdated and the mistakes of the past result in existential consequences. Success in 2019 means not only reacting to change but anticipating it. It means innovation.

In this special *Newsweek* feature, created in partnership with Ricoh, we’re saluting innovators who have developed creative solutions to the problems that face our world—pollution, economic disparity, war, discrimination and more. Who have leveraged heightened globalization, increased awareness and cutting-edge technology to make their dreams come true. These men and women aren’t just bringing new ideas to market, though. They’re shifting how corporations, institutions and entire governments do business.

Innovation often comes through experience: For Andrew Cooper and Alex Schulze of 4ocean, a post-college trip to Bali led to a groundbreaking plan to address the millions of tons of plastic dumped into the ocean every year. Frustration with the options available to her son sparked Mindy Scheier’s goal to revolutionize how the fashion industry serves disabled people. Tim Brown decided to launch his shoe company after playing as a professional soccer player in New Zealand.

Innovation can also come through adversity: Being raised in a small town in northern India inspired MacArthur “genius” grant recipient Manu Prakash to invent low-priced versions of essential scientific and medical tools. A harrowing attack led Nobel Prize nominee Amanda Nguyen to change the laws for sexual-assault survivors in America.

These individuals have been inspired to fundamentally change how we answer the basic questions of life: What secrets do our genes hold? How can we live more sustainably? What is the nature of the universe? They didn’t just have a vision. They had the determination to see it through. Say hello to the creative class of 2019.



Tim Brown

CO-FOUNDER, ALLBIRDS

As a professional soccer player in New Zealand, Tim Brown spent a lot of time in sneakers covered in flashy logos and bold patterns. So when he started Allbirds, a San Francisco-based shoe startup, in 2016, he wanted to keep things as simple as possible: The insanely comfortable kicks come in only a handful of muted colors and styles, and they retail for just \$95. (High-tops go for \$115.) “Humility is how we’ve approached the design,” says Brown. “We’re whispering when everyone else is shouting.”

It has proved to be a winning formula—Allbirds sold its millionth pair last March, and the company is worth upward of a billion dollars. Brown and co-founder Joey Zwillinger are also leading the way in sustainability, using renewable materials like merino wool and eucalyptus tree fiber. The soles on Allbirds’ new flip-flops are derived from sugarcane—and they’re giving its formula to anyone who wants to use it, free of charge: “We can’t wait for consumers’ tastes to change,” says Brown. “I believe businesses can be a force for good. Business 1.0 was about logos and brands. Business 2.0 is about authenticity and purpose.”

INNOVATORS:



MORGAN HIRSH

CEO, PUBLIC GOODS

Costco with a social conscience—that’s the idea behind Public Goods, Morgan Hirsh’s line of ethically sourced, environmentally friendly home and grooming products sold at cost online. “Our **obsession** is with quality, not price,” he says. “When price is the focus, companies tend to cut corners, and we’re not willing to do **that**.”

Insisting on eco-friendly packaging and nontoxic ingredients meant launching with just 10 products in 2017, instead of 100. Today, Public Goods offers about 75 essentials—everything from bamboo toilet paper to glass cleaner made with coconut and corn—and food items are on the way. So far, Public Goods has attracted 30,000 members, with high markups replaced by an annual \$59 membership fee. “The e-commerce giants want to carry everything, so they can’t stand for anything. We’re building a one-stop shop where you can actually trust what you’re getting is good.”



FROM LEFT: KENT ROGOWSKI/PUBLIC GOODS; COURTESY OF JOHN D. & CATHERINE T. MACARTHUR FOUNDATION; JULIAN BERMAN



MANU PRAKASH

BIOENGINEER

Growing up in India, Manu Prakash didn't have access to tools that would fuel his scientific curiosity. Now, as a professor at Stanford University, he's at the forefront of "frugal science": His inventions, including a 20-cent centrifuge, a paper microscope that folds up like origami and a way to track disease-carrying mosquitoes on your cellphone, aren't just saving lives; they're igniting a passion for science in young people the world over.

Katherine Lo

FOUNDER, EATON WORKSHOP

Katherine Lo is revolutionizing the hotel industry with Eaton Workshop, a concept that's part accommodation, part co-working space and part cultural incubator. "My generation is more fluid," says Lo. "There's a lot more connection between what we work on and our personal passions." The Eaton Workshop in Washington, D.C., houses a wellness center, a cinema and its own radio station, while the new Hong Kong outpost includes a food hall and yoga studio. (Workshops are also planned for Seattle, San Francisco and Toronto.) The hope is to attract creative spirits with a space that fuels social change, whether that's in the library (crammed with social-justice titles), the gallery (displaying political works from local artists) or even the front desk (where copies of LGBT-themed books banned in Hong Kong are available). "There's been a trend in companies that have a moral compass," she says. "We're not excluding anyone, but we're very clear about our progressive values."





Ethan Brown

CEO, BEYOND MEAT

Beef generates 11 times more greenhouse gases than wheat and uses 20 times the water. Enter Ethan Brown's Beyond Burger, which requires 99 percent less water than a quarter-pounder and just half the energy. The catch? This delicious whopper isn't made of cow—it's plant-based, with the look, taste and texture of red meat. (The patties even "bleed" beetroot juice.) Launched in 2016, Beyond Burgers are available at TGI Friday's, Whole Foods Market and thousands more restaurants and grocery chains, along with Beyond Meat vegan sausages and chicken strips. The reviews have been stellar—some 25 million Beyond Burgers have been sold to date—and Brown's "meat" is far lower in cholesterol than the real thing while still high in protein.

MINDY SCHEIER

PRESIDENT, RUNWAY OF DREAMS

Mindy Scheier realized how limited clothing options were for the disabled when her son, Oliver, wanted to wear jeans to school. Diagnosed with muscular dystrophy, Oliver usually just wore sweats that could fit over his leg braces. "No mainstream brand was including the disabled buyer," she says, "and the adaptive clothing that existed was medicinal, not stylish."

So Scheier founded Runway of Dreams, which educates retailers about designing for people with disabilities, one of the largest market segments in America, with a collective disposable income of about \$490 billion. "We show them they can adapt what they have with Velcro and magnets and enclosures," she says. Partnering with Tommy Hilfiger on a line of adaptive clothing in 2016 was a watershed moment. "It proved this was viable," Scheier explains. "Then came Target, and I got on Zappos Adaptive's advisory council. Nike has been incredibly supportive. It's really happening—and in not that long a time."





FROM LEFT: COURTESY OF BEYOND MEAT; JENNIFER PLAS; MICHAEL KOVAC/CONTOUR/GETTY



Yves Béhar

DESIGNER

As founder and CEO of Fuseproject, Yves Béhar is known for socially responsible design—a \$100 laptop for poverty-stricken children, a robot that keeps seniors company, a wearable sensor that measures exposure to ultraviolet rays. But the Swiss designer's newest idea really hits home: Tiny prefabricated houses that can be installed in your backyard. Ranging from 250 to 1,200 square feet, these “accessory dwelling units” cost less than \$300,000 each and aim to address California's affordable-housing shortage. Made from environmentally friendly materials, they take a day to build and can be customized to suit homeowners' tastes and the local climate. Béhar, who is also planning an ADU for under \$100,000, sees possibilities for them in suburban and farm areas too. But he knows he doesn't have all the answers: In 2015, he helped launch Spring, a startup accelerator that supports entrepreneurs looking to transform the lives of the estimated 250 million girls around the world who live in poverty. “If we keep [our values] in mind,” he says, “we can change the work that we do, the companies we work with, and eventually, together, we can change the world.”

INNOVATORS:

Temie Giwa-Tubosun

FOUNDER, LIFE BANK

Temie Giwa-Tubosun is fighting Nigeria's devastating blood shortage with LifeBank, an online brokerage that directly connects blood banks and hospitals. "We're like Amazon for blood banks," she says. "Once we have their order, we deploy it where it's needed, using motorbikes and trucks." Since beginning in Lagos in 2016, LifeBank has moved 11,000 pints and saved at least 2,500 lives. Giwa-Tubosun has already expanded into oxygen delivery and hopes to add vaccines and anti-venom.



TAKAAKI KAJITA

PHYSICIST

After proving neutrinos have mass, Takaaki Kajita, a physicist with the Super-Kamiokande observatory in Japan, was co-awarded the Nobel Prize in physics in 2015. "I wanted evidence that the oscillations of neutrinos and those of anti-neutrinos are different. This could be the first step toward the understanding of the emergence of matter in the universe," he says.

Now, Kajita and his colleagues, as well as other teams in the U.S. and Europe, are working to complete construction on a gravitational wave interferometer, which could help uncover the origins of heavy metals like iron and gold. "Gravitational waves are a new way to observe the universe," says Kajita, who joined the Kamioka Gravitational Wave Detector (KAGRA) project in 2009. "Black holes and neutron stars can be studied by observing these waves. It was clear they are very important."



FROM LEFT: COURTESY OF LIFE BANK; INSTITUTE FOR COSMIC RAY RESEARCH/THE UNIVERSITY OF TOKYO; COURTESY OF 40CEAN



ANDREW COOPER AND ALEX SCHULZE

FOUNDERS, 4OCEAN

It was a vacation to Bali that made Andrew Cooper and Alex Schulze realize how grave marine pollution had become. “The plane was landing, and I saw what I thought were big lines of seaweed,” recalls Schulze. “But they were actually little tide pools of plastic. The beach was just covered in plastic.”

Avid surfers, the two college friends founded 4ocean, a for-profit that recycles ocean plastic into bracelets that sell for \$20, with proceeds used to remove another pound of plastic from the water. Since January 2017, 4ocean has sold \$30 million worth of bracelets and dredged over a million pounds of trash. Their success, says Cooper, comes from creating a demand for the plastic, 8 million tons of which is dumped into the ocean annually. “We wouldn’t be where we are if we weren’t a private company that could scale up whenever we needed,” he says. “You have to find a sustainable business solution.”

INNOVATORS:



TANIA BRUGUERA

ARTIST - ACTIVIST

Visitors to the Tate Modern really have to work for Tania Bruguera's art: Dozens of people must lie down together to generate enough body heat to reveal a portrait of a Syrian refugee that's hidden in the floor. In another room, a compound pumped into the air literally brings museumgoers to tears in a show of "forced empathy," as the Cuban artist calls it. "More than ever, we have to work together, and instead of seeing fear, we should see migrants and refugees as people. I wanted to highlight the need to rethink how to feel [compassion] for others." Recently jailed for protesting Cuba's censorship laws, Bruguera says her art is intrinsically tied to her activism. "My art is inspired by injustice. Justice and freedom are the most beautiful feelings there are. Once you have experienced [them], you are transformed."



FROM LEFT: DANIEL LEAL-OLIVAS/AFP/GETTY; GARY GERSHOFF/WIREIMAGE/GETTY

George Church

GENETICIST

Having helped found the Human Genome Project, this Harvard Medical School scientist is gathering genomic data from thousands of volunteers and exploring gene therapy as a tool to fight diseases associated with old age. George Church's newest venture, Nebula Genomics, goes 23andMe one better—sequencing your entire genome for free. (In fact, you might get paid for it.) “No cost to consumers is feasible by harnessing the value to researchers,” he explains, “or to those paying for [gene therapy] for serious genetic diseases, which can average \$1 million per patient.” Up next: gene drives to eliminate malaria and Lyme disease, “multiplex editing” to make hundreds of gene changes per cell and “de-extincting” the woolly mammoth to help combat global warming.



INNOVATORS:

Jay Lin

LGBT RIGHTS ACTIVIST

The director of the Taiwan International Queer Film Festival, Jay Lin is also the founder of GagaOOLala, Asia's first LGBT streaming platform. "Many LGBT people in Taiwan stay closeted for fear of discrimination," he explains. "I hope that they can find stories [on GagaOOLala] that resonate." The service also has plenty of non-LGBT viewers. "Mostly, they come to be entertained by good movies, TV series and documentaries they can't see anywhere else. But many also watch to learn about the community."

He was also involved in recent efforts to legalize same-sex marriage. And while a referendum to amend Taiwan's civil code failed, the government plans to pass a new marriage-equality law this year. "Only if everyone enjoys the same universal rights, including the right to marry, can we overcome the obstacles ahead together," says Lin. "If the nation is divided into first- and second-class citizens, our future is bleak."





AMANDA NGUYEN

FOUNDER, RISE

After being sexually assaulted in college, Harvard grad Amanda Nguyen took on a criminal justice system she describes as “broken.” Launching the nonprofit Rise, she became the power behind the Sexual Assault Survivors’ Rights Act, which includes the right to not have a rape kit destroyed before the statute of limitations expires, the right to receive copies of police reports and the right to be notified of your rights. Its unanimous passage in 2016 “means equality under the law for all survivors,” says Nguyen. “[It] clears a path to justice in an otherwise complicated labyrinth of patchwork laws.”

Though nominated for a Nobel Prize, as a young woman of color, Nguyen is still sometimes discounted in the corridors of power. “But we are laser-focused and data-driven; we keep our heads down and continue our work. We’ve created 19 laws in 18 months, protecting nearly 40 million survivors. That keeps me pushing forward.”



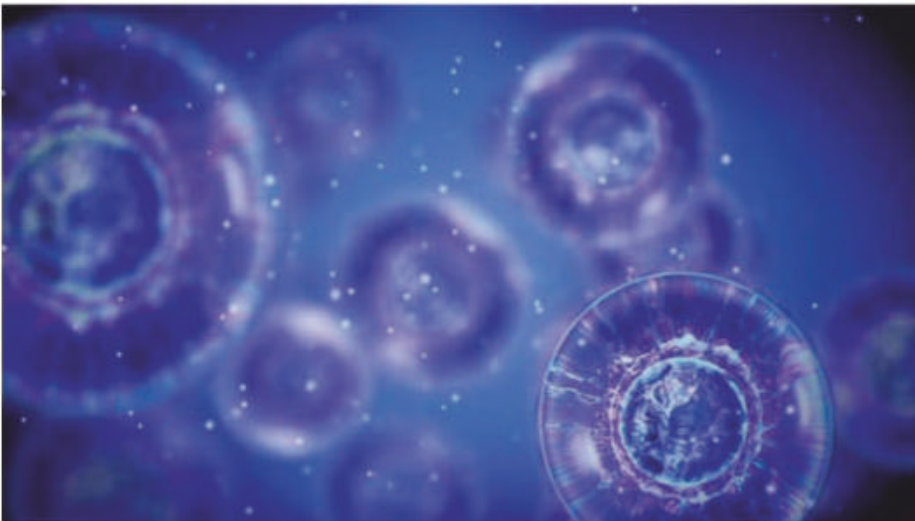
Shintaro Yamada

CEO, MERCARI

This former mobile-gaming entrepreneur is challenging eBay with Mercari, a marketplace app that topped \$1.1 billion valuation in 2018, becoming Japan’s first unicorn startup. Started in 2013, Mercari (“to trade” in Latin) boasts 10.5 million users in Japan, where it has generated 93 billion yen (\$850 million) in gross merchandise volume. Shintaro Yamada credits the app’s ease of use for its popularity: “All you have to do is take a picture of the item, fill in the description and tap a button.” The American market has been tougher to crack, but the company has brought on former Facebook Vice President John Lagerling to run Mercari U.S., which now boasts 100,000 new listings daily. Yamada’s goal is to build a global Mercari “ecosystem,” with members using their IDs for both online and offline payments. “We want Mercari to be a part of life for people from all walks of life...not just as a marketplace app, but in their everyday lives.”



THE NEW CATALYSTS FOR CREATIVITY



We're surrounded by screens feeding us an endless stream of information—emails, reports, monthly statements, maps, even entire books. Money changes hands electronically without the need for cash, checks or even credit cards. So, do we even need the printed page? Aren't pixels enough? Is printing dead?

Not even close. Printing as we know it has merely expanded beyond ink on paper. It now includes a host of new technologies and concepts that can give shape to almost anything imaginable and bring new solutions to design, health and the environment. Ricoh is an innovator in the printing industry and utilizes new technology and concepts—on-demand printing, environmentally friendly printing, printed building materials, printing on food, and even bioprinting human tissue—to help achieve the U.N.'s Sustainable Development Goals.

What role should printing fulfill in the future? Ricoh is working to answer this question by seamlessly integrating innovative printing techniques into everyday life—allowing for more personalization while lessening the detrimental impact of manufacturing processes. Its efforts to “ignite a revolution in manufacturing with printing technology” have focused on a few major areas in

which cutting-edge printing technology has the power to elevate the mundane and enrich everyday life, such as in the display printing of commercial goods and in applied printing, especially in the field of regenerative medicine.

In the area of display printing, digital printing has made on-demand printing cost-effective at last. It is no longer prohibitively expensive to print in small batches with short lead times. Now companies can keep up with the rapidly changing trends and rotating inventory of fast fashion rather than relying on the outdated methods of mass-producing garments with long lead times. This is equally true in the production of decor and building materials like wallpaper and flooring, where on-demand printing ensures that companies need only produce what they will actually use, reducing waste.

Billions of tons of wastewater from the dyeing of clothing pollutes water and soil. Tons of wallpaper and flooring materials are discarded in landfills as trends change. On-demand printing, which enables manufacturers to make only what they need, requires digitization.





But according to Ricoh's research, the digitization rate is less than 10 percent for production processes in the textiles and building markets. Promotion of on-demand printing will help control inventory and decrease the surplus inventory disposed of as waste. Ricoh's development of special ink that eliminates the need for a cleaning process that yields wastewater also addresses the issue of pollution.

On-demand printing isn't only good for the environment and the bottom line, it also encourages creativity. The threshold quantity for production and profit here is much smaller, encouraging the manufacture of one-of-a-kind designs at a reasonable cost.

In applied-printing technology, there are also dramatic new applications in the use of 3D printing technologies, especially for items such as cell tissue, bones and electronic components. Now 3D printing dramatically reduces the lead time and cost for these items. This is especially applicable to the field of biomedical engineering, where Ricoh is reimagining the future of regenerative medicine—making it a reality rather than science fiction.

Imagine repairing a patient's injury with fresh human tissue or replacing a damaged heart with a perfect replica—one that was printed using technology similar to an office inkjet printer. Ricoh sees its technology as contributing to the production of functional, transplantable 3D organs and it is dedicated to making this a reality. The technology already exists to bioprint layers of living human cells, and Ricoh has successfully collaborated with Osaka University in Japan to create 3D pulsating cardiac tissue.

The core technology used in Ricoh's inkjet printers is a high-precision droplet-by-droplet ejection system designed to output high-resolution images. By applying this technology to cells, it might be possible to develop a 3D bioprinter to output functional tissue, like building a house by stacking bricks.

"I am confident that the inkjet printer technology developed by Ricoh will contribute to the high-precision assembly of cells into genuinely functional tissue," says Manabu Seo of the Ricoh Institute of Future Technology.



Printing living tissue is not without significant challenges. Ricoh needed to modify the nozzle of the common inkjet printer to provide special conditions to allow cells to be printed like ink and in layers. In addition, the inkjet heads needed to eject the cells without using heat or other potentially damaging methods, and the cells had to be positioned into layers. Nevertheless, Ricoh was able to develop and combine these central technologies into working cells, and it is now working on improving the precision of the cell-dispensing mechanism so that fully functional organs can one day become a reality.

"The concept of bioprinting at first seemed extremely challenging," says tissue engineering expert Waka Lin. "But seeing the fast progress of 3D printing in general, printing cells is a promising idea whose time has come."

Ricoh is empowering digital workplaces by inspiring the creative class and bringing value to them with new ways of printing.

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By choosing to fight on steel and aluminum, Trump is giving China a pass on transformative technologies of the future—including artificial intelligence

BY BILL POWELL X ILLUSTRATION BY ALEX FINE



LI XIANGFU GREW UP IN A ONE-ROOM SHACK, LIT ONLY by a single bulb that dangled from the ceiling, in a desperately poor part of Henan province, about 500 miles from Beijing. His father, after losing his leg in an industrial accident, was unable to work. His mother toiled every day in the wheat fields.

When I first met Li, in the summer of 2001 on a long train ride through central China, his life was about to change profoundly. He was on his way home from Beijing's Tsinghua University—China's version of MIT—after graduating with honors. He was about to start his first job after college, as a software engineer for a company then little-known in the West: Huawei. Founded in 1987 as a manufacturer of phone switches, Huawei was one of hundreds of suppliers to what was then the country's sleepy, state-owned telecommunications industry.

Li has thrived in the nearly two decades since; he is now a

senior vice president, directing a team of software developers in the emerging field of artificial intelligence, or AI. So has Huawei. The Shenzhen-based company has emerged as a leading player in the transformation of China from a low-wage manufacturing country to an industrial and technological power. It now sells more smartphones than Apple. It provides equipment that undergirds the internet and other telecommunications systems in China and throughout the developing world. And it's a leading player in the rollout of 5G telecom networks that will connect everyday appliances, tools and objects into an "internet of things."

Last August, Huawei became the first global technology company to release a so-called AI chipset—a range of computer chips that enable smartphones to use techniques of artificial intelligence for recognizing faces and other objects in digital images and interpreting natural language at very high speeds. The announcement

demonstrates the stunning pace with which China has transformed itself from an impoverished economic backwater to a technological superpower. It's also the latest sign of China's growing ambition to exert its influence in this technology, which seems poised to transform our daily lives and reshape global commerce.

MISDIRECTED
The U.S. has slapped tariffs on steel, at right, while China's behavior in high-tech industries gets a pass. Left, from top: A Huawei store in Shenyang; Huawei devices on display at the Mobile World Congress 2017 in Barcelona, Spain.

China's ambitions have begun to cause some consternation in Washington, D.C., and Silicon Valley. In

2018, Beijing announced its Made in China 2025 plan to become a dominant player in aerospace, robotics, computer chips, biotechnology and other high-tech industries. It's the latest in China's increasingly aggressive approach to bolstering its domestic high-tech industries. As a price of doing business in China, Beijing is imposing onerous requirements on foreign companies to give up intellectual property, manufacturing know-how and control over their investments. It initiates cyberattacks on Western companies aimed at stealing trade secrets. And, in the case of Huawei, the government hides its close relationship with Chinese businesses through murky ownership structures, critics say.

For years, Washington had been content to downplay Beijing's alleged abuses because U.S. firms wanted access to its vast and quickly growing market. As long as Beijing continued to reform itself economically, the relationship was seen as a win-win. That logic no longer seems to apply. For one thing, China's economy is no longer growing at the breakneck speed of the past. And President Xi Jinping has slowed the opening of China's markets and in some areas reversed it. According to a report by the Council of Foreign Relations, the Made in China 2025 plan represents an "existential threat to U.S. technological leadership."

An existential threat might be reason enough for the U.S. to get



CLOCKWISE FROM BOTTOM LEFT: DAVID RAMOS/GETTY; VCG/GETTY; CHINA PHOTOS/GETTY



tough with China. Indeed, a full-scale trade war is now underway between the two nations. President Donald Trump has slapped 10 percent tariffs on \$200 billion worth of Chinese-made steel, aluminum and a wide range of other goods. If the current round of negotiations with Beijing, which began January 7, fails to produce a deal on trade, Trump says he will increase those tariffs to 25 percent in March.

In response, China increased its own levies on a wide range of U.S. imports and cut back on purchases of soybeans and other agricultural products. At the same time, high-profile companies that produce goods in China for sale there, such as Apple Inc., are now suffering as customers shun U.S. brands (see Page 44).

The trouble is, Trump is fighting the wrong war. His tariffs ignore the growth industries that will have a far more significant effect on the future prosperity of advanced nations. By punishing China for steel exports, he's letting Beijing off the hook for egregious behavior toward American high-tech that

“No other country can match the combination of scale and speed at which things are happening in China.”

could prove extremely damaging in the long term.

As the March tariff deadline looms, the Trump administration has a chance to confront China's anti-market industrial policies aiming to dominate technology at the expense of other nations. Doing so would dial down the risk of a ruinous trade war and, some Beijing economic reformers say, could lead to meaningful domestic reforms. These developments would be in everyone's interest, including China's.

But the White House has yet to fashion anything close to a coherent strategy to address Made in China 2025. “The next wave of technological disruption and technological promise, led by AI and 5G, is upon us,” says Lee Kai-fu, the former president of Google in China, who now runs his own venture capital firm (see Page 36). “As far as I can tell, no one in the U.S. government has much of a clue about how to help shape these powerful forces.”

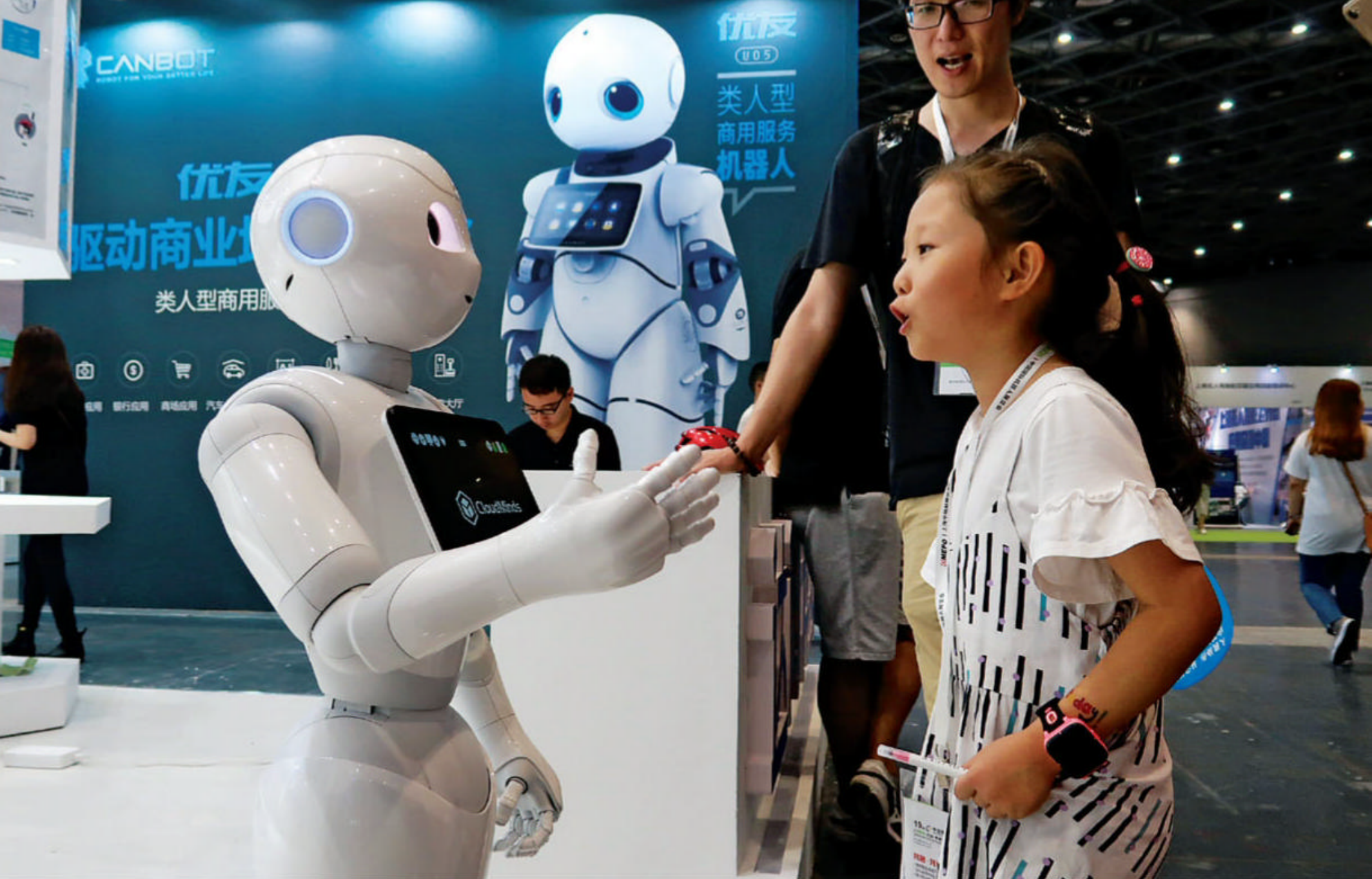
The Rise of Techno-Nationalism

CHINA JOINED THE WORLD TRADE ORGANIZATION in 2001, the same year I met Li on the train. It was a historic landmark that symbolized the country's return to the global economy. The rest of the world, led by the U.S., had worked hard to make accession

happen, believing that welcoming a country as vast and with the potential of China into a rules-based trading regime would be good for all. From that year on, China's extraordinary economic rise accelerated at a rate few foresaw. It is now the world's second-largest economy and on track to surpass the U.S. as No. 1 in a decade or two. Upon joining the WTO, China started opening its economy to investment and trade, and it promised to continue.

Under Xi, those promises were stillborn. Things got worse in key areas

of the economy, including telecommunications, computing and aerospace, where Beijing promoted domestic companies. Foreign applications for patents in what China believes are “strategic industries,” such as oil and gas, alternative energy and pharmaceuticals, are now denied at a markedly higher rate than are patent applications in nonstrategic sectors, says Marc Cohen, director of the Berkeley Center for Law and Technology, and the divergence is accelerating. When the American Chamber of Commerce in China surveyed business conditions in that country in 2017, 60 percent of its member companies, citing extensive and accelerating



protectionism, said they have little or no confidence that China will further open its markets in the next few years.

Since China joined the WTO, U.S. multinationals hoped Beijing's demands for the transfer of technology to local joint-venture partners—standard operating procedure in the early years after the economic opening—would diminish as Beijing's economy matured. If anything, the opposite has happened: China started demanding that foreign firms transfer ever more critical technologies to local Chinese partners—something about which the Trump administration, to be fair, has complained bitterly to Beijing.

Made in China 2025, announced at a moment of mounting frustration for U.S. and other foreign companies, imposes burdensome requirements. Foreign multinationals must move manufacturing and assembly facilities to China and collaborate with their future competitors, often as a minority joint-venture partner. "Implicit" in the document, says former U.S. Trade Representative Michael Froman, "was that they intend to achieve global dominance in these sectors and will do so, if need be, with significant state involvement, from outright subsidies to emerging industries to protection of Chinese 'national champions' from foreign rivals."

At the same time, as a report by Katherine Koleski, a policy analyst at the U.S.-China Economic and Security Review Commission in Washington, put it, "China has been leveraging the openness of the United States and other market-based economies to gain access to advanced research and data, acquire and invest in leading-edge firms through Chinese state financing, and freely sell their products and services abroad. The scale and volume of government resources directed toward these [efforts] severely limits the ability of foreign firms to compete fairly in China's market."

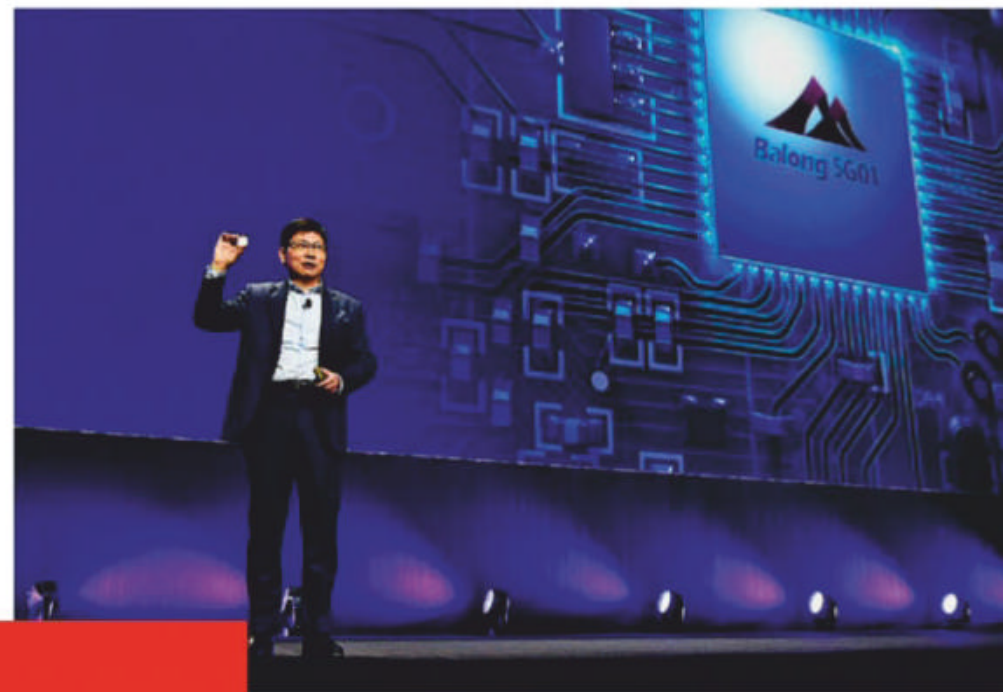
Trade experts call China's policy "techno-nationalism." The government is now more directly involved in moving resources—"massive state funding," Koleski calls it—to favored economic sectors. In AI alone, the central government says it will spend \$2 billion on a technology park devoted to research and development in Beijing.

Several provinces have followed suit, with parks of their own in Chengdu, Guangzhou and elsewhere. As Lee Kai-fu notes, Beijing is "turbocharging through a flood of new funding, including subsidies for AI startups and generous government contracts to accelerate AI adoption throughout the economy."

At the center of Beijing's desire to

FUTURE TAKE

China's aggressive plans to become a dominant player in aerospace, robotics, computer chips and biotechnology have caused some consternation in Washington. Clockwise from opposite top: An AI robot in Shanghai; Pand-Auto's driverless electric cars; Huawei CEO Richard Yu.



The Made in China 2025 plan represents an "existential threat to U.S. technological leadership."

dominate key technologies is the computer chip—the primary component of the modern economy. At present, U.S. firms, such as Intel, Qualcomm, AMD and Nvidia, lead the global chip industry. China consumes 50 percent of the world's semiconductors, but 80 percent of those purchases come from foreign suppliers. That's why, of the 991 mergers and acquisitions in the global chip sector from 2014 to 2016, one-third

involved China; over the next decade, according to state-owned media, Beijing intends to spend \$160 billion on its indigenous industry.

AI is the key to leapfrogging the West in chips. Beijing wants other Chinese firms to replicate Huawei's success in developing revolutionary chip designs that power deep neural networks—a branch of machine learning that is key to many AI applications. They're used in driverless cars and computers that can parse the written and spoken word and recognize faces and other objects in digital images. Indeed, Made in China 2025 calls specifically for developing neural-network chips that are 20 times better than Nvidia's M40 chips, a current staple in AI applications. In July, Chinese internet search giant Baidu announced that it was developing its own machine-learning chips, and Huawei is working with Chinese firm Cambricon on AI chips for phones.

Huawei's competitors and critics believe the company's rapid development has been the result of intellectual property theft, in explicit violation of WTO rules. Cisco sued Huawei back in 2003—a suit that was eventually settled—and Canada's Nortel Networks believes China hacked its systems and stole key technology that ended up benefiting Huawei. At least one former Nortel Networks executive believes that led to the company's eventual bankruptcy. Huawei denies these allegations and cites a lack of

GO FOR BROKE

Much as a Russian satellite launch in 1957 started the space race, a match between a computer program and a teenager galvanized China's dash to AI domination

Lee Kai-fu, the former president

of Google China and now a prominent venture capitalist in Beijing, remembers the scene well. Sitting in his office on a spring day two years ago, in an area of town known as the Silicon Valley of China, he, like millions of other people throughout the country, was glued to the television. On the screen, a gawky teenager in square black-rimmed glasses was squirming uncomfortably.

The young man was Ke Jie, and, as Lee jokes, he seemed an unlikely hero “to make humanity’s last stand.” But there the 19-year-old was, playing a game of the ancient Chinese board game Go. His opponent? A computer named AlphaGo, powered by an artificial intelligence program from a British startup, Deep Mind, that Google had acquired.

Go is believed to be the oldest board game, invented more than 2,500 years ago. Played on a 19-by-19-inch square board, it involves two players, one with white stones and the other with black, who try to encircle each other’s pieces. Fans call the game far more sophisticated than chess, imbuing its players with

“a Zen-like intellectual refinement and wisdom,” as Lee puts it.

Ke was a prodigy: He had started playing professionally at 10 years old, and by the time of the AlphaGo match, he was widely considered the best in the world. But in the Google event, with most of China watching, he was getting demolished by a machine, losing three straight games.

It was, as Lee describes it, China’s Sputnik moment. The reference is to the 1957 satellite launch by the Soviet Union, which stunned Americans. Their Cold War adversary had

done something technologically that the U.S. was still attempting. It led to the creation of the National Aeronautics and Space Administration and President John F. Kennedy’s pledge that the U.S. would put a man on the moon by the end of the 1960s. The space race was on.

Among Lee’s colleagues in China’s technology community, the effect of Ke’s loss to AlphaGo was similarly galvanizing. That the program had been designed in the West was both a “challenge and an inspiration,” Lee says. Now, the AI race was on.

application. All the government resources pushing AI may not be invested efficiently, but the fact that everyone from China's tech powerhouses—Huawei, Alibaba, Baidu—to individual entrepreneurs are pouring private money into the field virtually guarantees its significant growth.

That's true in part due to what's happening in the AI industry globally. For decades, computer scientists at universities and in the private sector have pursued AI, but progress has been plodding. An IBM-designed computer named Deep Blue shocked the world in 1997 by defeating Garry Kasparov, then world chess champion, but the program "had few practical applications," says Lee, who studied AI at Carnegie Mellon University in the 1980s.

AlphaGo's victory, however, promises to be transformative. The program runs on what is called "deep

learning," which can beat humans at key, cognitive functions, including identifying faces and speech. As Lee writes in his new book, *AI Superpowers*, the "revolution" had looked to be about five years away. "That's no longer true," he says.

The key to the revolution is massive amounts of data and the computing power needed to process it. That exists: The average smartphone has more processing power than the computers that helped send Neil Armstrong to the moon in 1969, when the U.S. made good on JFK's pledge. The data "trains" the deep-learning programs to recognize patterns, and massive computing power allows the program to sort through the data at high speeds.

Until China's Sputnik moment, almost all the important research in the field took place in the U.S., the U.K. and Canada. The industry's key research papers were written a full decade before Ke faced off against AlphaGo. But Lee and others believe the era of fundamental innovation in AI is now over; the future will belong to the companies and countries that can best put innovations to work.

As China demonstrated after its economic opening to the West some 40 years ago, it knows how to play catch-up in a hurry. And its massive entrepreneurial class is pragmatic and effective in learning how to build businesses out of technological innovation. Critically, in the mind of many analysts, China's huge digital universe—where hundreds of millions of Chinese citizens spend a good chunk of their time every day—creates and captures oceans of new data about the real world, as Lee writes in *AI Superpowers*. Lee is not alone in believing that as AI moves into the era of "implementation," it will be a advantage China. —BP

THE RACE IS ON

When champion Go player Ke lost in three straight games to a machine, with all of China watching, it was the nation's Sputnik moment.

In the two years since, both the Chinese government and private entrepreneurs have poured money into the field. Private investors alone sunk \$4.5 billion into AI in the five-year period ending in 2017. By the end of that year, China's venture capital investments made up 48 percent of AI venture funding globally. It was the first time China had surpassed the U.S. in total investment.

The Chinese government's goals are explicit: By 2030, it wants China to be the center of the AI universe, leading in theory, technology and



publicly available evidence to substantiate them.

The U.S. intelligence community is deeply wary of Huawei; it suspects that Huawei's computer chips contain hidden "backdoors" that allow Beijing to hack networks built with Huawei equipment. As a result, Washington has blocked the company from investing in the U.S. The suspicions that have long followed Huawei now infect wide swathes of the U.S.-Chinese trading relationship.

Yet whether China and its key firms may have cheated to help get where they are today is irrelevant, some tech executives now say, when it comes to what's next. Lee Kai-fu argues flatly that the climate for entrepreneurship in artificial intelligence is more favorable in China than in Silicon Valley. Yes, the pioneers of deep learning are still mainly in the West, but, in his new book, *AI Superpowers*, Lee

"As far as I can tell, no one in the U.S. government has much of a clue about how to help shape these powerful forces."

argues that Chinese engineers are further ahead in working to make these advances into commercial realities. That's similar to the early days of electricity in the United States, when "thousands of engineers began tinkering, using it to power new devices and reorganize industrial processes," Lee says. At the moment, China simply has more AI "tinkerers" than anyone else.

That's partly a result of an influx of venture capital. Rather than relying on government bureaucrats to pick winners, Beijing is instead making funds available to venture capitalists and other investors. In 2017, Chinese firms raised \$5 billion in venture capital funding, more than U.S. firms, according to ABI Research. To be sure, that is also partly a function of China's size, which is an advantage going forward. "The key is the combination of the scale and the speed at which things are happening," says venture capitalist Gary Rieschel, founder and managing partner at Qiming Venture Partners, a Seattle-based firm. "No other country can match it."

If these fears about China sound familiar, that's because a similar hysteria gripped Washington in the late '80s and early '90s over the rise of Japan as a technological superpower. Indeed, not everyone is convinced that China will make good on its plans to dominate AI. China's universities, outside of a handful of elite institutions, are second-rate at best compared with those in other developed nations. The country has relied on Chinese nationals, educated abroad, to fill critical knowledge gaps at domestic companies. China's goals may stretch the nation's elite researchers, computer scientists and programmers.

"Just because Xi Jinping wishes for something to be so doesn't mean it will be," says Derek Scissors, an economist at the American Enterprise Institute in Washington who specializes in Chinese economic policy. Still, even the possibility of China's ambitions being realized demands a coherent policy from the U.S.

A Distracted U.S.

FROM WHAT WE'VE SEEN SO FAR, THE TRUMP ADMINISTRATION IS incapable of crafting effective policies to deal with the technology threat. Instead, it has been implementing an "agenda that concentrates on preserving heavy industry—steel and aluminum—through tariffs and currency complaints," says Jim McGregor, a former head of the American Chamber of Commerce in China and now a Shanghai-based consultant at APCO Worldwide. "These are policies better suited to the 1950s."

The driver of these White House policies is Trump himself. For decades, he has been a protectionist who believes in the power of tariffs to bring trading partners to heel. He won states in the indus-





trial Midwest by promising to protect workers in metal-bending industries. Tariffs against China are another campaign promise kept—whether or not they constitute smart policy. His goal, Commerce Secretary Wilbur Ross has said, “is to increase the pain on China to the point where they’ll find it less painful to trade fairly.”

Although two of Trump’s trade advisers—Peter Navarro and Ross—are outright protectionists, National Economic Council Director Larry Kudlow and Treasury Secretary Steve Mnuchin (who comes from Goldman Sachs royalty) are bona fide free traders. The media often depict U.S. Trade Representative Robert Lighthizer (see Page 42)—now the lead negotiator with Beijing—as a protectionist ally of Navarro and Ross. But he was one of the earliest voices warning about aspects of China’s trade policies, including intellectual property theft and forced technology transfer; this was back when he was an attorney at Skadden, Arps, Slate, Meagher & Flom. These three agree that China has been engaging in predatory technonationalism and believe the U.S. must design policies to counter it.

How exactly should the administration fight the techno-war, beyond the blunt instrument of tariffs? The first step, say many current and former diplomats, should be an intense effort to rally allies to the cause; to the extent that China violates international norms in pursuit of technological dominance, it doesn’t just hurt the U.S. If Washington can effectively paint Beijing as an outlier when it comes to international trade rules, it can isolate China, forcing it to confront a central question: Is it, or is it not, a responsible stakeholder when it comes to the international trading system?

PROMISING START
 Joining the World Trade Organization signaled China’s return to the global economy. Clockwise from above: the WTO’s Mike Moore, Qatar’s Sheikh Yusef Hussein Kamal and China’s Shi Guangsheng at the signing ceremony in 2001; a U.S. soybean farmer; Beijing.

The administration has shown signs of progress on this front. Last year, Lighthizer wrapped up negotiations on NAFTA with Canada and Mexico in part so he could, as one White House economic official put it, “clear the decks on the other trade issues and concentrate on the main event: China.”

Then, in late December, the U.S. Justice Department brought charges against two individuals, Zhu Hua and Zhang Shilong, associated with China’s Ministry of State Security, charging them with cybertheft of intellectual property across a range of industries. The two individuals were part of a larger state-directed hacking group called APT10, according to the indictment. Since not only U.S. companies were targeted, U.S. intelligence agencies shared information on the case with a wide group of allies.

When the indictments came down, Germany, Japan, the U.K. and others all issued strong statements of support and condemned the alleged Chinese practices in the process—exactly the sort of one-for-all, all-for-one diplomacy most experts believe is necessary to combat China on trade. As Adam Segal, senior fellow at the Council on Foreign Relations, wrote, “The synchronized statements show that the Trump administration has tapped into deep international frustration with China’s behavior.”

The second step in a tough, effective policy, many analysts argue, would be to bring economic sanctions from both the U.S. and its allies against those Chinese companies that benefited from the intellectual property theft—including, in particular, state-owned companies. U.S. intelligence agencies have shared with allies a long dossier on the identities of the Chinese beneficiaries.

No sanctions were forthcoming. According to administration sources, Mnuchin successfully argued that to bring sanctions before the resumption of the trade talks in early January would scuttle their chances of success. For the moment, the administration would simply “name and shame” the Chinese officials involved in the alleged cybertheft.

What Do We Want From China?

THE EPISODE RAISED A CRITICAL QUESTION FOR THE TRUMP administration: Regarding trade, what does it want from China? The administration needs to be clear, to itself and to Beijing, what it is trying to achieve. To date, it has not come close to doing so. Does Trump, as some suspect, simply want a big reduction in the bilateral trade surplus, which now stands at \$375 billion? Does he also want China to take more significant measures to open its

markets? Does he—as Navarro has suggested—want to disrupt global supply chains in the hope of bringing back manufacturing jobs to the U.S.? Does he seek to deter China from implementing its 2025 plan? Or is it all of the above?

Beijing wants to know too. Since their re-opening to the world in the 1970s, the Chinese have been fairly pragmatic negotiators. Prior to Trump’s meeting with Xi in 2017 at Mar-a-Lago, a Chinese trade official told one of his American colleagues, “We want to be able to give the President [Trump] some tweetable deliverables.” The trade official never got an answer.

If, as some administration officials now whisper, the goal is to counter China’s by-any-means-necessary desire to dominate the high-tech industries of the future, getting the U.S. business community on board for a frontal assault on China’s industrial policies is also critical. Key aspects of Beijing’s policy—most notably forced technology transfer—are expressly forbidden in the accession document

TOUGH TALK

The U.S. might persuade China to change its trade practices by focusing on “enforceable reciprocity.” From left: Trump and Xi hold talks at Mar-a-Lago in 2017; Commerce Secretary Wilbur Ross; cars ready for shipment at the Lianyungang Port in May 2018.



Beijing signed in 2001 to join the WTO. But to date, China has been able to violate its obligation with seeming impunity because U.S. companies are reluctant to provide detailed evidence of WTO violations to the U.S. government for fear that Beijing will retaliate. The huge and growing Chinese market has been too valuable to too many multinationals for much evidence to emerge.

How could the U.S. persuade China to change its practices, without invoking retaliation? Several sources interviewed for this story answer with one of Trump's favorite words: *reciprocity*. "Our negotiations should be judged by enforceable reciprocity," says McGregor, "by which I mean China will be judged by its real actions, not its promises. For market access and cross-border investment, what is not allowed in one country will not be allowed in the other."

To this end, Washington has intensified scrutiny of China's direct investment in the U.S., particularly in technology. That has led to a sharp drop in the amount of money coming in from Beijing.

Trump, says Michael Froman, needs to prod allies to do the same—and to keep up the pressure until there is clear evidence that Beijing is reducing its own restrictions on foreign investment and access to its market.

Focusing on industries in which state-owned companies serve as piggy banks for the ruling Communist Party—and benefit from China's illicit policies—would get Beijing's attention. That's why trade hawks were so disappointed with the lack of sanctions after the December indictments. It wasn't the first time it happened. Scissors says the Chinese "freaked out" last year when the administration targeted ZTE, a state-owned telecommunications firm, for alleged sanctions-busting in its trade with North Korea. When U.S. suppliers to ZTE complained, the U.S. backed off its sanctions threat.

That's the kind of incoherence that plagues U.S. policy as the administration again engages China in talks aimed at resolving the trade dispute—before the higher U.S. tariffs go into effect in March. But the U.S. still has some leverage: Recently, a lot of political gossip has been coming out of China that elites in the Communist Party are not happy with the current state of affairs, including the trade conflict, which appears to be slowing and weakening the Chinese economy. These rumors suggest that Xi might move sooner rather than later to try to defuse the trade issue. Already, China has said it




If the Trump administration were smart, it would seize the moment and present some proposals meant to counter China's anti-market industrial policies.

is willing to amend Made in China 2025, has drafted new rules governing foreign investment and has reduced tariffs on foreign auto imports.

If confronted simply by the threat of even stiffer across-the-board tariffs, Xi would lose face by backing down. But if the Trump administration were smart, it would seize the moment and present some proposals meant to counter anti-market industrial policies aimed at creating dominant technology players at the expense of global competitors.

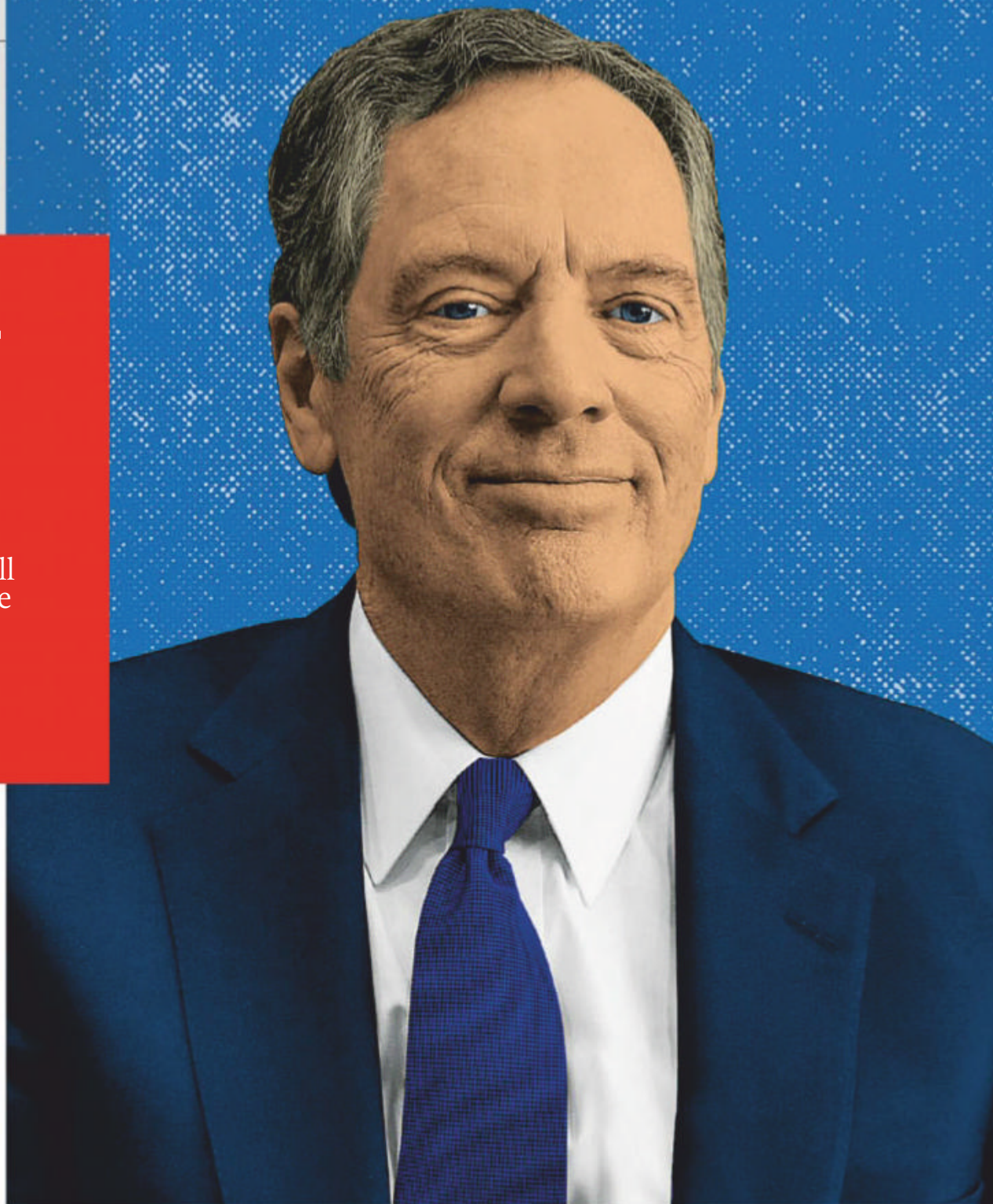
The moment is fraught, though. In early December, Huawei's chief financial officer, Meng Wanzhou, the daughter of company founder and Chairman Ren Zhengfei, was arrested in Canada at the behest of the United States, which seeks her extradition. The Justice Department suspects Meng helped direct a scheme to ship sanctioned high-tech products to Iran via Hong Kong. The arrest only added to the deeply toxic atmosphere between Washington and Beijing. Huawei and the questions that swirl around it—its rise, its tactics, its ambitions—are very much at the center of that deteriorating relationship.

I tried, in reporting this story, to get back in touch with Li Xiangfu, to see what he thought of all that had happened and was happening now. When I first met him, his story spoke to the hope and optimism of the new China. He was a decent, smart kid doing all the right things. He got a good job with a promising company in a booming economy. He was going to buy an apartment for his poor parents (which he did). He was the embodiment of what has come to be called the China dream, which seemed similar to the American dream.

What a time that was, the summer of 2001. So long ago. These days, I figure it's probably not wise for a Huawei executive to speak with an American reporter. I never heard back from him. 

TARIFF MAN

Robert Lighthizer is Trump's brain on trade. Will his tough-talk, no-nonsense approach resolve a trade conflict with China—or crater two of the world's largest economies?



On Donald Trump's first visit to

Beijing as president in late 2017, as trade tensions with China were building, the Chinese laid the hospitality on thick. There were tours of the Forbidden City, visits to museums housing priceless antiquities and elaborate banquets with President Xi Jinping and the rest of the Chinese leadership. When it came to substance, Beijing signed letters of intent for deals with U.S. companies ostensibly worth \$250 billion, and Xi pressed Trump on the value of a series of high-level, biannual talks between Washington and Beijing known as the “strategic and economic dialogue.”

Robert Lighthizer, along for the visit as Trump's U.S. trade representative (USTR), was not happy. Begun during the George W. Bush administration and continued under President Barack Obama, the SED, as it became known in Washington, was exactly the sort of open-ended gabfest that Beijing loved and Lighthizer loathed. He believed these sorts of confabs were designed to string the U.S. along and avoid dealing with the trade problems

at hand. “Strategic and economic bullshit,” he once called it. After the second day of talks, Lighthizer met with Trump privately. “You’re being played,” he told the president, according to multiple White House sources. The assessment jibed with Trump’s gut instinct as well; he reassured Lighthizer that he would keep trade as the focal point of discussions with Beijing moving forward. Ever since that visit, Lighthizer has become the most influential voice in Trump’s ear when it comes to what is arguably the administration’s most pressing issue: trade relations with the world’s second-largest economy.

To the dismay of Wall Street and

much of establishment Washington—neither of which wants to see trade with China seriously disrupted—Trump’s inclination is to be tough on Beijing. Policy wonks in both parties love to deride Trump’s “instincts” as the impulses of an accidental, know-nothing president. Lighthizer’s presence at his side makes that a far more difficult argument.

As far back as 2010—well before trade tensions with China consumed Washington—Lighthizer wrote a lengthy, scathingly detailed and (so it happened) largely prescient piece for the U.S.-China Economic and Security Review Commission, a group mandated by Congress to present an annual

LIGHTHIZER BY TEPHANIE LECOCQ/AFP/GETTY

report on the security aspects of Washington's economic relations with the People's Republic. He lampooned the wildly rosy assessments of what China's accession to the World Trade Organization would mean for the U.S. economy—and for manufacturing workers in particular. He pointed out the various policies in Beijing that distort trade, penalize foreign companies and tilt the playing field in China toward homegrown companies. He warned of industrial policies that were designed to promote the development of Chinese technology, again at the expense of foreign competitors.

Today, this is standard fare for the policy mills in Washington; seminars and conferences abound at places like the Center for Strategic and International Studies or the Brookings Institution mulling what to do about trade with China. Remarkably, there is now widespread consensus at least around the Trump administration's—which is to say, Lighthizer's—diagnosis of the problem. “[It] has quite fairly identified a series of problems in the [trading relationship] with China,” acknowledges William Reinsch, a former Clinton administration official who's now a senior adviser at CSIS. How to best respond is another matter.

When Trump appointed Lighthizer, the free trade purists—principally the Fortune 500 and their lobbyists, as well as powerful agriculture interests—knew they had a challenge. In their view, he's a protectionist hack: Lighthizer worked for years as a trade lawyer at Skadden, Arps, Slate, Meagher & Flom, the prominent Wall Street law firm where he represented American steel producers in a variety of cases involving unfair trade practices by foreign countries, such as dumping goods below cost in the

U.S. market. Critics saw him taking the book of the old clients who made him wealthy. And since Trump is a protectionist, they argue, Lighthizer is abetting his boss's worst instincts—and risking an ever more damaging trade conflict between the world's two financial powers.

The caricature mildly amuses Lighthizer, because he came to his “trade hawk” status through one of the most politically conventional paths imaginable: His first tour in government was as a staffer on the Senate Finance Committee under Bob Dole, the mild-mannered Republican from Kansas who ran against and lost to Bill Clinton in 1996. He then went to work as a deputy at



POLICY WONKS LOVE TO DERIDE TRUMP'S “INSTINCTS” AS THE IMPULSES OF A KNOW-NOTHING PRESIDENT. LIGHTHIZER'S PRESENCE MAKES THAT MORE DIFFICULT.

the agency he now runs, the USTR, during the Reagan administration. He was recruited by—and reported to—another milquetoast moderate, former Tennessee Senator Bill Brock, and served an administration headed by one of the most pro-free trade candidates of the 20th century.

Lighthizer considers himself a “rock-ribbed Republican” who believes in free trade, he says. “Always have,” he's said. Like Reagan, however, he is not dogmatic about it. Born and raised in Ashtabula, Ohio, he saw a vibrant steel industry, the cornerstone of the region's economy, get decimated by offshoring in the 1970s and '80s. Lighthizer's willingness to deviate

from Republican trade orthodoxy, he says, stems from getting “hit in the head by reality.”

During his first tour at the USTR, the major trade problems came from Japan. Both formal and informal trade barriers made Japan all but impenetrable to imports. At the same time, it built competitive companies in key industries, flooding American markets with automobiles, steel and semiconductors. U.S. companies were getting crushed by Japanese competition back then. Dogmatic free traders seemed to think the best course was to “sit back and take it,” as Clyde Prestowitz, a former Reagan-era Commerce Department official, puts it.

But Reagan was willing to use a powerful tool Congress had given the executive branch in 1974: the ability to bring unilateral trade action against foreign competitors thought to be unfairly injuring domestic competitors, bypassing what was then known as the General Agreement on Tariff and Trade, the forerunner to the WTO. Lighthizer was central to putting together these so-called “super 301” cases (named after the section of the 1974 trade law) against Japan. They threatened tariffs on Japanese-produced goods in order to provide relief to a range of U.S. industries, including semiconductors and satellites.

The moves infuriated Tokyo—its trade minister at the time decried Washington's “Mafia tactics”—but they got Japan's attention. In semiconductors, for example, the U.S. and Japan agreed to a series of measures that would increase over time Japan's purchase of American-made computer chips, while also implementing a complex pricing mechanism that was intended to prevent Japanese “dumping” of chips in the

U.S. market (that is, selling them below cost). The U.S. separately pressured Japan's car industry to assemble automobiles in the U.S. rather than export them, which would create jobs in the U.S. and reduce the bilateral trade deficit with Tokyo. Today, there are 24 Japanese car plants in the U.S.

As far as Lighthizer was concerned, the exceptions to the Reagan administration's pro-trade policies were effective. His critics have said because Japan, a key U.S. ally, did a series of trade deals with Washington to help defuse a bigger crisis, Lighthizer is naïvely assuming China—emphatically not a U.S. ally—will do the same.

He declines to compare the two situations, but USTR staffers and people who have worked with Lighthizer stress that he's anything but naïve. He understands that the case of China is more complicated than Japan was in the 1980s. He has said the key to a successful trade deal is to know "where the leverage is," and in this case he believes it's keeping the pressure on China at a time when it is arguably more economically vulnerable than the U.S., given its rapidly slowing economy.

"That doesn't mean he's slaphappy about tariffs and the risks they pose to U.S. business and the stock market," says a source who sees Lighthizer almost daily. Nor is he necessarily "all about the bilateral trade deficit." The key longer-term issue, as the USTR has laid out in its 301 complaint about China, is persuading Beijing that there will be significant consequences if it tries to build national champions in key high-tech industries at the exclusion of foreign competition, via state subsidies, intellectual property theft and forced technology transfer from the

U.S. and other developed countries. If doing so inflicts some economic pain in China (thanks to tariffs) and limits Chinese direct investment in the U.S. while also causing U.S. stock investors to head for the exits in fear of a trade war, Lighthizer appears to be fine with that.

Trade experts, such as Reinsch, say that tack risks disaster. "The question is, Can you come up with a cure that's not worse than the disease?" he says. "Are you going to crater the two biggest economies in the world in order to get China to alter its behavior on cybertheft and forced technology transfer and the protection of its domestic companies? Are we really going to get China to upend the way it does business [and] is there a way to do that without causing a crisis?"

In the corridors of the Trump administration, those, in fact, have been key questions asked by Treasury Secretary Steve Mnuchin and national economic adviser Larry Kudlow, who constantly remind the president that his beloved stock market does not like trade conflict. They favor a lighter touch than Lighthizer, who wants to keep the pressure on Beijing.

For the moment, Lighthizer's view is closer to Trump's, though all involved are acutely aware of how easily the president can change his mind. The temporary suspension of tariffs on Beijing, which Trump agreed to after dining with Xi last month at the G20 in Buenos Aires, Argentina, expires March 1. If Trump balks at a deal with China that doesn't give the U.S. all that it seeks, and he reimposes tariffs, it is likely that Lighthizer's view will have carried the day. Whether that will be a good thing or not is an entirely different question. —BP

GET 'EM WHERE IT HURTS

American brands like Apple and GM are feeling the wrath of Chinese "patriots"—to the enjoyment, no doubt, of Beijing

The statement from Apple CEO Tim

Cook, issued just after the New Year, was chilling for stock market investors. "We believe the economic environment in China has been further impacted by rising trade tensions with the United States. As the climate of mounting uncertainty weighed on financial markets, the effects appeared to reach consumers as well."

Largely as a result of that, Cook said, Apple would not reach its previous forecasts for sales and profits in the current quarter. Apple's stock promptly tanked, as did the broader market.

To what extent trade tensions affect Apple's results is hard to quantify. A slowing Chinese economy also contributes, as does the diminishing appeal of Apple's pricey phones in a market where cheaper domestic competitors have improved their products. Apple, however, is a flagship American brand with big stores in heavily trafficked areas of China's largest cities; to the government and its citizens, Apple making its iPhones in China, rather than shipping them from the U.S., is of no consequence. But given the tensions between Beijing and Washington, which are at

their worst level since the early '70s, before China reopened relations with the U.S., "Apple's got a big, fat target on its back," says John Rutledge, who sits on the board of directors of seven different companies doing business in China.

Trade wars, Donald Trump has said in the past, are "easily winnable." As a self-described "tariff guy," Trump thinks the numbers are basic: China exports more to us than we do to them; thus, we can apply tariffs to more of their goods than they can to ours, inflicting more economic pain. Therefore, to his mind, we win.

That crude calculus might have made sense in the 1980s, when the U.S. and Japan duelled on trade—and our current U.S. trade representative, Robert Lighthizer, first served in that agency. Japan's economic system promoted exports, shunned imports and made foreign direct investment expensive and difficult. But that is not analogous to the current situation with China.

The architects of Beijing's grand reopening to business in the late 1970s knew well that the lure of the world's most populous country—and one day, almost certainly, its biggest market—would be irresistible to the U.S. Americans would bring their dollars, their manufacturing expertise and their technology to ply their wares in a vast market.

Which they did. And that, amid the escalating trade conflict between Beijing and Washington, is China's whole card. As Trump is now discovering, fighting a trade war with a dictatorship, which controls all media in the country, is a tricky thing. As the U.S. has tried to increase pressure on Beijing by imposing tariffs on Chinese goods, the biggest American brands operating in China—including Apple, Starbucks,

General Motors, Ford—have become deeply vulnerable. The government doesn't necessarily need to injure those companies directly (through, for example, new and expensive regulatory requirements, or snap inspections on workplace safety or environmental compliance), but those options certainly exist; companies that have offended Beijing in one way or the other in the past have certainly felt such treatment.

Rather, the easiest way to hurt U.S. companies is to allow hot-headed and "patriotic" citizens to rant about them on ubiquitous social media sites such as WeChat. Beijing keeps a close watch on such vituperation, carefully controlling the tenor and tone of anger expressed in state-owned media organs. Last summer, for example, Reuters reported that Beijing had circulated a memo (based on verbal directives from government officials) to reporters and state-run news outlets:

Don't criticize Trump directly. "When exposing and criticizing American

words and actions, be careful not to link it to Trump and instead to aim it at the U.S. government."

But the Chinese government, to date, is more than happy to let the country's vast army of nationalists condemn the U.S. as the trade conflict grinds on. "Boycott all Apple products!" is a typical message, this one from Xingchu 88—in a group chat that included over 200 other participants. Another WeChat user wrote, "After a period of time, if the trade war really incites a sense of hatred against the United States, then I will not watch American movies, not listen to American music, not recommend Disney to friends." Wei Shoachuan, who lives in Chengdu, in central China, added: "I will start writing social media posts saying that Americans are not good, in order to counter American cultural products."

American executives acknowledge that such sentiment has an effect. In October, GM reported a 15 percent decline in sales in the most recent quarter, and all analysts agree that the trade tensions, not just a slowing economy, are affecting the result. The timing is particularly difficult for GM, which is rolling out a new line of electric cars, per a Chinese government mandate.

Smaller companies are feeling it too. Newell Corp.—which makes Mr. Coffee coffee makers and Sharpie pens—has seen its sales weaken as stores switch to local suppliers. An executive at one popular Chinese retail chain wrote that he was boycotting Newell products because of the trade dispute, and he received hundreds of supportive responses.

The Chinese government can just sit back and let the damage mount. And unless Trump and his counterpart Xi Jinping come to a deal, that's probably just what it will do. —BP



BEIJING IS HAPPY TO LET ITS PEOPLE CONDEMN AMERICA ON SOCIAL MEDIA. "BOYCOTT ALL APPLE PRODUCTS!" IS A TYPICAL MESSAGE.





HOCUS-POCUS

The show's ensemble, left to right: Stella Maeve as Julia, Bishil, Appleman, Ralph, Dudley and Arjun Gupta as Penny.



TELEVISION

Spawn of Buffy

Following in the quippy footsteps of Joss Whedon, SyFy's *The Magicians* ambitiously tweaks classic fantasy tropes



LEFT: LORENZO AGIUS/SYFY; TOP RIGHT: MIKE PONT/WIREIMAGE/GETTY

➔ THERE'S A SCENE IN THE SYFY NETWORK'S *The Magicians* where the characters speak exclusively in pop culture code. "Someone is 'XOXO, *Gossip Girl*'-ing our shit," says Eliot, the flippant bad-boy ruler of a kingdom. "So we have to keep it very 'best episode of *Buffy*.'"

Based on Lev Grossman's best-selling series of the same name, *The Magicians* doesn't expect you to get all those references; the scene comes with subtitled "translations," explaining that Eliot believes someone is spying on him and his queen, Margo, so they need to try to keep things confidential ("Hush" being the referenced *Buffy* episode). But it does expect you to respect the effort. "This show is for people who grew up reading *Harry Potter*, who have seen all the *Lord of the Rings* movies, who have an opinion about *Star Trek* vs. *Star Wars*," says Sera Gamble, who co-created the show with John McNamara.

BY

ANNA MENTA

🐦 @annalikestweets

The *Harry Potter* association is evident in Grossman's trilogy; on the back cover of the first book, published in 2009, *Game of Thrones* author George R. R. Martin opines that

"*The Magicians* is to *Harry Potter* as a shot of Irish whiskey is to a glass of weak tea." The story's Quentin Coldwater (played by Jason Ralph on the show) is a depressed 19-year-old nerd who discovers that his childhood obsession, a fantasy series called *Fillory and Further*, is real. He heads off to magic school, Brakebills College (Brakebills University on the show), where he collects a crew of magician friends (aged up for graduate school in the series), drinks heavily and battles inner and outer demons.

Both Gamble and McNamara frequently profess their love for Grossman's novels, but after the first season, which more or less follows the first book, attempts at faithful adaptation ended. Plotlines were remixed, rearranged and reinvented; with each passing season, Grossman's tone of introspective gloom moved toward irreverent fun.

"There was a necessary and important discovery process in Season 1," says Gamble. "This happens on every show: The crazy alchemy of the writers' room, the production team, the actors and their chemistry

moves you in an unexpected direction.” (Grossman, a creative consultant, has admitted that while he likes the show, the changes “took some getting used to.”)

Season 2 included fan favorites Eliot and Margo (Hale Appleman and Summer Bishil), rulers of the Fillory realm, spontaneously breaking into song (“One Day More,” from *Les Misérables*) as they head into battle. Season 3 included a full-on musical episode, a nod to *Buffy the Vampire Slayer*’s ambitious “Once More, With Feeling.” Gamble, like *Buffy* creator Joss Whedon, adeptly juggles fantasy tropes, subverting them with a cheeky wink. “Yes, we are *Buffy* fans,” says Gamble. “I assume that it was a reference point for pretty much every show of this nature for the last 15, 20 years. I would be flattered if

people considered *The Magicians* part of that lineage.”

Whedon’s influence is everywhere: in the ensemble cast playing the central group of quippy friends, those sly pop culture references and the subversive humor. Season 4, premiering January 23, will include a down-on-his-luck Santa Claus, imprisoned for

“I’d be flattered if *The Magicians* was considered part of *Buffy the Vampire Slayer*’s lineage.”

improper use of magic. It’s also in the shifting formats, like the episode broken down into six short stories about characters both minor and major. And in the way star student Alice (Olivia Taylor Dudley) suddenly loses her dad to a pre-existing heart condition rather than the magical beast she was protecting him from. (Echoing *Buffy*’s “The Body,” where the slayer’s mother dies of an aneurysm.)

The 35-year-old Gamble, who is simultaneously running the series *You* on Lifetime, is also drawing on her seven-year experience writing for and running the CW hit *Supernatural*. “I’ve written so much fantasy at this point,” she says, “that I have a pretty strong desire to be irreverent and specific—to tell those classic stories in ways that surprise you and also me.

“After 150 episodes of *Supernatural*,” she goes on, “the one thing I didn’t want to do was procedural stories. I always looked at those as an excuse—if we presented you with a little puzzle box of an episode that functioned in a closed-ended way, then we would buy your attention for what I cared about most: the characters. I’m really enjoying that we don’t have to do those gymnastics here.” (She appreciates, too, the recent loosening of SyFy’s language regulations, allowing her characters to use the f-word liberally.)

Magicians influences beyond *Buffy* include C.S. Lewis’s *The Chronicles of Narnia*—“Fillory is a fictionalized version of Narnia,” says Gamble—and *Pan’s Labyrinth*, Guillermo del Toro’s 2006 film. “Anytime you see a creature or monster, that’s del Toro.”

There’s even a nod to *The Princess Bride*, Rob Reiner’s 1987 film. “I had

DARK MAGIC Appleman is Season 4’s featured villain, now that a monster possesses Eliot’s body. “I’ve come to think of this monster as a reflection of the neglected inner child in all of us,” he says.



FROM LEFT: EIKE SCHROTER/SYFY; ERIC MILNER/SYFY



literally begged John McNamara for swashbuckling on *The Magicians* because I grew up loving the *Princess Bride* duel so much,” Appleman says of Eliot’s duel with King Idri of Loria in Season 2. “Then, on top of that, he turned it musical [with the *Les Mis* number], so I was like, “This is my *Men in Tights* and *Princess Bride* moment.”

McNamara, the writer and co-producer behind the 2015 film *Trumbo*, is the comparative traditionalist. “He would tell you he’s not a fantasy fan,” says Gamble. “When I reference Anne McCaffrey, he’s, like, ‘Who?’ [McCaffrey is the author of the *Dragonriders of Pern* sci-fi series, among other books.] That was the necessary voice to keep it from getting too ‘See you at the convention.’”

Perhaps, but the show’s screaming followers did fill a room at a recent Comic-Con in San Diego. *The*

Magicians has yet to reach *Buffy*’s status in critical acclaim or viewers, but it is consistently SyFy’s highest-performing original series. The show isn’t geeky so much as bonkers, with a breakneck pace that, in its first few seasons, has seen the death of three main characters, all of whom have come back to life in some complicated way. “Admittedly, we have a lot going on,” says Gamble, who gets lost herself from time to time. “It’s the job of several staffers to keep track of what has happened in past seasons.”

New viewers can catch up with past seasons on Netflix, and even fans might want to brush up before the start of Season 4, which references what many consider to be the show’s best episode, Season 3’s “A Life in the Day.” It will also contain some real-world parallels via the Library of the Neatherlands, a massive archive

HITTING THE RIGHT NOTE Quentin and the gang dance to David Bowie’s “Under Pressure” in Season 3’s musical episode “All That Josh”—the show’s answer to *Buffy*’s “Once More With Feeling.”

currently in control of all magic.

“I wouldn’t say things get unusually political,” says Gamble, “but we all watched the election of Trump. The Library was an opportunity to explore how authoritarianism happens. That’s a huge world this season, and also a door into some of my favorite, eeriest environments so far.”

More generally, Gamble says, Season 4 is about “how to live with problems that cannot be perfectly solved. They’ve now lived through four seasons of trying to fix things. Every time something gets fixed, something gets worse. In my opinion, that’s how life works.” A certain slayer from Sunnydale could relate. **N**

MUSIC

Atomic Blondie

The band reflects on 40 years of 'Heart of Glass,' finally playing Cuba and hearing their songs at CVS

➔ BLONDIE'S SINGLE "HEART OF Glass"—released 40 years ago this month—wasn't supposed to be a hit. It wasn't even supposed to be on an album. When the band entered the studio to record 1978's now-classic *Parallel Lines*, "Glass" was an abandoned disco experiment from years before. Their producer, Mike Chapman, persuaded them to salvage it by pumping up the backbeat.

By the spring of 1979, the glittery dance-pop anthem was "a commercial phenomenon," says Blondie drummer Clem Burke, pushing the band from a fixture on New York's underground punk scene to international stars. Singer Debbie Harry, guitarist Chris Stein and Burke recently marked the song's anniversary with a 12-inch vinyl EP that resurrects early incarnations. There's another milestone as well: In mid-March, the band will perform in Cuba for the first time. "Chris and I have always talked about going there," says Harry.

That's not surprising, says Burke, who describes Stein, affectionately, as a "left-wing commie." He had wanted to go when Fidel Castro was alive. "The handling of most of Latin America is disgraceful, and Cuba especially so," says Stein. The band had intended to play there in 2015, when President Barack Obama restored diplomatic relations and lifted travel restrictions. "That didn't happen," says Burke, and then came

Donald Trump. "When the new administration put these sanctions on [Cuba], we had to find a different arrangement. So we're going under the auspices of a cultural exchange."

Blondie's Cuba show will emphasize tracks with a Latin or reggaeton flavor. "We have a song we used to do way back in the early days, 'Attack of the Giant Ants,'" says Harry, who remains a compelling performer at 73. "We might drag that old thing out because it's got that boom-boom-boom-boom-boom beat." Additionally, she wants to play the Spanish-language version of

"Call Me," a 1980 hit from the *American Gigolo* soundtrack, and the cumbia-inspired "Sugar on the Side," from the band's 2014 album,

Ghosts of Download.

Havana's historic Teatro Mella, where the concert will take place, is a long way from the band's grungier early days gigging at Max's Kansas City and CBGB, the club that incubated New York's punk explosion. The suavely cool Stein and the magnetic Harry founded Blondie in 1974, and Burke joined not long after (rotating members have come and gone). As "Glass" demonstrates, the New Wave and punk pioneers were adept and enthusiastic genre jumpers.

Back then, Stein and the platinum-haired Harry—a former waitress

BY

ZACH SCHONFELD
 @zzzzaaaaccchhh



CLOCKWISE FROM LEFT: VITTORIO ZUNINO/CELOTTO/AMFAR/GETTY; EXE/WAVE/ISTOCK/GETTY; COURTESY OF NUMERO GROUP; JACK VARTOOGIAN/GETTY; SUZAN CARSON/MICHAEL OCHS ARCHIVES/GETTY; RICHARD CREAMER/MICHAEL OCHS ARCHIVES/GETTY



24-HOUR PARTY PEOPLE Clockwise from far left: Harry today; a “Heart of Glass” single; CBGB in 1983; the 1977 lineup of, from left, Jimmy Destri, Stein, Gary Valentine, Burke and Harry; Harry in ’78.



Of a Target re-creating the CBGB awning, Stein says, “Better it was a store. The fucking Fillmore East is a bank!”



with a voice both dreamy and sharp—were creative and romantic partners. The band’s 1976 self-titled debut drew raves, but sales were disappointing.

Parallel Lines, with its indelible fusion of pop songcraft and punk charisma, came two years later. The band’s label, Chrysalis, initially rejected it. “They didn’t think there were any hits,” says Harry. In fact, there were two besides “Heart of Glass”—the stalker anthem “One Way or Another” and the power-pop classic “Hanging on the Telephone.”

But it was “Glass” that crossed over. Disco was a new frontier for Blondie, or any nominal rock band. So was the sonic blueprint: a burbling Roland drum machine that gives the song its otherworldly pulse. “It was an arduous process,” Burke says. “Digital and MIDI didn’t exist then. You had to do it manually: The synthesizer would go out of sync with the [drum loop] after a measure or two.”

The new EP exhumes an embryonic version with a slower, funkier groove. “It incubated over a period of years,” Burke says. “When I heard the *Saturday Night Fever* soundtrack, that was the inspiration for my drum performance.” Legend has it that the drummer initially refused to play “Glass” live, though he disputes this; it was just difficult to present properly.

Parallel Lines went on to sell millions, and its follow-ups, 1979’s *Eat to the Beat* and 1980’s *Autoamerican*, offered even bolder genre leaps. “I’m fond of *Autoamerican*,” says Stein, “because it’s weirder and more all over the place.”

While making that record, Blondie first heard rap music and befriended early hip-hop pioneer Fab Five Freddy. “There was an excitement and a power [to rap],” says Harry. “In my mind, it seemed like a folk music ethic.”

Stein remembers Freddy taking

the band to a memorable concert put on by a Police Athletic League in the Bronx, where the Funky 4 + 1 and Grandmaster Flash played. Blondie was dazzled, and the result was “Rapture.” With Harry’s icy-cool delivery, it became the first rap song ever to reach No. 1.

“I would do a listening party in my loft for friends when an album was finished,” says Burke. “I remember their reaction when ‘Rapture’ came on: Jaws dropped.” (Thirty-eight years later, the band remains a fan of hip-hop. Burke became interested in Kendrick Lamar after David Bowie cited him as an influence; Harry listens to rap at the gym: “My trainer likes rap, so I always work out to it.”)

Autoamerican also included “The Tide Is High,” a cover of a Jamaican ska tune. Blondie’s version, Stein complains, now seems to play in every CVS store he goes into. “The best thing to do then,” Harry tells Stein, “is to stay out of CVS.”

“That’s where my prescriptions are,” Stein replies. “So it’s unavoidable.”

By 1983, the band had been done in by debt, drug addiction and illness—Stein had been diagnosed with a rare and serious autoimmune disease. Harry is understandably uninterested in revisiting that time now. As she told *Vice* in 2017, “Chris was sick, and the IRS took the house. I mean, everything just went ‘braah!’”

The couple broke up, but the band got back together in the late 1990s. “There was, like, a curve upwards of other people referencing the band,” says Stein of bands like the Smashing Pumpkins covering their songs. “One Way or Another” was featured in

ALL DRESSED UP Burke seated with, from left, Destri, Harry, Nigel Harrison (bending over), Stein and Frank Infante (who replaced Valentine), circa 1977.

1998’s *The Rugrats Movie*. (Yes, millennials discovered Blondie via a *Rugrats* soundtrack).

Blondie’s 1999 reunion effort, *No Exit*, was fairly well received, and the band has been touring ever since; its most recent album, 2017’s *Pollinator*, included collaborations with new-generation stars like Charli XCX and Dev Hynes (aka Blood Orange). And there are side projects: Stein, an avid photographer, recently released a punk photography book called *Point of View: Me, New York City, and the Punk Scene*. Harry will soon tell all in a nearly finished memoir. “I’m a little behind—about two years,” she says with a laugh. The book began as interviews with rock journalist Sylvie Simmons. “I hated it for a while. Now,

Yes, millennials discovered Blondie via 1998’s *The Rugrats Movie*, featuring “One Way or Another.”



I love it,” says Harry. “Pretty soon, I’ll probably hate it again.”

In 2019, Blondie’s endurance is “kind of a miracle,” says Harry. Along with Patti Smith, the band is one of the few surviving acts from the original CBGB scene. Their good friend Joey Ramone and his fellow Ramones are dead; the Cramps are defunct; Talking Heads will almost certainly never reunite without divine intervention (or a very hefty Coachella offer).

The first wave of British punk hasn’t fared much better. By chance, while I’m interviewing Burke, news breaks that Buzzcocks frontman Pete Shelley has died at 63, and I find myself blurt-ing out the news. “It’s too early for people like that to pass,” says Burke, before launching into stories about the Buzzcocks opening for Blondie in 1978.

But while the bands are gone, punk iconography endures—in sometimes unfortunate ways. “There’s a CBGB bar at Newark Airport,” says Burke. “That’s just ridiculous! That’s like a dream sequence.” Or a nightmare. In July, Target drew ire after opening a store in New York’s East Village; the façade was a tasteless re-creation of the famous CBGB awning. Stein described it at the time as “grotesque.” Six months later, he offers me some caustic optimism: “Better that it’s a store than if it was a bank, I suppose. The fucking Fillmore East is a bank!”

Harry wishes more of Blondie’s CBGB peers would play live. “Television should be doing it all the time, and so should Richard Hell,” she says. “Richard made an appearance at [New York’s] City Winery. He said, ‘Wow! I told the guys to go learn the songs. They learned them. I came up and sang ‘em!’ He was floored that it was so easy.

“It was great to see him,” she adds. “I encouraged him heartily to play more music.” ■



MOVIES

Women Behaving Badly

The massive success of Netflix's *Bird Box* suggests an auspicious future for fans of female-directed thrillers—and their emotionally rich heroes

↑ IN 1953, THE ACTRESS IDA LUPINO directed *The Hitch-Hiker*, a hard little nut of a film—the first noir directed by a woman. Twenty-five years later, Lina Wertmüller's art house thriller *Blood Feud* pushed the grieving widow—a distinctly unglamorous Sophia Loren—from the hand-wringing shadows into a position of fierce retribution.

Female directors are rare, but those directing thrillers remain rarer still. Kathryn Bigelow opened the door a crack more with her 1991 cult classic *Point Break*. Mary Harron's gleefully deranged *American Psycho* followed in 2000. But both films featured men in the leading roles. Traction for Wertmüller's groundbreaking choice—placing female avengers front

and center—took a lot longer. Highlights include Jane Campion's 2003 film *In the Cut*, Debra Granik's 2010 Oscar winner *Winter's Bone* and Claire Denis's 2013 *Bastards*.

This past December, Netflix released *Bird Box*, from the Danish director Susanne Bier and starring Sandra

BY

MARY KAY
SCHILLING

Bullock. It quickly broke records for the streaming service, becoming the most watched film in a seven-day period. On January 18, Netflix's *Close* debuts, from British director Vicky Jewson, and starring Noomi Rapace as a bodyguard assigned to protect a billionaire's troubled daughter (Sophie Nélisse of *The Book Thief*). What both thrillers demonstrate (in addition to Netflix's commitment to hiring diverse creators) are the singular qualities women bring to the genre—among them a willingness to subvert traditional tropes, and to feature distinctly nuanced female characters, well beyond the usual bunny-boiling nut jobs, oversexed psychopaths and victimized wives and girlfriends common to the genre.

Bier—the only female director to have won an Oscar, a Golden Globe and an Emmy—displayed considerable skill for driving tension with an adaptation of John Le Carré's *The Night Manager*, a big hit for BBC One and for AMC in the U.S. But with *Bird Box*, she created something women clearly crave: a hero they can relate to. Bullock's Malorie is antisocial and ferocious, an aggressive mother protecting her children from an undisclosed evil. She is not, as Bier has put it, "a male-defined mother figure"—soft, calm and idealized. "That was why Sandra was attracted to [the film] and why I got attached to it."

The women of *Bird Box* and *Close* defy the decorative stereotype—extensions of men, displayed provocatively. Rapace and Bullock spend much of their respective films in shapeless clothing, looking rough and battered. They both have unusual, imperfect faces and a spiky sexuality—what Bier has said she hopes to see more of as women cast their own films.

Jewson cast and wrote *Close* with her screenwriting partner and

husband, Rupert Whitaker. She had long been frustrated by female-driven action films "where you think, There's nothing about this person that makes them a woman; it's just that they stuck a woman in the role," she says. With *Close*, she steered clear of *Atomic Blonde*-style clichés: "leather, leotards and women running in 6-inch heels. I wanted to avoid cat fights and anything that would use sexuality to sell that it's a woman in the lead. That frustrated me massively growing up."

As a kid, Jewson made James Bond movies with her friends. She grew up loving action movies. "I was looking for role models, and I wanted to be a filmmaker, but all of the films were telling male stories," she says. The lack of role models led, at one point, to Jewson calling herself William, "really embarrassing my parents."

That changed when she saw Luc Besson's 1990 film *La Femme Nikita*. The character of Nikita, played by Anne Parillaud, "had a level of emotionalism that you'd never see in a Bond film. I'm an emotional filmmaker. I thought, That's it!" says Jewson, who, quite remarkably, had written, financed and directed her first film, 2008's *Lady Godiva*, by the time she was 22. (*Close* is her third film and second thriller.)

Other influences included Ridley Scott's *Thelma & Louise* and Tony Scott's *True Romance*, starring Patricia Arquette. "When Arquette goes

up against James Gandolfini in the bathroom and wins—it's just the most amazing action scene to watch. She's fighting from a place of feminine power, with a raw fire, and we took that into *Close*."

For stunt coordinator, Jewson hired Julian Spencer, who had worked on the famously savage Turkish bath fight scene in *Eastern Promises*. "When we met, he asked me, 'What kind of action do you want to do, choreographed fight sequences or brutal and real?' I was like, 'Brutal and real!' And he said, 'OK, I'll definitely work with you then.'" Jewson laughs. "It's almost like he was testing me."

Rapace, whose international breakthrough came playing the merciless Lisbeth Salander in the Swedish *Girl With the Dragon Tattoo* films, spends much of *Close* emotionally and physically ravaged. "I don't think you get to see—particularly with women in action films—the harsh reality of getting punched in the face: You bleed! But those raw scenes are underpinned by the emotional journey. The characters drive the action, not the other way around," says Jewson.

Rapace's Sam is based on a real bodyguard, Jacquie Davis, who consulted on the film. She and Jewson spent time talking about how Davis navigated her job mentally. "When Jacquie would tell me a story, I'd ask her how she dealt with it afterwards. How did it make her *feel*? In reality, if we went through those extreme scenarios, our lives would be affected by it. I find that just as fascinating."

The double standard, of course, is that seeing women getting beaten up or beating people up or simply behaving in unlikable ways can provoke backlash. Violence against women in films is often labeled "gratuitous," and in the hands of men it frequently is. But even Bier caught heat for a scene

Jewson was repeatedly told that "women leads in genre movies don't sell. As a director, I was making my life harder."



NEVER SAY NEVER 007's first female director could be here. Clockwise from above: *Close*'s Rapace and Nélisse; Jewson directing Nélisse; *Bird Box*'s Bier.



of a woman being tortured in *The Night Manager*. And Bullock in *Bird Box* was criticized for being an overly assertive mother. That's perhaps to be expected: indoctrination is powerful, and male directors and screenwriters—and the men who decide what to finance—have defined how women behave on the big screen for over a century. Showing them as powerful and redemptive is a last Hollywood taboo. (Though not, it should be noted, for creators of international crime dramas, with their mother lode of gritty female characters.)

The *Bird Box* script was around for years before it got made, largely because the industry couldn't wrap its head around Bullock's character. Despite box-office bonanzas like *Alien*, *Terminator*, *Crouching Tiger*, *Hidden Dragon* and *Kill Bill*, Jewson was repeatedly told in pitch meetings for *Close* that “women leads in genre movies don't sell, and as a director I was making life harder for myself.”

It was thanks to the production company, WeLove, the distaff arm of the U.K.'s WestEnd Films, and Netflix that *Close* got made—that and Rapace signing on to the project. The response to the film remains to be seen. Critics weren't overly enthusiastic about *Bird Box*, but, as it turns out, that didn't matter in the least—good news for female directors and female-driven action films. As Bier told *The Hollywood Reporter*, “Classical measurement has either been box office or awards. [*Bird Box*] defies all of it. But creating a phenomenon is bound to translate into something.”

Perhaps even a Bond film. Bier was rumored to be on the short list of directors for the franchise, until Cary Fukunaga was tapped for the 25th outing (due next year). Maybe for Bond 26. It's about time 007 had a good cry. **N**

PARTING SHOT

Catherine O'Hara

➤ SHE HAS COLLABORATED WITH EUGENE LEVY ON DOZENS OF PROJECTS SINCE they met at Second City in 1974, but when Catherine O'Hara heard from him about a Canadian sitcom created with his son, Daniel, she hesitated. "Ever since *SCTV*, I've had an aversion to locking into one character for any length of time," says the actress. "But he convinced me to come to a pilot presentation, and I loved it. He tricked me!" The sweetly wacky *Schitt's Creek*, just beginning Season 5 (on CBC in Canada and Pop TV in the U.S.), stars O'Hara as Moira Rose, a former soap star, wife to Johnny (Levy) and mother to David (Daniel Levy) and Alexis (Annie Murphy). The family lost millions after Johnny was busted for fraud; now their only asset is the tiny town of Schitt's Creek. While Moira, with her posh accent (unidentifiable), ever-changing wigs and over-the-top designer outfits, might seem to have little in common with O'Hara's anxious mother in 1990's *Home Alone* or her clueless dog owner in 2000's *Best in Show*, the actress sees a common thread: "I've always loved characters with no idea what impression they're making."

In Season 5, Moira finally gets to shoot a scene for her comeback film, *The Crows Have Eyes*.

That did make me laugh—the conviction with which Moira plays a crow, or a human transitioning into a crow. As Moira, I had to take that really seriously, even while wearing a beak! I would never want to play that role, but Moira's an actress who puts every bit of faith into what she does. Being the pro she is, she also convinced her director to care.

Explain Moira's signature way of speaking.

I've got dictionaries of obscure words that help me with the arcane vocabulary. I want to have Moira learn a new word every day—to not only educate herself but everyone in the town. Then I stretch those words and add syllables. The voice was unintentional, but it's like she wants to sound somewhere between Marilyn Monroe and Audrey Hepburn.

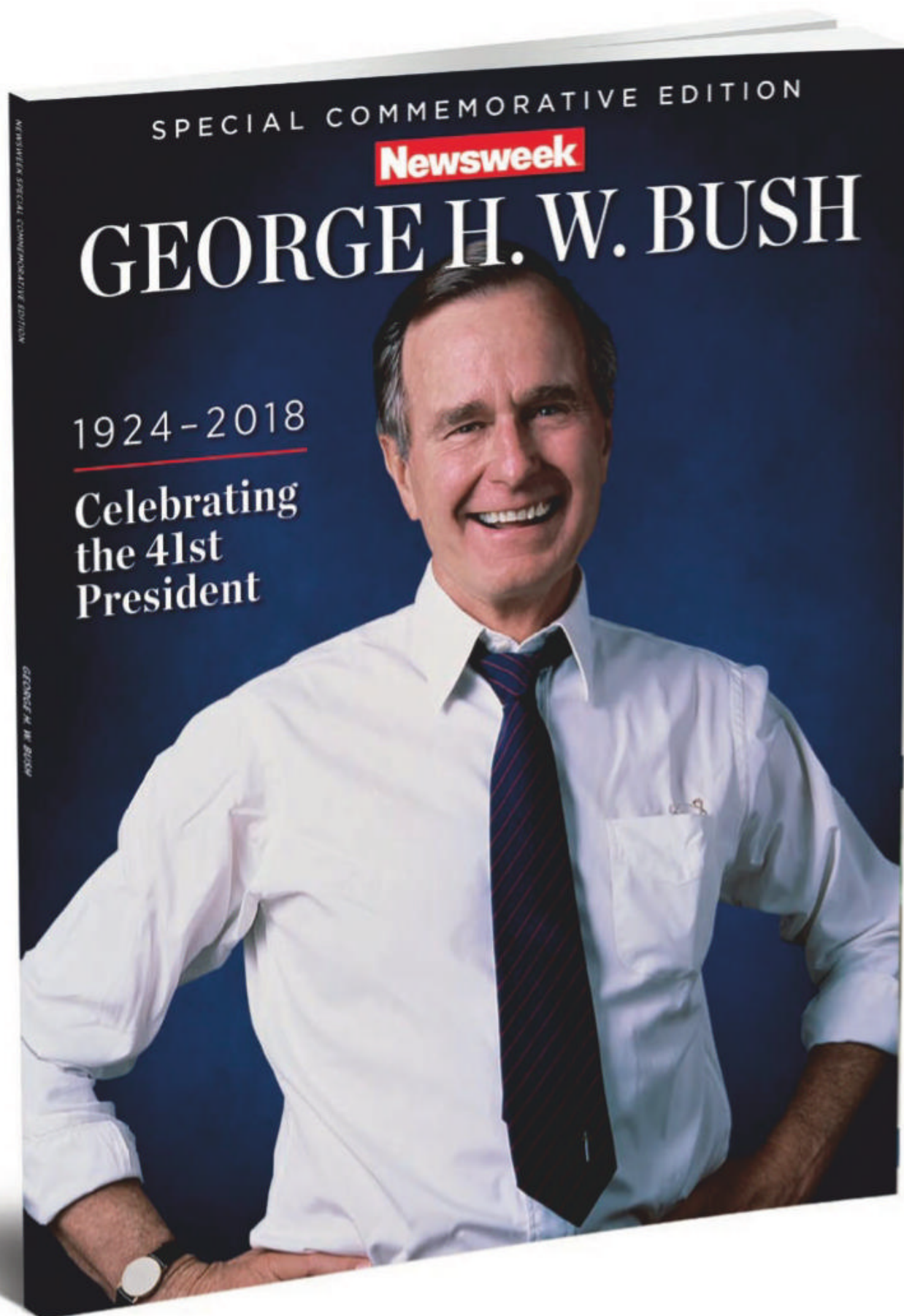
How has comedy changed since you began in 1974?

There were always more men than women onstage then. I worked with good guys, but women's lib was just starting, and many were raised with holdover ideas from the past—women weren't supposed to be seen laughing, let alone causing it. Now, there are [Second City] casts with more women than men—every race too, which is beautiful. Comedy has changed with the times—slowly, oh my Lord, slowly—but it has. —Anna Menta

"I've always loved characters with no idea what impression they're making."



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