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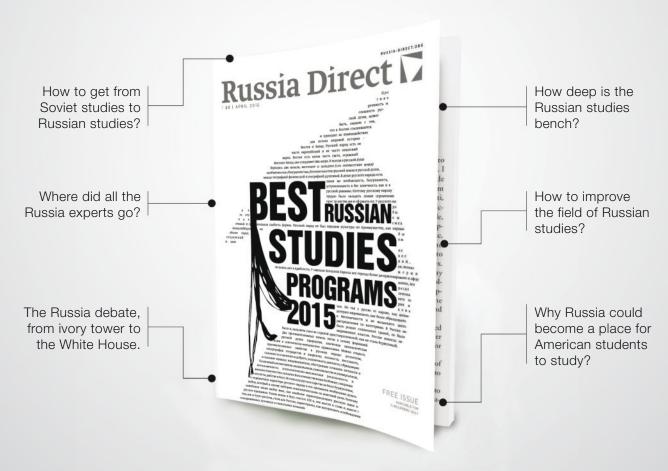
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by DAVID ROTHKOPF

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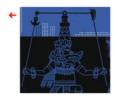
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David Rothkopf

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James Wellford

William Inboden, Charles Kenny, Christina Larson, Aaron David Miller, Thomas E. Ricks, J. Peter Scoblic, James Traub, Stephen M. Walt, Micah Zenko

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JOÃO PINA

"In August 2011, I was in the Araguaia region of the Amazon jungle in northern Brazil. There I met Adalgisa Silva. She had lived with her family in the small village of Chega com Jeito, and when the war between the left-wing guerrillas and the Brazilian Army broke out decades ago, she started guiding, feeding, and helping the guerrillas buy ammunition and supplies. In retaliation, security forces tortured her husband and kidnapped her daughters, using them as slaves. I listened outside her home, where she'd settled after these traumatic events, and I decided I wanted to return to the village to shoot a portrait of her there. As we drove, a dirt road became a sand road, and the car—packed with me, my guide, Adalgisa, and her daughters—got stuck, just as the sun was going down. Two peasant farmers approached to help and asked where we were going. Adalgisa said we were headed to her former town because I was doing something regarding the war. The two men looked at each other and immediately started walking away without another word. That's when it became clear to me how the fear under people's skin still remains." P.14

Christina Larson

is a Beijingbased journalist and contributing correspondent to Science. She writes about technology, culture, science, and the environment in Asia for the New York Times, MIT Technology Review, and other outlets. She is a former editor at



FOREIGN POLICY.

Tim Requarth

has written for the New York Times, Scientific American. and the New Republic. Jack El-Hai, the author of The Lobotomist: A Maverick Medical Genius and His Tragic Quest to Rid the World of Mental Illness, contributed to the cover story.



Ferris Jabr

is a science journalist based in Portland, Oregon, and is a contributing writer for Scientific American, His work has also been published by the New York Times Magazine, Outside, Wired, and McSweeney's.



Elizabeth Dickinson

is a journalist based in the Arabian Peninsula, She previously worked as an assistant managing editor at Foreign Policy and a Nigeria correspondent for the Economist.





Partners in Prosperity

Historic Georgetown, Kentucky claims to be the first place where Kentucky bourbon whiskey was produced. Today, this town just north of Lexington has another claim to fame: it's one of the state's fastest-growing economies and a prime example of how foreign direct investment can spur U.S. economic growth and generate employment.

Japanese companies play an integral role in Kentucky's economy. In 1988, the first Camry rolled off the line at Toyota's largest North American vehicle manufacturing plant in Georgetown. The new plant generated 7,000 jobs, transforming the community.

"Japanese investment in Georgetown-Scott County ... has been magnanimous to say the least," said Jack Conner, Executive Director of the Georgetown-Scott County Chamber of Commerce. "We have been able to establish great relationships with our Japanese partners as well as use their expertise to retain, expand, and grow our own group of businesses."

Georgetown's population has grown from about 11,000 to more than 30,000 people, and Toyota's success has attracted many more Japanese companies to the region. Six Japanese companies subsequently established operations in nearby Marion County, generating 2,000 jobs and creating more diverse communities in the area.

The 174 Japanese businesses now operating in Kentucky have created more than 41,000 jobs alone, according to the office of Kentucky Governor Steven Beshears, and have invested more than \$2.3 billion in the state.

"During my many visits to Japan, I have been impressed with how we share common goals of mutual goodwill, economic development and prosperity," Beshears said.

Kentucky offers a prime example of how Japanese foreign direct investments can invigorate communities throughout the United States. Today, some 3,000 Japanese companies operate in the US, generating (directly and indirectly) 1.7 million jobs and \$580 billion in cumulative output, according to the Japan Business Federation (Keidanren).

The US-Japan economic relationship will continue to thrive under the new global trade agenda. The recently passed Trade Promotion Authority

"Japanese investment in Georgetown-Scott County...has been magnanimous to say the least. We have been able to establish great relationships with our Japanese partners as well as use their expertise to retain, expand, and grow our own group of businesses."

-Jack Connor,

Executive Director of the Georgetown-Scott County Chamber of Commerce

(TPA) paves the way for the conclusion of the Trans-Pacific Partnership (TPP), the broad-reaching trade deal that President Barack Obama and Prime Minister Shinzo Abe both say will strengthen U.S. and Japanese global economic influence and spur opportunities throughout Asia. During a joint news conference with Mr. Abe at the White House in April, Mr. Obama said TPP will be "good for the workers of both our countries."

Republican Senator Orrin Hatch has been bullish on the passage of TPA. "With Trade Promotion Authority back in our trade arsenal, we can continue as the premier leader on global trade and open more international markets," he said in a recent statement. "These new opportunities will mean better jobs, bigger paychecks, and a healthier economy here at home."

Japanese auto manufacturers such as Toyota, Honda, and Nissan are key drivers of these opportunities. Seventy-four percent of Japanese vehicles sold in the U.S. are manufactured in North America, and Japanese automakers employ more than 457,700 people through direct operations and dealerships, according to the Japan Automobile Manufacturers Association, Inc.

In addition to the automotive industry, Japanese companies maintain a vital presence across many industries, including pharmaceuticals, gaming, entertainment, retail, and others. These corporations not only bring thousands of jobs to the U.S., but also support their communities through philanthropic initiatives, many of which are highlighted on the map on the next page.

Employment by Japanese-Owned Firms/Affiliates

Top 10 US States

1.	Calitornia	137,575
2.	Texas	71,526
3.	New York	57,136
4.	Illinois	51,850
5.	Ohio	49,531
6.	New Jersey	35,170
7.	Michigan	35,020
8.	Kentucky	33,203
9.	Tennessee	31,826
10.	Georgia	31,749

Source: Dun & Bradstreet, 2014

Japan and the U.S.: The Bigger Picture is an exploration of the two countries' long-standing partnership, highlighting the unique ways in which the U.S. and Japan complement and depend on one another. The project is underwritten by the Embassy of Japan. This is the first of a two-part series, beginning with an in-depth look at Japan's foreign direct investment and job creation in the United States. The second installment will appear in the November/December issue of *Foreign Policy*.



Investing in the US and its Communities

The map on the right highlights how Japanese companies create jobs and invest in local economies across the U.S. From San Francisco to New York City, Japanese auto manufacturers, retailers, pharmaceutical companies, and many others help people build communities and careers. "Japanese companies are thoroughly embedded in the American economy," said James Fatheree, president of the U.S.-Japan Business Council and executive director of Japan and Korea for the U.S. Chamber of Commerce. "They are good corporate citizens at every stage at which they operate." For more information, please visit: foreignpolicy.com/sponsored/japanus

San Francisco, California Japan's popular Kikkoman soy sauce Molten U

Japan's popular Kikkoman soy sauce brand is headquartered in San Francisco but operates regional offices throughout the country. Kikkoman follows a time-honored brewing process that is more than three centuries old, creating a unique aroma with roughly 300 different components. Kikkoman regularly donates to local food banks through the Kikkoman Kares program. In 2015, Kikkoman has donated more than 130 tons of food to U.S. food banks. The company also sponsors international exchanges and scholarships for Japanese and U.S. students.

Kikkoman Sales USA

Molten USA Reno, Nevada

Founded in 1958, Molten is the world's largest ball and sports equipment manufacturer. Molten USA also makes the official volleyballs for the NCAA Women's and Men's Volleyball Championships and the official basketballs for the FIBA Championships. The company recently partnered with World of Children and USA Volleyball on Molten USA's Pass It Forward program, which promotes sportsmanship, philanthropy, and accountability.

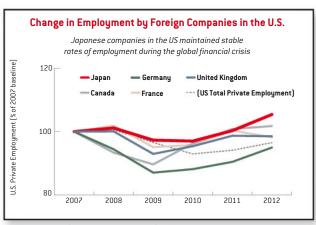
Nintendo of America Redmond, Washington

Nintendo was founded more than 125 years ago in Kyoto, Japan. Nintendo of America minimizes video game waste by offering a free Take Back Program, which allows people to ship their games and systems to the company for recycling free of charge, and other user-friendly recycling and repair options. Nintendo of America also helps the Starlight Children's Foundation create bedside therapeutic mobile entertainment centers for sick children.

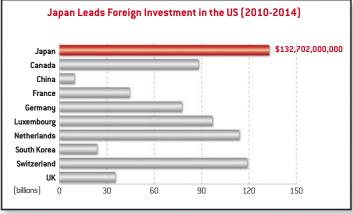
IRIS USA, Inc.

Surprise, Arizona

IRIS USA, which produces clear plastic storage products, has been operating in the US since 1994. The U.S. division of IRIS Ohyama broke ground this year on its Western United States Regional Headquarters, a move that is expected to bring 100 jobs to Surprise, Arizona. The Arizona Commerce Authority predicts that the facility will generate \$800,000 of city revenue in its first operational year. IRIS USA also operates in Pleasant Prairie, Wis., and Mesquite, Texas.



Source: U.S. Bureau of Labor Statistics and Bureau of Economic Analysis



Source: Bureau of Economic Analysis

Kawasaki Rail Car, Inc. (KRC) and Kawasaki Motors Manufacturing Corp., U.S.A. (KMM)

Yonkers, New York and Lincoln, Nebraska

KRC and KMM (collectively "Kawasaki") have operated their manufacturing plants since 1986 and 1974, respectively. KMM's railcar plant has been operating since 2001. Kawasaki is a long-standing producer for the American rail industry and has delivered more than 4,000 railcars, including for the New York City Subway. Kawasaki is the first Japanese company to supply railcars for the Washington, D.C., Metro. The first eight-car train was accepted for revenue service in April 2015, and all railcars will be built at KMM facilities in Lincoln, Nebraska, totaling 748 cars by 2020.

Uniqlo New York, New York

Originally called the "Unique Clothing Warehouse," Uniqlo got its start as a suburban Japanese brand and has since expanded to more than 800 stores worldwide. Through its "A Warm Gesture" program, Uniqlo invites disadvantaged children in New York, New Jersey, Pennsylvania, California, and Connecticut to go on a free shopping trip for warm winter clothing at local Uniqlo stores.

Panasonic USA

Newark, New Jersey

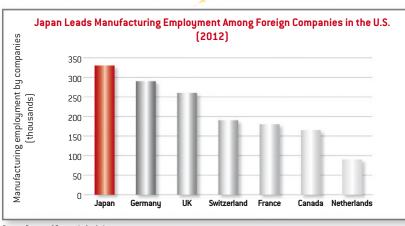
Panasonic was first listed on the New York Stock Exchange more than 40 years ago. To fulfill its mission of environmental responsibility and contribute to the city's revitalization, Panasonic moved operations from a suburban New Jersey campus to the heart of Newark in 2013. Fifty-seven percent of Panasonic's Newark employees now take public transportation to work, and the company encourages employees to get involved in the local community through initiatives such as Celebrate Newark Day and has contributed more than \$1 million in professional TV production equipment to the NJ Performing Arts Center in Newark.

Takeda Pharmaceuticals U.S.A., Inc. Deerfield, Illinois

Takeda has more than 5,000 employees based in the U.S. and strives to deliver important innovations in medicine. The company recently launched three new drugs and filed a new drug approval application for the cancer treatment Ixazomib. Takeda gives back through a number of CSR projects, including working with Rebuilding Together to strengthen communities by refurbishing homes for families and people in need.

Toyota USA Plano, Texas

Toyota has 39,000 team members working at 10 manufacturing plants as well as research facilities, field offices, and numerous other divisions in the U.S. The company produces more than 1.25 million vehicles a year here and has contributed more than \$700 million to U.S. nonprofits. Toyota is also a global leader in R&D with more than 1,500 patents granted in 2014 alone. Toyota founded and supports Buckle Up For Life, a national child passenger safety education program, with Cincinnati Children's Hospital Medical Center and a network of the country's leading children's hospitals.



Source: Bureau of Economic Analysis

The Experience of a Lifetime











The JET Program is an initiative sponsored by the Japanese government to promote internationalization at the grassroots level by bringing young, college-educated individuals to work in communities throughout Japan. Since 1987, over 60,000 participants from countries around the world have come to Japan on the JET Program. JET participants work full-time as Assistant Language Teachers in the public school system, as Coordinators for International Relations in local government offices, or as Sports Exchange Advisors promoting international connections through sport. With the JET Program, participants can gain valuable work experience abroad and explore a rich and historical culture. Applications open in October. Visit our website to learn more.

<u>sightlines</u>

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The survivors of South America's brutal Operation Condor bear the scars of mass atrocities. | P. 14

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Documentary filmmaker Joshua Oppenheimer and writer David Rieff discuss humanity's death instinct. | P. 30



"The human capacity for evil depends on our ability to lie to ourselves." | P. 30





photographs by JOÃO PINA

The Hunt for Justice

Forty years ago this November, six rightwing South American governments—in Argentina, Bolivia, Brazil, Chile, Uruguay, and Paraguay—covertly banded together to eradicate the threat of communism. Through Operation Condor, the countries. all led by military juntas, cooperated on everything from intelligence sharing to the assassinations of suspected leftists. Over several years—the operation foundered in the mid-1980s after a number of participating dictatorships collapsed security forces killed and disappeared tens of thousands of people.

Condor's existence has come to light through leaks and declassified documents, yet accountability for the perpetrators' atrocities remains elusive. In part, this is due to long-standing national amnesty laws protecting former government officials from prosecution. Some Condor countries, however, have shifted legal course: In Argentina, for example, hundreds of people have been tried since 2003, when amnesty laws were annulled. Here, retired Lt. Col. Walter Bartolomé Tejada (left) and Vicente Antonio Forchetti, a former police commissioner in the city of Viedma, stand trial in 2012. accused of kidnapping, torture, and murder. Both were sentenced to life in prison.

Portuguese photographer João Pina spent nine years documenting Condor's legacy and the crimes committed by the participating states' dictatorships. His photographs of trials, victims, and former detention sites together serve as a memorial to one of the 20th century's worst acts of mass violence.

aperture



Security forces in Argentina used secret facilities, including this converted auto-body shop in Buenos Aires, to detain, torture, and kill dissidents. According to an Argentine government cable, some 22,000 people were killed or disappeared between 1975 and 1978. Abuses continued for another five years, until the country's military junta stepped down.



After Chile's 1973 coup, which brought Augusto Pinochet to power, the government rounded up thousands of so-called "subversives" in the country's national stadium in Santiago. Pinochet's regime continued to attack leftists until he stepped down in 1990; according to a 2004 Chilean government report, more than 27,000 people were victims of torture during his dictatorship.



Now a high-security prison, Emboscada ("Ambush" in English, as well as the name of the town where the facility was located) was once a concentration camp used by the Paraguayan military to house political prisoners.







Survivors of Londres 38, a torture site in downtown Santiago, Chile, have recounted that beatings and electric shocks were used during interrogation sessions. After the regime's fall, investigators were able to identify Londres 38 in part because survivors remembered the distinctive black and white tiles near its entrance.



Automotores Orletti, another converted auto-body shop, served as one of the main Condor detention centers in Buenos Aires. According to survivors, the facility was often used by Uruguayan security forces to torture their citizens on Argentine soil.



The Punta de Rieles jail in Montevideo, Uruguay, housed female political prisoners. It was shuttered in 1985 when the dictator-ship fell, but later reopened as a regular lockup facility.









Paraguayan Martín Almada, a teacher at the time, was arrested in 1974 after his agitations for better salaries and working conditions raised concern among security forces. Almada spent three years behind bars and suffered torture.



Leonardo Benito Peña witnessed Argentine security forces arrest his parents when he was a young child. He never saw his mother or father again, and their fates remain unknown.

As a farmer in rural Brazil, Adalgisa Silva aided leftist guerrillas fighting the military government. She guided them through the jungle and even stored arms. Security forces captured and tortured her husband to punish her for working with the rebels; she also says they kidnapped two of her daughters and raped them.









The Argentine Forensic Anthropology Team (abbreviated EAAF in Spanish) was established in 1984 to investigate cases of the disappeared. EAAF has worked to exhume and identify thousands of people executed and dumped in mass graves. In addition to skeletal remains, investigators often dig up clothing and other belongings that were buried with a body.

Mourners gather at the 2007 funeral of Horacio Bau, an Argentine leftist who vanished in November 1977. His remains were discovered in 2007 in a cemetery in the city of La Plata; his grave was marked "NN" for nomen nescio ("I do not know the name" in Latin). During Condor, Argentine soldiers commonly disposed of bodies under the same NN label.



by STEFANOS ANDREADIS

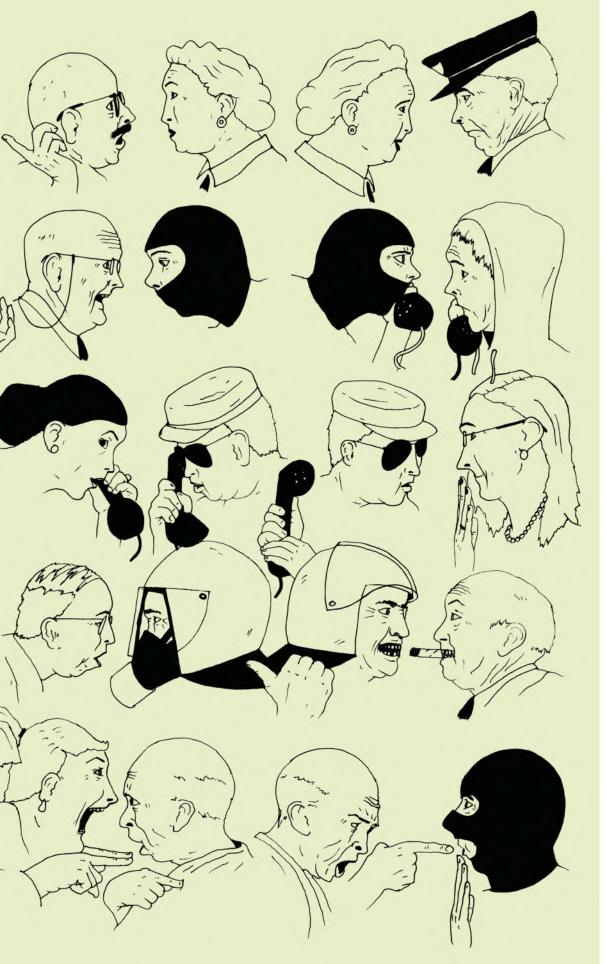
"For weeks after the Saturday Evening Post published Norman Rockwell's The Gossips on one of its 1948 covers, thousands of readers sent letters asking the same question: What exactly was the juicy piece of information? The answer was never given.

Here, I attempt to modernize Rockwell's work by applying his characters-their movements, expressions, and tones—to Greek society. The country's severe economic instability has caused social decay, violence, poverty, and corruption. My piece shows the gossip being circulated among teens, anarchists, policemen, politicians, soldiers, judges, reporters—the conversation involves all walks of lifeabout a possible exit, or Grexit, from the eurozone.

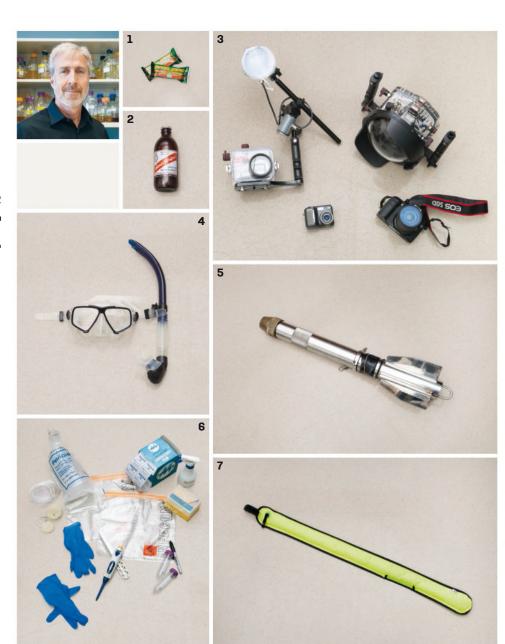
My country's debt crisis did two things: It displayed the flaws of our political aesthetic, and it also showed the problems of our society. The masked person, whose identity will never be revealed, is the person most responsible."

-THE ARTIST





The **Bioprospector** Russell Kerr



Beer and granola bars

1, 2

Our ships are dry, so we drink Red Stripe-sometimes the only beer we can find-when we return to port. I also bring a snack since, in the past, we've had lunches consisting of white bread and something resembling baloney.

Cameras

The big camera is a \$5,000 Canon and is used when we can devote one diver to just taking photographs. The smaller one, a \$500 Nikon, attaches to my wrist and floats out of the way when I'm not using it.

Mask and snorkel

Last year, when taking students out for a snorkel, I spotted an octopus. To encourage it out of its hiding hole, I gave it a gentle poke with my snorkel. The octopus grabbed my snorkel's end and didn't let go. That's why it's missing a flap.

Mud scud

We had this made by Diversified Metal Engineering in Charlottetown, Prince Edward Island. It collects mud from very deep water. Of all the tools we travel with, it looks the most suspicious: It resembles a missile.

Tools for specimen

collection We use bags and plastic tubes to store samples, which we are careful not to contaminate by wearing gloves and spraying ethanol on the lab surface—which might be a hotel coffee table or a desk on the ship.

Safety sausage

A few years ago, our boat captain was supposed to follow a float tied to a diver, but it detached and took the captain miles off course. When we came up and couldn't see the boat, we inflated our sausages; eventually another boat picked us up.











Equipment bag

We carry everything around in these string mesh bags. On land that equipment might weigh 20 pounds, but underwater everything is buoyant. So we're dragging around these clumsy pillowcase-sized bags, but at least they're not heavy.

Dive computers Two computers. one on the tank, another on my wrist, show depth and how much time I have before I get decompression sickness. Once, we borrowed computers, but they were so scratched we couldn't see the numbers. We now carry two sets.

Dry shipper Originally built by Chart MVE BioMedical to ship cattle semen, we use this device to freeze cells, fungi, and other biochemicals. It looks like a little bomb. so we give ourselves an extra hour for explaining it to security at the airport.

11 **Buoyancy**

vest and tank Hoses run from our vests to tanks: we push the buttons to control our buoyancy. If you're negatively buoyant, you kick to stop from sinking. While taking clippings, it's important to hover above the reef, so you don't damage it.

WHILE DIVING IN THE BAHAMAS a few years ago, Russell Kerr turned his head and noticed more than his green mesh equipment bag floating beside him—there was also a 5-foot-long reef shark. "It was quite startling," he says, "but you can't spend the whole time looking over your shoulder."

Spending days alongside sharks is just an unavoidable part of the gig, says Kerr, a Canadian biochemist and bioprospector who scours nature for molecules with healing properties and powers. Kerr focuses almost exclusively on marine life; bioprospecting on land, he notes, is old hat, while oceans still remain largely untapped.

In 2007, a year into his professorship at the University of Prince Edward Island, Kerr co-founded Nautilus Biosciences Canada to capitalize on his academic work's commercial potential and further develop the compounds that he and his university team have uncovered in the field. Projects have included coral-dwelling fungi that could be used to alleviate pain, a marine microbe that attacks cancer cells, and a bacterium that produces a molecule with moisturizing properties.

None have reached market yet, but such is the lot of a bioprospector. Perhaps one in every several thousand compounds analyzed will prove useful. Yet the potential is great—more than half of all therapeutic drugs and some three-quarters of all antibiotics have origins in bacteria. So Kerr casts a wide net, cultivating hundreds of species of microbes from each bit of sea sponge, sediment, and coral his team hauls above the surface. In an hour underwater, they can collect enough samples to stay busy in the lab for weeks. They've explored areas off Turkey, Colombia, and the Arctic coast of Canada's Nunavut territory, and Kerr travels annually to the Bahamas, home to vast biodiversity in its shallow reefs, mangrove forests, and hypersaline lakes. "We used to bring along the movie Jaws," he recalls. "But some of the students with little experience on the water didn't share our sense of humor."

In a recent conversation with FOREIGN POLICY, Kerr revealed the tools of his life aquatic.

Across Borders

IN APRIL, A 66-FOOT BOAT carrying some 850 migrants across the Mediterranean Sea to Italy capsized, killing almost all those on board. The tragedy catapulted migration issues to the forefront of Brussels's political agenda, as ministers grappled with how to deal with Europe's influx of asylum-seekers and migrants without documentation.

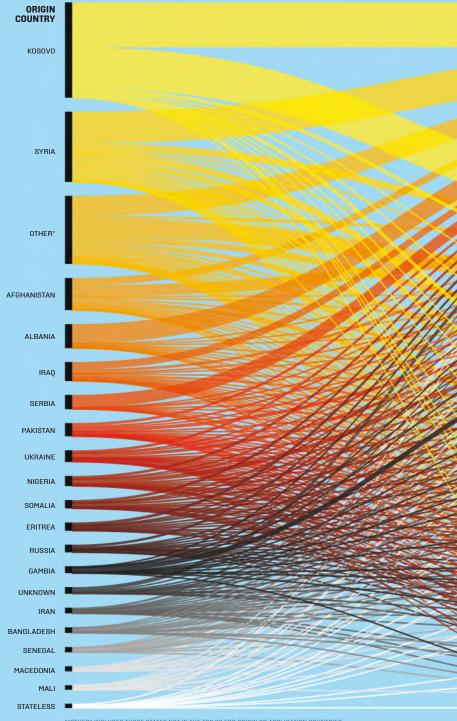
The crisis, of course, had been simmering long before April. According to the Genevabased International Organization for Migration (IOM), some 3,200 people died trying to cross the Mediterranean in 2014. (The number was nearly 2,000 for just the first half of 2015.) And globally, the number of people displaced by conflict, persecution, or human rights violations topped 59.5 million at the end of 2014, according to a report by the Office of the U.N. High Commissioner for Refugees—numbers not seen in decades.

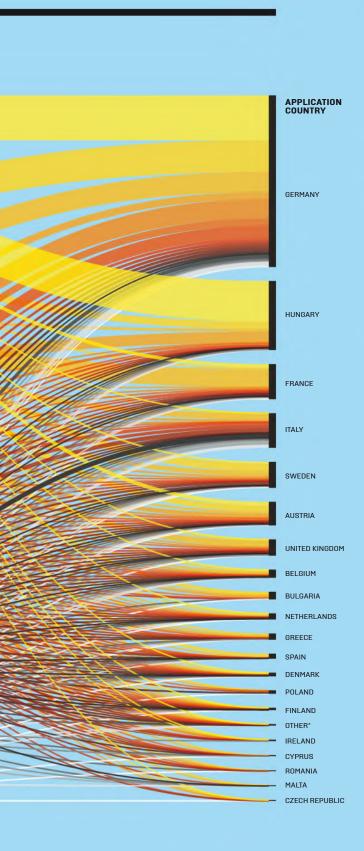
The European Union's proximity to protracted conflicts in the Middle East and Africa, as well as economically depressed areas in Eastern Europe, has made member countries-particularly Germany, Hungary, France, Italy, and Sweden—top destinations for asylum-seekers. In the first four months of 2015, EU member states received 242,075 first-time asylum applications, an 80 percent increase from the same period in 2014. (First-time applications, represented throughout the graphs to the right, offer the best trend measure, due to the high likelihood of repeat claims within a year or even a month.) Hungary, which people typically reach by way of Turkey or the Balkan states, saw the largest increase in applications, with nearly 13 times as many. And given the wellpublicized dangers of traversing the Mediterranean, the EU shouldn't be surprised that this land route is growing congested: In the first six months of 2015, IOM data showed 61,000 asylum-seekers and undocumented migrants there, already surpassing tallies for the whole of 2014.

No one can deny that migration is a fullblown regional crisis. The question now is whether the EU has the collective will and resources to solve it.

WHO GOES WHERE?

Citizens from Syria and Kosovo comprised nearly 40 percent of asylum applicants during the first four months of 2015; Syrian claims were up 80 percent from the same period last year, whereas those from Kosovo exploded, seeing a 17-fold jump.





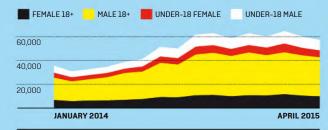
WHAT ARE THEIR FAVORED DESTINATIONS?

Germany received 40 percent of asylum applications during the first third of 2015, while Hungary, France, Italy, and Sweden combined received another 39 percent.



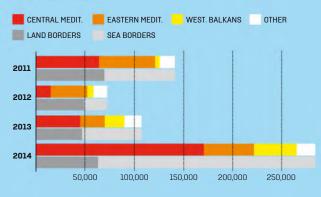
WHO ARE THEY?

The vast majority of asylum applicants are men ages 18 to 34, but the proportion of minors grew significantly during 2014. Those with unknown age or gender (only 0.1 percent of applicants) are not shown.



HOW DO THEY GET THERE?

In 2014, nearly 78 percent of detections of asylum-seekers and undocumented migrants occurred at sea-the most common being Syrians attempting to traverse the eastern and central Mediterranean (two of the most congested border crossings). Eritreans were one of the most frequently found populations along the central Mediterranean, while Afghans, Somalis, and Iraqis contributed to heavy volume along the eastern Mediterranean. And in late 2014, a spike occurred along the route through the Western Balkans, the third-most-popular land or sea route.



"WHO GOES WHERE?" AND "WHAT ARE THEIR FAVORED DESTINATIONS?": EUROSTAT, JANUARY-APRIL 2015; "WHO ARE THEY?": EUROSTAT; "HOW DO THEY GET THERE?": FRONTEX.



Robots of the Deep

WHEN IT COMES TO DEEP-SEA exploration, Europe has been flailing in shallow waters compared with its main competition, American-made gliders, which can dive a few thousand meters underwater. France's SeaExplorer, the continent's first unmanned underwater vehicle, set records for distance and duration for a single battery charge in 2013, but it can reach merely 700 meters; that's limiting, because the average ocean depth is 4.265 meters.

Now, the European Union is funding plans by Britain's National Oceanography Centre (NOC) to build the continent's first *ultra*-deep-sea robot, capable of diving 5,000 meters underwater for three months at a timebetter than almost all other operational undersea drones. America's Nereus is the only vehicle able to reach deeper: 10,900 meters. (Or rather, it was: Researchers permanently lost contact with the drone during a Pacific mission in May 2014.) But at 130 pounds, the NOC's drone will be lighter and more nimble than the 6,200-pound Nereus.

The new glider is also notable for the versatility of its detachable nose cone, which can be changed to adapt to varying missions and environments. One cone could measure how much ore is located in sediments, for instance, while another could navigate murky, low-light waters. Prototype crafts are expected soon, with final testing slated for 2019.

Sound Energy

Living by a bustling highway affects more than sleep. Noise pollution can also cause mental fatigue, hearing loss, and even hypertension. So this June, the Dutch government introduced a colorfully innovative noise barrier (which typically reduces sound anywhere from 5 to 10 decibels) along A2, one of the Netherlands' busiest highways: bright yellow and red walls-14.7 feet high by 16.4 feet wide-made of solar panels capable of generating renewable energy. Designed by researchers at Eindhoven University of Technology, each panel looks like a stained-glass window. Experiments suggest that just a 0.62mile row could generate enough electricity to power 50 households, though this summer's trial, the first field test, is observing the effects of the panels in real-world conditions.



Rendering of the Dutch noise barrier.

The number of homes, according to the U.S. Energy Department, that could be powered by tapping into 5 percent of the energy produced by oceans around American shores. In June, off the coast of Hawaii's Kaneohe Bay, a government research group began a vearlong test on Azura, a device that converts wave energy into gridconnected electricity.

Let There Be Bendable Light

FOR THE PAST 60 some years, engineers have been working to develop what are known as "metamaterials"—artificially structured substances with properties not available or easily found in nature. Such materials can be engineered for incredible strength, durability, or other attributes; they could be used, for example, to reinforce buildings against earthquakes.

But there's also the potential that they could be employed for more sinister purposes. Some metamaterials with exotic electromagnetic properties can cause light to bend away from them, meaning that an object fashioned from the materials can be made to look invisible. This could be a huge asset for anyone working in security or espionage—for instance, if someone wanted to hide valuable artifacts in a building.

A team at Harvard University recently found that it's possible to take this stuff of science fiction a step further and manipulate the degree of an object's visibility. As detailed this summer in Nature, the scientists changed how light interacted with a certain

metamaterial by etching a microscopic grating pattern onto its surface. What they discovered is that with the grating, the substance refracted oncoming light 100 times better than it did without the grating. And by changing the width and depth of the etching, the scientists could ensure that only desired beams of light were allowed to hit the metasurface.

The overall effect is one of more control for the user, allowing variability in cloaking options: Different effects could be created at different distances or under different lights and light intensities, among other conditions. As a practical example, thanks to a covering in metamaterials, a person's body could be made invisible while only a head was left, seemingly floating.

The U.S. military has spent many years investing in cloaking technology, with the hope of turning tanks and fighter planes into machines undetectable by enemy forces. Now, the world might finally see what an invisible squadron of soldiers looks like-or, actually, we might never see it.





Blue-Collar Superhuman

Japan has created a notorious labor culture that encourages employees, both on factory floors and in office cubes, to work like robots. Now, Panasonic subsidiary ActiveLink is further pushing the limits of just how much a human body can endure. The company has developed the Assist Suit AWN-03, a 13-pound exoskeleton that will enable workers to carry as much as 33 pounds more than what they're normally capable of easily bearing. For someone used to lifting around, say, 70 pounds dozens of times an hour, the suit could reduce the load by almost half, helping the worker conserve energy and do his or her job for longer durations.

The device-imagine an elaborate mechanical backpackstraps to the individual's torso. thighs, and feet. Sensors send signals to motors in the suit that shift stress from the spine to muscles well suited for heavy lifting. Starting in September, ActiveLink will sell the machine to companies around the world for \$8,158, with the option to rent as well. And this is just a stepping stone to something much more powerful: The company is now testing a high-end version of the exoskeleton that could help users lift a whopping extra 220 pounds.

Illustration by KATE FRANCIS

COURTESY OF EINDHOVEN UNIVERSITY OF TECHNOLOGY

How different are victims from victimizers?

Filmmaker Joshua Oppenheimer, who was awarded a 2014 MacArthur "genius grant," has challenged the relationship between filmmaker and subject, and between film and audience in his two documentaries about the 1965-1966 slaughter of percieved communists in Indonesia, The Act of Killing and The Look of Silence. This type of mass violence has long been a focus for writer and analyst DAVID RIEFF, who has made a career studying and reporting on inter-national conflict and humanitarian aid in books such as A Bed for the Night and the upcoming The Reproach of Hunger. Oppenheimer and Rieff recently talked in FOREIGN POLICY's recording studio in Washington about whether society is desensitized to the realities of genocide and why it's important to examine—and even to understand—its perpetrators.

> JOSHUA OPPENHEIMER: Most nonfiction films dealing with human rights abuse tend to tell us that things are well in hand because we're following an activist or an investigator or a judicial process that promises some sort of resolution even if, when the film ends, things are still a mess. The sense of things getting better when we leave allows the viewer to more easily let go of the experience and to feel like it is being dealt with by somebody, somehow. It also serves the viewer to feel that, by having this explained to us as a phenomenon that's at least at arm's length from us, it's something that we can understand from above. The task of cinema in intervening in and exploring these issues is to actually immerse us in these problems, in these phenomena, so that we actually feel something about what is it like as a survivor or, in the case of The Look of Silence, to have to live surrounded by the still-powerful perpetrators and to live in fear for half a century. Most human rights documentaries also replicate that most basic form of narrative escapism, dividing the world into good guys and bad guys. That is reassuring because we inevitably identify with the good guys. But it's problematic because it makes it difficult to understand—not in the sense to excuse, but to understand how human beings do these sorts of things to each other and the consequences for how we continue to live in the aftermath of atrocity. If we don't accept the uncomfortable proposition that every perpetrator of virtually every act of evil in our history has been a human being like us, then we actually foreclose the possibility of understanding how we do this to one another and there-







INSHIIA OPPENHEIMER

fore make it impossible to figure out how we might prevent these things. DAVID RIEFF: I completely agree with the centrality of the issue that these are people like ourselves. One must not give into the narcissism of the fact that one is above the ground rather than under it. I think that we have very romantic views of ourselves and of progress, so that indeed we don't think the killers are like us. There's a wonderful story that [writer] Clive James used to tell of being at a cocktail party in London and having all these people talking about what it would've been like to have been a prisoner in a concentration camp. As he writes, the more interesting question is not, what would you have done if you'd been a prisoner in Auschwitz or in Barkhausen? But instead, what would you have done if you'd been a guard? The fact is,



we tell ourselves fairy tales. Maybe people always did; maybe people always will. But one of the most uncomfortable things I've learned is how rapidly a victim becomes a victimizer, and a victimizer a victim. And I've never recovered from that.

DR: I'm very skeptical of so-called "humanitarian interventions" for all sorts of reasons. Obviously, as we were taught in first-year philosophy, there are limiting cases; I'm not an absolutist. But I think that [the West doesn't] know enough usually to intervene. I mean, this is a very narcissistic society, and it's a very inward-looking society. And when it gets indignant, it also gets hubristic. Syria is an excellent example of this. Of course one wants the war in Syria to be over, but does anyone in Washington or Brussels have the faintest idea of how to do it? So just saying, "There's interventionism, or there must be something else"— I'm afraid that does start to remind me of the sort of primitivism of binary thinking. I don't know how to solve the Syrian issue, and I don't think anyone else does. The bitter joke, "You can't get there from here" might apply. And there's the issue of who's doing the intervening. In Syria, for example, it would be the same countries that colonized Syria—that is to say, the Turks under the Ottomans, and the imperial Western powers. Surely there's something wrong with that. Maybe the honorable thing to do is to witness these situations, to try to learn lessons in one's own society, one's own life, from the horrors and the tragedies one sees. Again, there are exceptions. Jo: I think that there's something you said that was crucial: When the society becomes indignant, it can become hubristic. I think that indignation is pleasurable, and it's pleasurable because it's self-righteous; the world becomes kind of distorted and obscured by this false moral view of oneself. There's a crucial moment in The Act of Killing where Adi Zulkadry and Anwar Congo, the two death squad members in the film, are watching this piece of government propaganda that justified the killings, and I asked them, "What do you feel about this film?" And Zulkadry says, "Of course it's a lie. We know this is a lie." And Congo panics visibly and says, "Well, it may be a lie, but it's the one thing that makes me feel better about myself," suggesting that the perpetrators sincerely believe those stories—whether it's the ideological anti-communism, which I think was the excuse for murderous plunder in Indonesia, or the anti-terrorism that's used as an excuse for policy in the Middle East. This has sort of led me to the insight, which is maybe reduced to platitude here, that the human capacity for evil depends on our ability to lie to ourselves.

DR: One of the things I keep coming back to is this great exchange between Freud and Einstein about war. It's 1932, and Einstein writes a letter to Freud discussing the possibility of preventing war. Freud says he's pessimistic because there's a "death instinct" that







This conversation has been condensed for publication. Go to ForeignPolicy.com for the extended and recorded versions.

lures people and that draws people and that attracts people to war and death, and that isn't going to go away. In Rwanda, for example-and I think in Bosnia too-people were mobilized by fear. They were people like us, and when they weren't in this pressurized situation, there were just as many decent people among the killers as among any other group of people. But they were afraid. They were mobilized to be afraid. And so, what in any rational or decent context would seem like murder to them seemed like self-defense. Jo: I think when you mentioned Freud, there was something there maybe more profound and more difficult to talk about. The death instinct, the fascination with that exorbitant power over life and death, that God-like power that people have when they're incited to kill and participate in atrocities—I think there's a fascination and attraction which is unfortunately defying of rational explanation. DR: Absolutely. And with your film, one has to start talking about who these people are as people—that the victimizers are like us. As [French poet Charles] Baudelaire said, "mon semblable, mon frère"—"my double, my brother." Until we face that, we're just going to keep going to ceremonies that honor heroic people. But that doesn't help one understand, and indeed it does make one smug.



KUWAIT INVESTMENT OUTREACH

NOVEMBER 3, 2015

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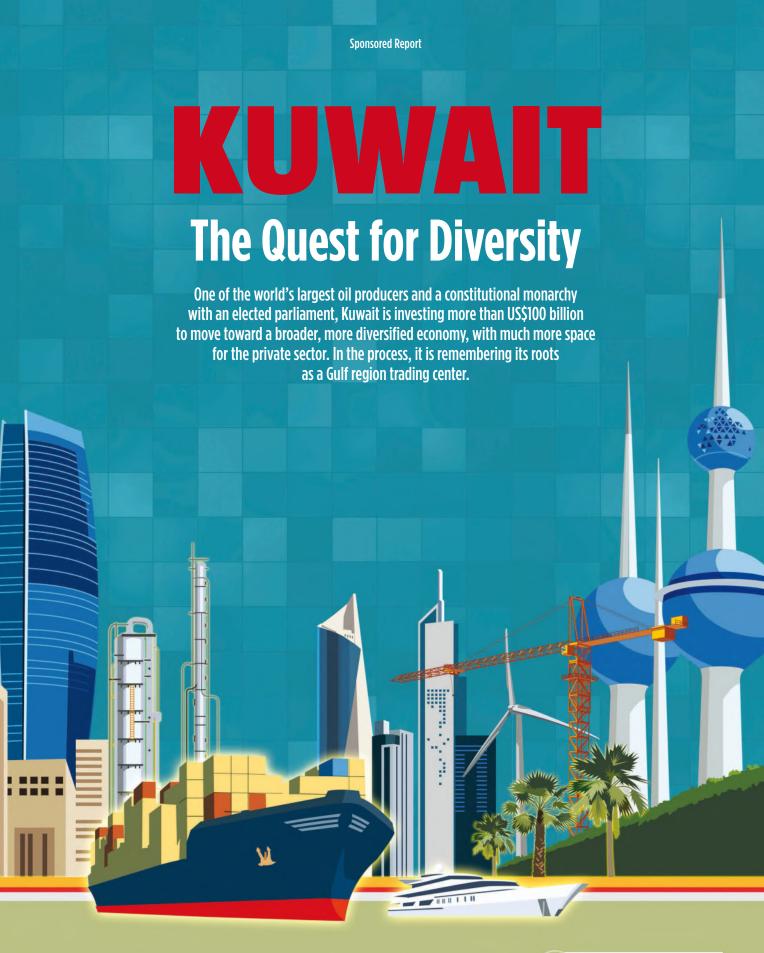














Spotlight



H.E. Sheikh Mohammed Abdullah Al-Mubarak Al-Sabah

Minister of State for Cabinet Affairs

H

ow would you describe this moment in time for Kuwait?

This is truly a turning point in the history of modern Kuwait, meaning Kuwait after the [1962] constitution. We have recently changed the electoral law to allow one man, one vote. We have also pushed through a dramatic development plan that aims to inject a lot of government money into infrastructure, and more important into developing our human capital, which is our most valuable resource. Finally, it is a time in history when, thankfully, things have recently stabilized much more in our neighborhood than has been the case in the last ten or fifteen years, because Kuwait's position and size mean that we are normally greatly influenced by what is going on in the region. When you consider all of these developments, you find that it is truly a moment with great opportunity for Kuwait. Not only for Kuwaitis, but also for foreign businesses who intend to partner with us.

The government is placing great emphasis on youth development...

Right we recently created the Ministry for Youth and Youth Affairs to ensure that we have one body where we can concentrate government spending and initiatives so they effectively reach young people. And eighteen to thirty five year olds certainly receive a large proportion our new SME [small and medium enterprises] fund. We also have a fantastic initiative by which any Kuwaiti who receives accreditation or acceptance from the top one hundred universities automatically gets a government scholarship.

Traditional Strengths, New Directions

Once a sleepy fishing village in an idyllic niche of the Persian Gulf, Kuwait boomed in the eighteenth century as a major commercial center and entrepôt. Kuwaiti-built boats were famed for their quality; merchants from far and wide set up shop and Kuwait became a haven of peaceful prosperity.

hen came the twentieth century. Flush with easy oil revenues that regularly finance nine-tenths of public expenditure and spared Kuwaitis the burden of paying income tax, as many as 95 percent of citizens shunned the private sector to work in safe, well-paid government jobs. In 1990, the Iraqi invasion frightened away foreign investors who were beginning to grow the non-oil economy.

But Kuwaitis have not forgotten their commercial and entrepreneurial past. While Kuwait's oil reserves will last for many years, and the country has massive hard-currency reserves to tide it over low prices, the International Monetary Fund (IMF) has warned for some time that government spending could soon exceed oil revenues. Led by Emir Sabah Al-Ahmad Al-Jabir Al-Sabah, who came to power in 2006, publicand private-sector leaders have started planning to diversify the economy and shift away from an over reliance on petroleum, drawing on the state's historical strengths to become a regional trade and financial hub.

"Kuwait was built on the pri-

vate sector, its roots come from being a natural port," says Faisal Al-Mutawa. CEO of Ali Abdulwahab Sons & Co., a centuryold trading company and retail distributor. "With the discovery of oil, Kuwait has moved toward government more and more because the government has grown richer; it started to have more power and to employ more people. That is why we in the private sector became very small. We have to change the culture." Today's lower oil prices merely reinforce the necessity, he said. "Because of the excess wealth of the oil, they have become blind to what could happen in the future. We have to go back to previous ages."

Al-Mutawa is far from alone in his analysis. "Kuwait is gifted with talent, it is a trading community; this worked very well for us when there was no oil," noted Finance Minister and Deputy Prime Minister Anas Khalid Al-Saleh. "We were gifted with being strong merchants along with our strategic location at the top of the Gulf. I think there is no other option for us than to be a trading hub with financial services. It's what we do best."





Dr. Meshaal Jaber Al-Ahmad Al-SabahDirector General
Kuwait Direct Investment Promotion Authority

WHY KUWAIT WANTS FOREIGN INVESTMENT

There is a widespread notion that an oil-rich country like Kuwait does not need foreign direct investment (FDI). Dr. Meshaal Jaber Al-Ahmad Al-Sabah explains why it does: "Kuwait needs FDI to attract top global corporations that bring in their technology and their modern managerial, administrative, and marketing systems. That enhances our country's technological capabilities and helps establish viable linkages with global value chains via successful partnerships and joint ventures with the local private sector. The ultimate goal is to diversify the economy, ensure sustainable growth and broaden the jobs pool and capacitybuilding opportunities for Kuwaitis."



TacklingSystemic Problems

The government has launched an ambitious plan to invest some US\$110 billion in infrastructure to make the country more efficient and help promote the private sector. There is also a major fund to foster small and medium enterprises, and newlegislation to facilitate foreign direct investment and public-private partnerships.

Moreover, Kuwait is attacking some deep-rooted systemic problems, not least ingrained bureaucracy and corruption. In 2015, the World Bank's Doing Business Surveyranked Kuwait 86 out of 189 countries for ease of doing business, 150 for starting a business, and 131 for contract enforcement, while Transparency International's 2014 Index of Corruption Perceptions placed Kuwait 67 out of 175 countries.

Kancor, the Kuwait Anti-Corruption Authority, was created in 2012 and became operational this year with a mandate to implement the UN Convention against Corruption, which Kuwait ratified in 2007. Kancor President Abulrahman Nemash Al-Nemash said Kuwait has good anticorruption legislation and hailed the establishment of a Financial Investigations Unit. "However, we do see deficiency in the paucity and weakness of procedural monitoring measures inside state institutions... aimed at the performance of employees and officials, especially those whose tasks involve administering public funds and property," Al-Nemash said, adding that Kancor is studying mechanisms to rectify this. The authority sent staffers abroad to study best practices and is promoting seminars and workshops to raise public awareness.

Some commentators were skeptical. "Kuwait's corruption body has a mountain to

NEUTRALITY

"Kuwait had the great honor to be asked by the UN to hold not one but two donor conferences on the Syrian humanitarian crisis. Kuwait has the ability to bring different parties to the table, because it truly is politically neutral on many events."

Sheikh Mohammed Al-Sabah

climb," the Gulf States Newsletter commented, pointing in particular to labyrinth bureaucracy that favors bribery as a way of getting things done.

Foreign observers are optimistic. Peter Somekh of the DLA Piper law firm said that "recent legislative developments have undoubtedly made Kuwait a more attractive investment region. Attracting foreign investment has the benefit of introducing more rigor and discipline in relation to corporate governance practices."

QSA



H.E. Anas Khalid Al Saleh

Deputy Prime Minister and Minister of Finance



oes the current low price of oil make it easier or more difficult to diversify the economy?

It definitely helps to sell the idea and brings urgency to the notion. In the past, diversification was a program that we had to initiate to be prepared; now it is a necessity. The positive outcome of major reforms is the solid backing not only from politicians but moreover the worldwide public: they are listening.

What are the short- and long-term implications of current oil prices?

Kuwait is well prepared for this, thanks to the prudent and skillful policy that was implemented to maintain reserves. Over the last two financial years, we managed to increase from 10 percent to 25 percent the credit reserve transfer to the Future Generations Fund. We treat it as an expense; this is part of our conservative policy.

What are the plans to offset the deficit you will face?

We started to implement practices before the oil price fell. We began attacking the subsidies, launched our partnership with the private sector and now are giving the private sector, the space it needs to participate and support us in the development plan.

Does lower oil revenue lead to a greater need for foreign investment in projects?

We have recognized the need for foreign investment since 2008. A department was created to facilitate and encourage FDI but it did not perform as we wished so we developed KDIPA to provide a welcoming environment for foreign investors. Kuwait used to be the least accommodating state in the Gulf Cooperation Council (GCC) for foreign investors, but last year saw major legislative reforms: the corporate law, the license law, and the KDIPA law. Now we have to enforce these laws and implement them efficiently.

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Bader Nasser Al-Kharafi Vice Chairman 7ain

s a leading mobile telecommunications provider in the Middle East and North Africa. Zain is one of a number of Kuwaiti firms that have leveraged local roots to go international. Along the way, many have professionalized their management and opened their capital —Zain is 100 percent traded on the Kuwait Stock Exchange. This exposure to—and success in—a competitive environment gives Zain Vice Chairman Bader Nasser Al-Kharafi, a graduate mechanical engineer and an ardent supporter of entrepreneurial youth training, an exceptional vantagepoint from which to analyze Kuwait's economic progress.

How can the Kuwaiti private sector grow stronger?

To sustain and manage the growth achieved by the public sector, the way forward is to privatize businesses and create efficiencies, enhancing scale and profitability and spurring healthy competition. The private sector will gain traction once the government increases infrastructure spending under the Kuwait Development Plan. It would also be helpful for the government to set up an infrastructure and national projects financing plan under which an autonomous financing institution provides flexible long-term financing for private-sector projects in areas of economic interest, for example retail, health care, services, food, and technology. This will empower the private sector to take on large-scale projects whose feasibility improves significantly with long-term funding.



National Development Plan

New Directions

espite falling oil revenues, Kuwait is pursuing an ambitious fiveyear plan designed to pump some US\$112 billion into economic and social development, mainly major infrastructure projects. The goals? Diversify the economy, boost privatesector participation-including foreign investment-and create thousands of opportunities for young people.

"I aim to maintain expenditure and run a higher deficit rather than cause stagnation in an economy that depends on government spending," Finance Minister and Deputy Prime Minister Anas Khalid Al-Saleh said in an interview. "We are pushing ahead with our development plan and have announced 521 projects at a cost of KWD 6 billion for this financial year. But we would like [the government] to slowly move out [of the economy] and allow the private sector to step in."

The 2015-2020 Kuwait Development Plan (KDP) builds on its 2010-2015 predecessor. Some 80 percent of the projects are continued, with the addition of around one hundred. The emphasis on local and international private participation remains the same, as does the overall goal, officially described as transforming Kuwait into "a regional trade and financial hub through sustained economic development, economic diversification, and GDP [gross domestic product growth."

Although infrastructure megaprojects, many structured as public-private partnerships, are the eye-catchers, the plan also targets housing, demographics, and other structural imbalances, according to Planning and Development Minister Hind Sabeeh Al-Sabeeh.

Many Kuwaitis in and out of government speak of the KDP as creating a historic shift in priorities aimed at decreasing the country's dependence on oil revenues, although it also includes some US\$35 billion to boost oil and natural gas production.

Better to Start Early

Reshaping an oil-rich national economy is rarely easy. "Inter-

national experience shows that diversifying away from oil is very difficult. Success or failure appears to depend on the implementation of appropriate policies ahead of the decline in oil revenues," IMF economists warned in a staff discussion note published December 2014. The report, "Economic Diversification in the GCC: Past, Present, and Future," argued that "greater diversification would reduce exposure to volatility and uncertainty in the global oil market, help create private sector jobs, increase productivity and sustainable growth, and establish the nonoil economy that will be needed in the future when oil revenues start to dwindle."

Kuwait does not face an imminent decline in oil receipts, but the KDP strategy closely matches the IMF economists' analysis: "Diversification in the GCC will require realigning incentives for firms and workers. At present, the distribution of oil revenues within the economy crowds out production of non-oil tradables. Producing non-tradables is less risky and more profitable for firms because they can benefit from the rapid growth in government spending, while the easy availability of low

At a Glance KDP 2015-2020

- US\$112 billion over five years
- US\$19 billion in current financial year
- FDI attraction, with public-private partnerships (PPPs)
- support for SMEs
- US\$20 billion Kuwait City metro, 69 km, construction starts 2017
- KWD 8 billion rail link with Kuwait's five GCC partners
- a new "media city"
- privatization of some public schools and a university
- construction of a new terminal at Kuwait airport
- power-generation projects
- sewage network expansion
- development of low-cost housing
- major new container port on Boubiyan Island
- Silk City—a huge new business and residential area
- tourism development of Failaka Island

skilled, low-wage foreign labor has helped extract larger rents. The continued availability of public sector jobs discourages nationals from pursuing entrepreneurship and private sector employment."

Many of the infrastructure projects in the KDP are designed to stimulate the private sector. Plans call for development of the Mubarak Al-Kabeer Port on Boubiyan Island, plus a major business and residential development at Silk City in Subiya, a 250-square-kilometer area north of Kuwait Bay. This will link to Kuwait City via the twenty-four-mile Subiya Causeway, due for completion in 2018.







QSA

Lord Jonathan Marland

Co-Chair UK-Kuwait Business Council

Alliances for the Future

Lord Jonathan Marland, a former British government parliamentary under secretary and prime minister's trade envoy, serves as co-chair of the UK-Kuwait Business Council alongside Mohammed Alshaya, the executive chairman of Kuwait's Alshaya retail and entertainment conglomerate. The Business Council is a semi-official body created in 2013 to boost trade and investment between the two countries, and to identify and remove any obstacles hindering these bilateral flows. Marland, a successful businessman, also serves on the High Advisory Council of the Kuwait National Fund for Small and Medium Enterprise Development—a body with US\$7 billion in Kuwaiti government capital.

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ou have said that the Kuwait Development Plan offers great opportunities for Kuwaiti and British companies to build "alliances for the future." Where, in particular?

There are tremendous opportunities in the oil sector and British companies have been awarded some of the new oil sector contracts. The rejuvenation of Kuwait Airways has seen the order of Airbus planes with Rolls Royce engines, and these will be arriving very soon. With regard to the new airport, the architect selected was Norman Foster. There will be a lot more activity relating to the airport in which British companies can be involved.

Where else?

Britain has skills and the need to grow our economy through exports, while Kuwait has complimentary skills and capital. I think that the combination of investment. skill sharing, and trust makes Kuwait an ideal partner for Britain. If you look at our medical profession, for example, there are thousands of Kuwaitis coming to London for medical treatment and we are privileged to receive them, but why should we not transfer some of our skills to Kuwait? Business can develop as a result of that. And just look at our education system—a lot of Kuwaitis come to the UK to be educated, or further educated. So why don't we create this opportunity in Kuwait, so that they have

the system available within their country and don't need to travel?

Britain and Kuwait have enjoyed very long relations. When you were in government, how did you help promote that?

Well, Britain had a very good ambassador in Kuwait and our diplomatic relations were excellent, so it was possible to start building strong business relationships relatively easily. Kuwait and Britain have a good royal connection, matched with great ministerial links. This helps foster businesses. Kuwait has had a sovereign wealth fund based in the United Kingdom for sixty years, and Kuwait has been one of the biggest investors in the United Kingdom for many years and will continue to invest, so the platform is there for mutual development. We organized a series of events; we took British business people to Kuwait, and Kuwaiti business delegates then came to the United Kingdom with the country's ministers to show what opportunities Kuwait offers. And the state visit of the emir [in November of 2012] was considered hugely successful; it reminded us that we were long-term friends.

What's your advice for British businesspeople wanting to get involved in Kuwait?

Kuwaitis are extremely friendly people, [but] they take a long-term view and drive a very hard bargain. Once you have taken the time to build relationships—and business is all about relationships—you can establish very strong, open and trusted ties in Kuwait.



Ghosson Ghassan Al-KhaledChief Operating Officer
ACICO Industries Company

The Kuwait Development Plan is creating huge construction opportunities, but it's not the only game in town. The ACICO group—civil construction, cement, prefabricated construction materials, and real estate—has seen strong growth concentrating mainly in low-rise residential development, both in Kuwait and throughout the region, with factories in Kuwait, Saudi Arabia, Qatar, and Dubai. Now it is branching out into precast concrete to supply projects such as hospitals, bridges, roads, transportation, and schools, says COO Ghosson Ghassan Al-Khaled.



Making It Happen

Kuwait's new development plan seeks to increase the number of Kuwaitis working in the private sector by roughly 50 percent through 2020, from 92,000 to 137,000, boosting the private sector share of GDP from 26.4 percent to 41.9 percent. Billions of dollars will be poured into promoting local SMEs, in particular in sectors where Kuwait has potential for homegrown development and innovation.

KDIPA's simplified "one-stop shop" promises to reduce FDI bureaucracy, while infrastructure megaprojects should benefit from recent improvements to legislation.

A 2013 FDI law received detailed regulation in December of 2014, allowing up to 100 percent foreign capital in most Kuwaitregistered companies and the installation of branch and representative offices. In February 2015, the Council of Ministers

named just ten sectors that are excluded from the 100 percent rule; they include oil and gas production, some downstream activities, real estate activities, and professional services such as law firms. Everything else is up for grabs.

This year also saw a new public-private partnership law that brings Kuwait closer to international best practices. Ashurst LLP, a global law firm based in London, noted that



KUWAIT LABOR LAW PROGRESS

Human Rights Watch (HRW) recently praised Kuwait's National Assembly for new legislation that gives domestic workers enforceable labor rights. The country has an

estimated 660,000-plus domestic workers, mainly women from Asia and Africa. "Kuwait has set an important precedent for its Gulf neighbors by accepting that domestic workers' rights should be protected in law," HRW researcher Rothna Begum told reporters.

"the new PPP law places an emphasis on the principles of transparency, openness, freedom of competition and equality of opportunities, all of which will be welcomed by investors. This over-arching philosophy translates into more investor-friendly provisions in the new PPP law, particularly in relation to attracting financing."

All Pull Together?

However, analysts caution that transforming fine plans into real change and effective development will require more than just good intentions, in particular given the disappointing rate of implementation of the 2010-2015 plan, caused, they say, by administrative inefficiency and political squabbling. As of January 2014, the government had spent just 57 percent of the allocated budget.

"Partly because of its vast oil wealth, Kuwait has been slower than regional peers in developing its non-oil sector through encouraging private sector activity and attracting foreign investment," Moody's Investors Service noted in November 2014. While stating that "the inherent instability of Kuwait's institutional setup does not pose a risk to overall political stability," Moodys warned that "the continued confrontation of the legislative and executive branches of government hampers effectiveness of policymaking."

Similarly, Peter Somekh, managing partner (Dubai) of the DLA Piper law firm, cautioned that "Kuwait needs to ensure that the political framework supports a swifter approach to executing development projects. We often hear ambitious plans that fail to come to fruition. There needs to be confidence that projects will get off the ground."

KFH Research Limited, an investment research firm that focuses on Kuwait, noted that the major KDP infrastructure projects will "undoubtedly" stimulate the national economy to include wider aspects like housing, education, health, airports, and harbors, in addition to oil and infrastructure projects: "If the government and National Assembly establish a better working relationship, major progress is expected on development projects." •

Spotlight



Marzouk Al-Kharafi Chairman Kharafi National

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Hind Sabeeh Al-SabeehMinister of State for Planning and Development

"The new Kuwait Development Plan seeks to match projects with goals, and there's a system to monitor implementation on a daily basis"

H

ow does the 2015–2020 Kuwait Development Plan differ from the 2010–2015 plan?

The first KDP did not focus enough on the policy and the goals to be achieved; it mainly just put in place the projects. However, we must match each project with the required policy and goals. Now we have instituted a daily follow-up process to maximize implementation. Each project affects others so we must look at the output of each one, and we must focus on the megaprojects to expand other areas. We used to adopt a top-down approach based on targets; there was a lack of implementation and understanding. We needed target-driven planning in which the implementer must have autonomy determining how to achieve his goals.

Is there a central goal to the 2015-2020 KDP or do the components work alongside each other? We have five goals in the plan and more than two hundred policies.

Whatever we propose, we then have to implement it, so there is not just one goal. We want the entire cabinet and Parliament to focus on the plan, and we have succeeded in that. We also now have a committee to schedule Parliament's priorities in accordance with the plan.

You are in charge of the communication of the Development Plan. Have you received any collaboration from abroad?

I visited Japan to seek Tokyo's input and experience; also Korea and England to learn how people can help us speed up the implementation of our plan. We have memorandums of understanding with countries for input, in particular with the United Kingdom.

Can SMEs be involved in KDP projects?

They definitely can! There are huge opportunities in the private sector.

"Kuwait should achieve significant progress in diversification of sources of income, reducing reliance on oil."

In just four decades, Kharafi National has grown from a local Kuwaiti contractor into a major regional infrastructure project developer, contractor, and service provider to the oil industry and other sectors. With more than 27,750 employees and its own fleet of more than 6,100 heavy construction machines, the company is active in build-operate-transfer (BOT), build-own-operate (BOO) and public-private partnership (PPP) projects in various countries. This wide experience gives Chairman Marzouk Al-Kharafi a unique advantage in assessing his country's best paths forward: "Kuwait should promote a number of sectors that can most benefit from foreign investment and expertise, such as infrastructure investments, water, waste-water treatment, power, and communications," he said. "Kuwait also should focus on investment in the banking and financial sectors, insurance, IT and software development, hospitals and pharmaceuticals."



30% are citizens

41% are under 25

30% more than the USA

Kuwait has a population of around four million but just three in ten are citizens; the rest are immigrant workers.

One in four people in Kuwait is aged fourteen or under, while just 7 percent are fifty-five or older. This means Kuwait must focus on education.

Kuwait's per-capita GDP is US\$71,000, 30 percent higher than the United States and 88 percent higher than the UK (PPP, 2014).

Q&A



Faisal Ali Al-Mutawa

Chief Executive Officer
Ali AbdulWahab Sons & Co.

Kuwait's origins are in commerce, as a trading port, and your company is a great example of that tradition. What's needed to get back to those roots?

In a word, economic freedom. Throughout history, economic freedom has always created wealth. The problem we are facing in Kuwait is that we have a very large public sector that is very expensive and very inefficient.

You're talking about a change in culture?

Right. Look at countries that have grown and become very wealthy without natural resources, like Japan, Hong Kong, Singapore, and Dubai, which is the most prosperous. Economic freedom means laissez-faire, which facilitates and creates a friendly working environment without too many restrictions, too much bureaucracy, or too many laws. Regulations need to be limited to the protection of society against malpractice. As long as people are working within the rules and ethics and laws, then we should help them. What Kuwait requires is less government and more private sector.

What's your dream?

I would like to bring Kuwait back as the Pearl of the Gulf, as it used to be in the 1960s.

The Future IsSmall... and Medium!



"CREATING A SECOND ECONOMY"

"In Kuwait, 2015 is the year of educating the younger generation that when you create a new business it's not about making a cupcake at home, and it's not about designing a new *deraa*, or a new *abaya*. It's about creating a second market, a second economy for Kuwait because we really need to go in that direction, especially with the current situation with the oil prices."

here's widespread understanding that Kuwait needs to reduce the presence of the state in the economy, both via privatization and by growing the private sector. In particular, this means supporting small and medium enterprises in sectors that can offer good jobs for Kuwaiti citizens rather than relying on immigrant labor.

"It could be a business that brings in technology, and if it is labor intensive then it's important that there are jobs that Kuwaitis like doing or are able to," said Mohammad Al-Zuhair, executive chairman of the recently created Kuwait National Fund for SME Development. "ICT [information and communications technology] is an obvious choice to develop as a sector; another is media and creative design. We have many marketing graduates as well as architects and we want to tap in to their minds. Historically, those people do not go and work for government."

Planners have ruled out heavy industry but some light manufacturing could make sense. "Traditionally SMEs are part of a large value change; we would be focusing on the petrochemical sector," Al-Zuhair said.

Planning and Development Minister Hind Sabeeh Al-Sabeeh is another SME fan, in particular given the potential to provide good jobs for young Kuwaitis. Her portfolio includes labor, and recently she created a special department just for SMEs. It has helped more than three hundred companies. "Up to 80 percent of SMEs involve working with young people and they want everything quickly," she said. "Kuwaiti SMEs don't necessarily need finance; they need help in areas like obtaining licenses quickly."

Al-Sabeeh said her ministry is involving all areas of government to speed up licensing and minimize costs. She also wants government-procurement tenders to be open to smaller companies, and to help budding entrepreneurs seize opportunities outside of Kuwait. "If we work together as a government, we can help the growth process. Young people are the engine for progress; they drive the process through speed, efficiency and technology."

Enthusiastic Entrepreneurs

Not surprisingly, Kuwait's successful young businesspeople are extremely supportive of the government's focus on SMEs. Bader Nasser Al-Kharafi, vice chairman of Zain, a Kuwaiti telecoms company, called the newly established SME Fund



Three Young Private–Sector Trailblazers Offer Their Visions for the Future



Basil Alsalem CEO Kuwait Food Concepts



Ghazi F. Alhajeri Founder United Sports Co.



Mohammed Jaffar Owner Talabat

We could benefit from partnerships in technology, which are human-intensive, and could take advantage of our young, educated population.

Kuwait can become a technological hub.

Developing the tech sector requires easy interaction between government, finance, and entrepreneurs, with the least complication possible. Not every company will succeed, but some will.

Q&A



Mohammad Al-ZuhairExecutive Chairman
Kuwait National Fund for
SME Development

"a remarkable initiative that emphasizes the government's desire to promote the development of Kuwaiti youth and the private sector."

This initiative, Al-Kharafi predicted, would provide much-needed impetus to the SME sector and encourage Kuwaitis to set up their own businesses, not least those people who were previously held back by the non-availability or high cost of seed capital. "This [SME Fund] is just one of the many steps that we expect the government to announce. It would also be immensely helpful to have dedicated business and industrial parks established with supporting infrastructure that can further boost the productivity and profitability of the industrial and manufacturing sectors," Al-Kharafi said.

Basil Al-Salem, cofounder and owner of the Kuwait Food Concepts Company, noted that many SMEs face a shortage of "Our allocated capital is KWD 2 billion (US\$7 bn), making this the world's largest SME Fund. We will work actively with the private sector; I have no intention of the fund becoming an unnecessarily-large organisation."

Why did Kuwait decide to promote small and medium enterprises?

Kuwait can become an exporter of ideas, and

Kuwaitis to travel, gain experience, and see

progress. It's in Kuwait's DNA.

that would be a great regional business. I want

The SME Fund was created by law in 2013 but it was not the first time the government has tried to support smaller firms. There have been many attempts since 1997 and 1998 to promote SMEs in terms of financing but they were not development-focused. People complained that they did not have access to financing and that they were being asked for financial history and collateral which made things more difficult.

So what's different about the SME Fund? Everything to do with SMEs is now under

suitable employees because of restrictive rules and regulations. However, as a volunteer member of a Labor Ministry committee that seeks to address SME questions, Al-Salem said he was optimistic about achieving "fruitful results."

Saleh Al-Tunaib, a cofounder of the Jaribha crowdfunding site, told the National in April that bureaucracy was his biggest start-up challenge. But Samar Mohammad Bager, a professor of entrepreneurship and marketing at Kuwait University, who holds a PhD in business administration from the University of Texas at Arlington, noted that the number of Kuwaiti SMEs has grown fast recently, with the potential to foster change in the economy and create new jobs.

A key driver, she said, was private investors' expectation of money from the SME Fund: "Everybody is waiting for that fund to officially work."

one umbrella. We're not just a fund; we're also the country's SME agency which seeks to enhance the entrepreneurial spirit of Kuwaiti citizens; provide finance to grow their businesses; and upgrade their skills through

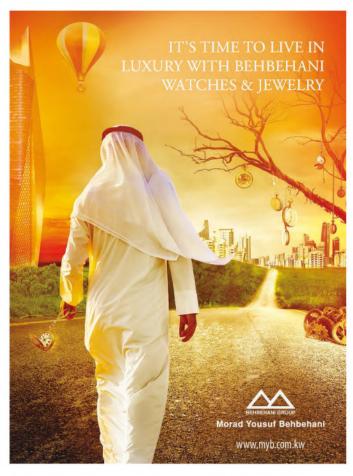
training and technical assistance. **How do you, or will you, operate?**

We have developed our strategy during the past year, and it was a challenge. Our main objective is to develop businesses which in the long run can provide returns for the fund to sustain itself. We will not be charging market interest rates even though we are assuming the

risk of the projects that we finance. Awareness and education are key if we are to change the culture; the way that small and medium enterprises are viewed; and to explain the difference between a small business and a start-up.

How will you support start-ups?

We will provide the right incubation for entrepreneurs. Incubators are often placed in universities, where innovation is booming and students have fewer distractions from other aspects of life. Many people talk about incubators when in reality they are just referring to working space, and we know this is not enough. There needs to be an element of handholding to develop and pilot ideas, followed by effective mentoring to turn ideas into thriving businesses.







Q&A



Nader Al-Awadhi Senior Partner NEN/DLA Piper

From a legal point of view, how would you describe the business environment in Kuwait today, and in the context of the Gulf region?

From my experience, international clients coming to Kuwait do not necessarily have full confidence in the legal system. However, we started developing a legal system conducive to business before our neighbors, and Kuwait has a real democracy with a good judicial system. This gives us a competitive advantage over others; a sound legal framework is a key component of both commercial development and social change.

What is the advantage of having a joint venture with a major international practice?

Law firms in Kuwait are mostly a one-man show. When you work for institutional clients, you need to include the type of special services that such clients require. Most of our lawyers are general practitioners with appropriate industry experience who can provide clients with a general overview of each particular situation. We also leverage our firm's global trade and government affairs practice to support clients in Kuwait, and Kuwaiti sovereign and commercial entities internationally.

A Blossoming Private Sector

Like changing course in the massive tankers that carry Kuwaiti crude, it will take time to steer the economy toward the private sector. But much is happening.

ectors offering valueadded services such as finance, education, telecommunications, and health already boast many vibrant local companies, often with international links. "A number of Kuwait's traditional business families have recently been investing in areas such as finance and banking, hospitality, leisure, retail, and fast-moving consumer goods," notes Bader Nasser Al-Kharafi, vice chairman of Zain. He also sees good prospects for tourism: "The World Travel and Tourism Council predicts 440,000 tourist arrivals by 2024, up from 270,000 in 2014." Investments in infrastructure, not least the new terminal at Kuwait International Airport and the development of tourist facilities on Boubiyan and Failaka Islands, will help.

Interestingly, many of Kuwait's new entrepreneurs are women. Nouf Al-Mutawa, who has a degree in mass communications and advertising, joined forces with her sister-in-law eleven years ago. Today they have an expanding chain of high-end chocolate bars in malls and shopping centers.

"When we founded Bon Group, the idea of starting your own business, especially in the food industry, was not very common," Al-Mutawa recalled. "The idea was mostly for large corporations that were bringing in international franchises that are established all over the world. For two young female Kuwaitis starting up their own food business, it was challenging in terms of people's mindsets." One clue to success: "Eleven years ago, it was all word of mouth and location was the most important thing. Today we have Instagram and Facebook. Social media has made all the difference."

Engineering graduate Ghosson Ghassan Al-Khaled was one of seventeen Kuwaitis named in Forbes Middle East's 2014 ranking of Most Powerful Women. As COO of ACICO Industries Company, she runs part of a cement, prefabricated construction and property development group started by her father. Expanding throughout the Gulf has meant adapting: "Kuwait is very different; the biggest difference is the culture so the marketing has to be very different."



Ali Morad Yousef Behbehani President Morad Yousuf Behbehani Group

Formed in 1935 by Morad Yousuf Behbehani, a legendary Kuwaiti entrepreneur, the group that today bears his name is a leader in various areas of luxury retailing and wholesaling, telecommunications, vehicle distribution, engineering, and travel. The group pioneered both radio and TV broadcasting in the country, and in 1949 introduced the first air-conditioning units, so transforming living conditions and the potential for modern economic development. Today the group is led by Ali Morad Yousef Behbehani, who holds a degree in English literature from Kuwait University and has experience in fields that include banking and insurance.

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Dr. Kazem BehbehaniDirector General
Dasman Diabetes Institute

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he Dasman Diabetes Institute is a world leader in its field; you have partnerships with Harvard Medical School, Cambridge University, and several other top institutions. But why did Kuwait develop such an interest in diabetes?

The main health issue in Kuwait today is chronic diseases like diabetes. Many years ago this was not a disease here; diabetes was a disease of the North, not the South, and we are considered part of the South.

However, over the past fifteen years we have started to have a problem with diabetes because of the change in lifestyles. We did not have the professional manpower to deal with diabetes, so this institution was established. We are looking at a completely new disease in Kuwait, which is affecting children under ten years old—Type 2 diabetes is supposed to be adult onset.

It's not just a Kuwaiti phenomenon...

Right, the whole world suddenly changed, even countries that aren't rich. Unfortunately, Kuwait is number two among GCC countries for diabetes. We were number three globally; now we are number nine. But we have 365,000 diabetic patients. That's the problem.

You want people to change their behavior?

Yes, we are looking to the future and the younger generations. So we are going into schools, and we bring the children here and teach them what diabetes is, how it works, and how to prevent it. They go home and change the views of their parents.

A regional flagship in the fight against Diabetes See Dasman Diabetes Institute المالة موز العلم العلم المسلم ا

Creating the Future

Kuwait's native workforce may be small but many people hold good international degrees, so one key watchword is innovation.



"Our competitive advantage is that Kuwait has the best educated young population in the region," said Basil Al-Salem of the Kuwait Food Concepts Company. "Our youth travel and they bring home their experience. Kuwait is a huge exporter of ideas. If we can harness and capitalize on that, and the government provides the infrastructure for their development, Kuwait can create the right ecosystem for innovation."

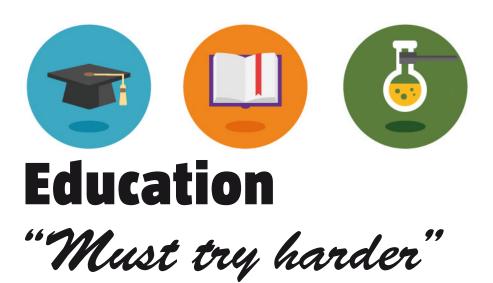
Britain's Lord Marland sees Kuwait as a niche for the medical sector: "One must identify what skills sets are available within the country and set up the incubator to build those skills, so that they become businesses that can progress and build upon themselves."

Talabat founder Mohammed Jaffar says the environment for technology is not as developed as in the United States or Europe, but it is progressing: "The most successful e-businesses have not re-invented the wheel; they have taken offline services and converted them online,

making them easier. The Talabat deal [bought by Germany's Rocket Internet] has given people hope and inspiration. In the next few years we will see more companies like Talabat in Kuwait and the GCC."

Kuwaiti women are also driving innovation. Mona Al-Mukhaizeem is chief dealmaker at Sirdab Lab, a start-up that offers co-working space, training, and networking to other start-ups. "There are many women entrepreneurs in the [Gulf] region, and many wonderful initiatives supporting women in entrepreneurship," she said.

Sheikha Inistar Al-Sabah created Alnowair in 2013 as a nongovernmental organization (NGO) dedicated to the application of positive psychologyhelping people feel better about life and by extension Kuwait. One program "focuses on inculcating positive thinking and attitudes in schools and universities, at the grass roots of our society," she said. Another has placed thirty bright yellow benches at key locations, offering people the chance to sit and reflect on a beautiful view.



Kuwaitis in both government and the private sector know they have to focus on improving and broadening education to power the dream of becoming a world-class services hub.

TOMORROW'S TYCOONS

INJAZ-Kuwait is an educational NGO modeled on the United States' centuryold Junior Achievement. Volunteers from private companies provide young people with hands-on, real-world experience and help them understand the role of business in a global economy, plus the importance of ethical and sustainable practices. Since it was founded in 2005, INJAZ-Kuwait has reached more than 27.000 students at 70-plus schools and universities, aided by 1,200-plus volunteers. "I believe INJAZ-Kuwait will make a real difference in the lives of young people and help mold Kuwait's future generations of business leaders and entrepreneurs," said INJAZ-Kuwait Chairman Omar Kutaiba Alghanim.

n the latest (2013) Human Development Index compiled by the UN Development Programme, Kuwait ranks 46 overall, with HDI of 0.814. That puts the state just inside the group of countries with "very high human development." But Kuwait is significantly below the average for this elite group in terms of "mean years of schooling" and "expected years of schooling." However, the gap for the former indicator, which measures the adult population, is much greater than that for current youngsters. So Kuwait is catching up, but still has a way to go.

Adult literacy is 94 percent and virtually all boys and girls are in state or private schools; 22 percent go on to tertiary education. Moudi Al-Homoud of the AOU says Kuwait must retrain teachers, re-empower schools, and reform the curriculum to give more emphasis to the sciences, technology, and languages: "We have to provide a sound educational system to ensure better outcomes at the elementary, secondary, and university levels. However, although our system has some serious shortcomings, we have succeeded in certain areas."

In March of 2015 Kuwait launched a five-year program with the World Bank to "support capacity building, improve the quality of teaching and learning, and monitor [the] impact on schools and students."

Consortium Targets SMEs

Wael Ghafoor, CEO of the American School of Kuwait, a private institution, criticizes the complicated curriculum and lack of motivation at state schools. Educational specialist Hanan Al Mutawa who, together with Russell Byrne, founded the Education Consortium (EC), an award-winning NGO, links better education to the program to promote SMEs.

"The opportunity the government is now giving people with regards to funding SMEs, all these new start-ups, that's great," Al-Mutawa says. "But how they go about it is just pushing money at them to get them going. They haven't actually trained them in implementation, how to process procedures and actually complete projects. That comes back to education and training, and that's an area where we feel we should work more closely with government to channel the money in a better way." The EC has a strong focus on school leadership, empowering students, and engaging stakeholders. •

Spotlight



Dr. Moudi Al-Homoud Rector Arab Open University

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he Arab Open University (AOU) was founded in 2002 by Prince Talal bin Abdulaziz AI Saud of Saudi Arabia, with support from Unesco. A private, nonprofit institution offering mainly online courses, AOU is headquartered in Kuwait with branches in Jordan, Lebanon, Bahrain, Sudan, Egypt, Oman, and Saudi Arabia, where it has six campuses. The original focus on information technology and computing (ITC), business studies, education, and English is now expanding to include engineering, international law, graphic design, and media, and there is a collaboration and certification agreement with Britain's Open University.

Rector Moudi Al-Homoud, who holds a PhD in business administration from the City University London, said that the AOU's strategic plan calls for the aggregate student body to rise from just over thirty thousand to fifty thousand by 2017. To date, more than twenty thousand have graduated, more than half of them women.

A vocal advocate of women's rights, Al-Homoud—a former Kuwaiti minister in various portfolios—said that governments are not taking women's empowerment seriously enough, and this is hampering growth and development. "Women form around 74 percent of the Kuwait University student population; society has to use these resources more effectively. Today the [Kuwaiti] constitution considers males and females to be equal, so there is no excuse: they have to empower women." One personal aim, Al-Homoud said, was to make Arab governments realize that women can deliver as affectively as men in certain areas, if not in all. "Kuwait is more progressive in the educational field than most of the Arab world," she said. "We are trying to provide a role model: that is. Arab women can be as efficient as men."

Spotlight



Abdulwahab Al-BaderDirector General
Kuwait Fund for Arab Economic
Development—KFAED



or more than half a century, Kuwait has dedicated part of its oil wealth to helping less fortunate countries around the world. Created 1961, as of mid-2015 KFAED had extended loans totaling the equivalent of some US\$18.4 billion for 890 projects in more than 100 countries.

"Philanthropy is not a good word for what we do; development aid is a better term," said Abdulwahab Ahmed Al-Bader, an economist who has been director general of KFAED since 2005.

Energy and transportation projects normally lead the loans list, with around three-fifths of total commitments, followed by agriculture, water and sewage, industry, and communications. Just over half of the total loan amount has been directed to Arab countries.

Al-Bader noted that KFAED was created the same year that Kuwait gained independence, and reflects part of the country's fundamental philosophy: "We are not into development aid for the sake of it. We truly believe that aid assistance is pivotal to the future of this world." Recent loans have averaged maturity of 18 to 28 years with grace of three to six years, and carry annual interest (including a 0.5 percent service charge) of between 1.5 percent and 3.5 percent. According to KFAED's most recent available report, these terms imply a substantial average grant element in the value of the loans. Recent grants include US\$22 million to support a drinking water project in the historic city of Axum, in Ethiopia, and US\$17 million for irrigation in Eastern and Central Nepal.

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Springboard for Development

Foreign investors can now receive significant help to address bureaucracy, and may soon be able to place into three planned new economic zones.

wo of the most significant recent developments in Kuwait, at least as far as potential foreign investors are concerned, were the operational start-up in December 2014 of the Kuwait Direct Investment Promotion Authority and the definition this year of sectors open to FDI.

Prior to KDIPA, the country had an agency tasked with promoting inward FDI, the Kuwait Foreign Investment Bureau (KFIB), but a consensus emerged that it lacked the teeth to be effective. In the period 2003-2012, KFIB approved investment applications totaling just KWD 1.05 billion—equivalent to some US\$3.5 billion at current exchange rates, with roughly 85 percent of that destined for industrial projects.

The new 2015-2020 Kuwait Development Plan calls for investments averaging some US\$22 billion per year, with about half coming from private sources. Though there is no fixed share for FDI, the government wants to attract significant foreign involvement for the technology and market links it can bring. This suggests average annual inflows of FDI will need to be significantly higher than the old agency achieved.

"I believe that the three most important improvements brought about by the new investment law are, first,



Muhannad Al-Sane Chairman and Chief Executive Officer Al-Riyada Finance & Investment Co. KSC

"There is a huge focus on how to encourage [foreign] direct investment in Kuwait. Business in Kuwait is a great opportunity. Education is growing; health care is growing; services are doing great; ICT [information and communications technology] is amazing. There is a big market they can share. That is what Kuwait needs: foreign experience to help and move forward."

the establishment of KDIPA as a separate and multidisciplinary public authority, as compared to KFIB which was a division within a ministry." said KDIPA Director General Dr. Meshaal Jaber Al-Ahmad Al-Sabah. "Second was mandating KDIPA with broader tasks in addition to simply promoting Kuwait as an attractive direct investment location targeting both foreign and local investors; and lastly, supporting the creation within KDIPA of an administrative unit that is effectively a 'one-stop shop' to facilitate and speed up pro-



cedures in collaboration with relevant government entities.

Kuwait offers approved income-tax exemption for foreign investors for up to ten years, plus customs duty exemption for the importation of raw materials, machinery, equipment, and spare parts. Foreigners may have 100 percent ownership in all but a few sectors (see page 6).

Askedabouthis "sales pitch" to potential foreign investors, Dr. Al-Sabah first mentioned the country's recent legislative reforms that favor FDI. Then he added: "Kuwait's unique selling proposition is based on its strategic location, the open and stable economy, 10 percent of the world's proven oil reserves, democracy, sound macroeconomic conditions with high purchasing power reflecting high per-capita income, investor grade rating, low-risk classification, adequate infrastructure, a friendly, youthful and dynamic society, and a good record in human development indictors."

Two major investments assisted by KDIPA in its first months of operation were the establishment of a KWD 353 million, fully owned subsidiary of Chinese telecoms giant Huawei and a fully owned subsidiary of IBM that will support local research and development (R&D)

and innovation, in particular for oil sector services.

Economic Zones

One of KDIPA's potential trump cards for attracting FDI, in addition to the KDP megaprojects, could be the creation of three new economic zones.

"The ultimate goal of these economic zones will be to lay the optimal foundation to develop new areas of specialization within Kuwait to enhance its competitive advantage, creating added-value clusters and differentiating Kuwait from other countries in the region," Dr. Al-Sabah said.

Potential locations are Abdali on the main highway north of Kuwait Citynear the Iraqiborder; Al-Wafra near the southern border with Saudi Arabia; and Shaghaya, west of Kuwait City on the main highway to Riyadh. Potentially, all three sites will have links to the proposed national rail network that will connect with other GCC countries.

International consultants led by U.S. firm Skidmore, Owings & Merrill (SOM) have been preparing a feasibility study for the zones, looking at aspects such as potential investor demand and the legal framework. The World Bank has been supporting this work.

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Spain Office

Paseo de la Castellana, 95 15º planta Madrid 28046 Tel +34 91 418 50 32 www.peninsula-press.com

Editor-in-Chief Stella Klauhs Associate Director Mauro Perillo Project Director Kathryn Mechie Project Coordinators Marios Koundouros,

Production Eliana Lucio, Dora Skalicki

NVESTMENT

USA Office

1050 Connecticut Avenue, NW 10th floor, suite 1000 Washington, DC 20036 Tel +1 202 772 1090 info@peninsula-press.com

Creative Director Marta Conceição Writer Brian Nicholson Photography Faisal Albisher, Jonathan Perugia, Mshal Albaqer, Sarah H. Alsayegh, SXC Illustration André Kano (cover), freepik.com

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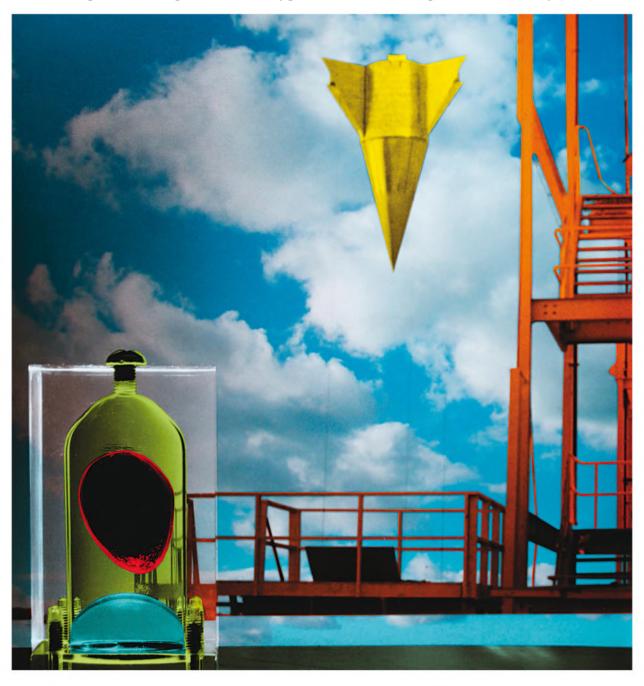
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the science and technology issue

features

CALL IT THE CURSE OF scientific progress: As labs generate tools and data to improve health, communications, and other facets of life, humankind scrambles to control its worst instincts—or undo the damage they cause. The features in FOREIGN POLICY's science and technology issue examine this struggle. As Tim Requarth explains, cutting-edge neuroscience technologies developed for peaceful purposes—telepathic interaction, for instance—could be co-opted and deployed as weapons. Ferris Jabr reports that scientists have developed a novel method of discovering antibiotics, yet it may not be enough to end the global resistance crisis, fueled by decades of drug misuse and pharmaceutical companies fixating on their bottom lines. And Christina Larson shows how young entrepreneurs are breaking out of China's hierarchical, corruption-prone science bureaucracy—but asks whether they can succeed on their own. As Isaac Asimov once said, "Science gathers knowledge faster than society gathers wisdom." It's a danger all too evident today. —*THE EDITORS*





CUTTINGEDGE BRAIN
TECHNOLOGIES
CAN ERASE
TRAUMATIC MEMORIES
AND READ PEOPLE'S
THOUGHTS. THEY
COULD ALSO BECOME
THE 21ST CENTURY'S
MOST DANGEROUS

MIND FIELD

BY TIM REQUARTH

ILLUSTRATIONS BY JIMMY TURRELL **ON AN OTHERWISE** routine July day, inside a laboratory at Duke University, two rhesus monkeys sat in separate rooms, each watching a computer screen that featured an image of a virtual arm in two-dimensional space. The monkeys' task was to guide the arm from the center of the screen to a target, and when they did so successfully, the researchers rewarded them with sips of juice.

But there was a twist. The monkeys were not provided with joysticks or any other devices that could manipulate the arm. Rather, they were relying on electrodes implanted in portions of their brains that influence movement. The electrodes were able to capture and transmit neural activity through a wired connection to the computers.

Making things even more interesting, the primates shared control over the digital limb. In one experiment, for example, one monkey could direct only horizontal actions, while the other guided just vertical motions. Yet the monkeys began to learn by association that a particular way of thinking resulted in the movement of the limb. After grasping this pattern of cause and effect, they kept up the behavior—joint thinking, essentially—that led the arm to the target and earned them juice.

Neuroscientist Miguel Nicolelis, who led the research, published earlier this year, has a name for this remarkable collaboration: a "brainet." Ultimately, Nicolelis hopes that brain-to-brain cooperation could be used to hasten rehabilitation in people who have neurological damage-more precisely, that a healthy person's brain could work interactively with that of a stroke patient, who would then relearn more quickly how to speak or move a paralyzed body part.

His work is the latest in a long string of recent advances in neurotechnologies: the interfaces applied to neurons, the algorithms used to decode or stimulate those neurons, and brain maps that produce a better overall understanding of the organ's complex circuits

governing cognition, emotion, and action. From a medical perspective, a great deal stands to be gained from all this, including more dexterous prosthetic limbs that can convey sensation to their wearers, new insights into diseases like Parkinson's, and even treatments for depression and a variety of other psychiatric disorders. That's why, around the world, major research efforts are underway to advance the field.

But there is a potentially dark side to these innovations. Neurotechnologies are



"dual-use" tools, which means that in addition to being employed in medical problemsolving, they could also be applied (or misapplied) for military purposes.

The same brain-scanning machines meant to diagnose Alzheimer's disease or autism could potentially read someone's private thoughts. Computer systems attached to brain tissue that allow paralyzed patients to control robotic appendages with thought alone could also be used by a state to direct bionic soldiers or pilot aircraft. And devices designed to aid a deteriorating mind could alternatively be used to implant new memories, or to extinguish existing ones, in allies and enemies alike.

Consider Nicolelis's brainet idea, Taken to its logical extreme, says bioethicist Jonathan Moreno, a professor at the University of Pennsylvania, merging brain signals from two or more people could create the ultimate superwarrior. "What if you could get the intellectual expertise of, say, Henry Kissinger, who knows all about the history of diplomacy and politics, and then you get all the knowledge of somebody that knows about military strategy, and then you get all the knowledge of a DARPA engineer, and so on," he says, referring to the U.S. Defense Advanced Research Projects Agency. "You could put them all together." Such a brainet would create near-military omniscience in high-stakes decisions, with political and human ramifications.

To be clear, such ideas are still firmly in the realm of science fiction. But it's only a matter of time, some experts say, before they could become realities. Neurotechnologies are swiftly progressing, meaning that eventual breakout capabilities and commercialization are inevitable, and governments are already getting in on the action. DARPA, which executes groundbreaking scientific research and development for the U.S. Defense Department, has invested heavily in brain technologies. In 2014, for example, the agency started developing implants that detect and suppress urges. The stated aim is to treat veterans suffering from conditions such as addiction and depression. It's conceivable, however, that this kind of technology could also be used as a weapon-or that proliferation could

allow it to land in the wrong hands. "It's not a question of if nonstate actors will use some form of neuroscientific techniques or technologies," says James Giordano, a neuroethicist at Georgetown University Medical Center, "but when, and which ones they'll use."

People have long been fascinated, and terrified, by the idea of mind control. It may be too early to fear the worst—that brains will soon be vulnerable to government hacking, for instance—but the dual-use potential of neurotechnologies looms. Some ethicists worry that, absent a legal framework to govern these tools, advances in the lab could enter the real world dangerously unencumbered.

For better or for worse, Giordano says, "the brain is the next battlespace."

DRIVEN BY THE DESIRE to better understand the brain, arguably the most unknowable of human organs, the past 10 years have seen a burst of neurotechnology innovation. In 2005, a team of scientists announced that it had successfully read a human's mind using functional magnetic resonance imaging (fMRI), a technique that measures blood flow triggered by brain activity. A research subject, lying still in a full-body scanner, observed a small screen that projected simple visual stimuli—a random sequence of lines oriented in different directions, some vertical, some horizontal, and some diagonal. Each line's orientation provoked a slightly different flurry of brain functions. Ultimately, just by looking at that activity, the researchers could determine what kind of line the subject was viewing.

It took only six years for this brain-decoding technology to be spectacularly extended—with a touch of Silicon Valley flavor—in a series of experiments at the University of California, Berkeley. In a 2011 study, subjects were asked to watch Hollywood movie trailers inside an fMRI tube; researchers used data drawn from fluxing brain responses to build decoding algorithms unique to

THE SAME BRAIN-SCANNING

MACHINES MEANT TO DIAGNOSE

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each subject. Then, they recorded neural activity as the subjects watched various new film scenes—for instance, a clip in which Steve Martin walks across a room. With each subject's algorithm, the researchers were later able to reconstruct this very scene based on brain activity alone. The eerie results are not photorealistic, but impressionistic: a blurry Steve Martin floats across a surreal, shifting background.

Based on these outcomes, Thomas Naselaris, a neuroscientist at the Medical University of South Carolina and a coauthor of the 2011 study, says, "The potential to do something like mind reading is going to be available sooner rather than later." More to the point, "It's going to be possible within our lifetimes."

Expediting this is the rapidly advancing technology behind brain-machine interfaces (BMI)—neural implants and computers that read brain activity and translate it into real actions, or that do the reverse, stimulating neurons to create perceptions or physical movements. The first sophisticated interface made it out of the operating room in 2006, when neuroscientist John Donoghue's team at Brown University implanted a square chip—measuring less than one-fifth of an inch across and holding 100 electrodes—into the brain of then-26-year-old Matthew Nagle, a former high school football star who had been stabbed in the neck and paralyzed below the shoulders. The electrodes were positioned over Nagle's motor cortex, which, among other things, controls arm motions. In a matter of days, Nagle, with his device wired to a computer, could move a cursor and even open email just by thinking about it.

Eight years later, BMIs had grown profoundly more complex, as demonstrated at the 2014 World Cup in Brazil. Juliano Pinto, a 29-year-old with complete paralysis of the lower trunk, donned a mind-controlled robotic exoskeleton—developed by Duke's Nicolelis—to deliver the kickoff at the tournament's opening ceremony in São Paulo. A cap on Pinto's head picked up signals from his brain, indicating his intention to kick. His computer, strapped to his back, received these signals and then spurred the robotic suit to execute the action.

"THE POTENTIAL TO

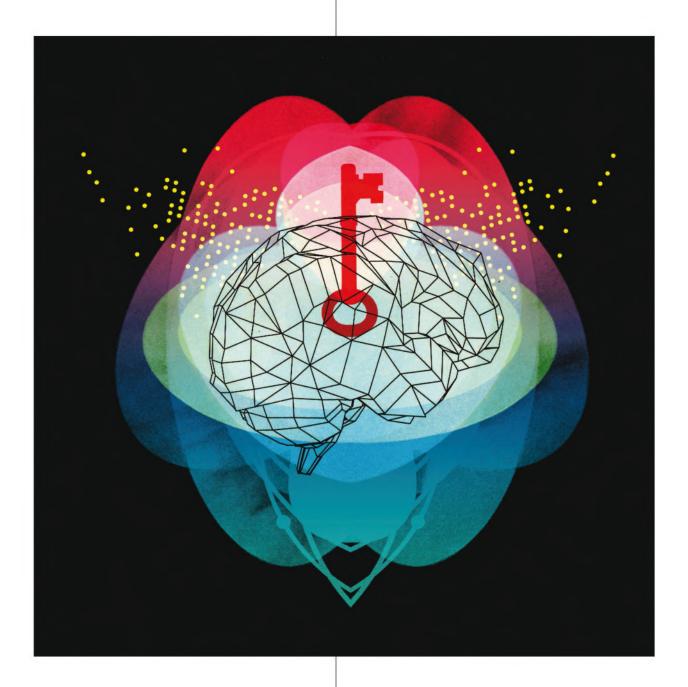
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Neurotechnologies go further still, dealing with the complexity of memory. Studies have shown that it might be possible for one person to insert thoughts into another's mind, like a real-life version of the blockbuster film Inception. In a 2013 experiment led by Nobel laureate Susumu Tonegawa at the Massachusetts Institute of Technology, researchers implanted what they called a "false memory" in a mouse. While observing the rodent's brain activity, the researchers placed the animal in a container, and watched as the mouse became acquainted with its surroundings. The team was able to pick out the precise network of cells among millions that were stimulated in the mouse's hippocampus while it formed a memory of the space. The next day, the researchers put the animal in a new container it had never seen before, and delivered an electric shock while simultaneously activating the neurons the mouse had used to remember the first box. The association was formed: When they put the mouse back in the first container, it froze in fear, even though it had never experienced a shock there. Just two years after Tonegawa's discovery, a team at the Scripps Research Institute administered mice a compound that could remove a specific memory while leaving others intact. This kind of erasing technology could be used to treat post-traumatic stress, eliminating a painful thought and thus improving someone's quality of life.

It's likely this research momentum will continue, because the mind-science revolution is being bankrolled lavishly. In 2013, the United States launched the BRAIN Initiative (Brain Research through Advancing Innovative Neurotechnologies), with hundreds of millions already earmarked for studies within the first three years; future funding has not yet been determined. (The National Institutes of Health (NIH), one of the five federal agencies involved in the project, has requested \$4.5 billion, spread over a 12-year period, for its part alone.) For its part, the European Union has devoted an estimated \$1.34 billion to its 10-year Human Brain Project, which began in 2013. Both programs are designed to build innovative



tools that will map the brain's structure and eavesdrop on the electrical activity of its billions of neurons. In 2014, Japan launched a similar initiative, known as Brain/MINDS (Mapping by Integrated Neurotechnologies for Disease Studies). And even Paul Allen, Microsoft's co-founder, is throwing hundreds of millions of dollars into his own Allen Institute for Brain Science, a large-scale effort to create brain atlases and unravel how vision works.

To be sure, as incredible as recent inventions are, most of today's neurotechnologies are inchoate. They do not function for very long inside the brain, can only read or stimulate a limited number of neurons, or require a wired connection. "Mindreading" machines, for example, rely on expensive equipment available only in lab or hospital settings to produce even their crude results. Yet the commitment from researchers and funders alike to neuroscience's future means devices will likely become only more sophisticated, ubiquitous, and accessible with every passing year.

Each new technology will bring creative possibilities for its application. Ethicists warn, however, that among these uses is weaponization.

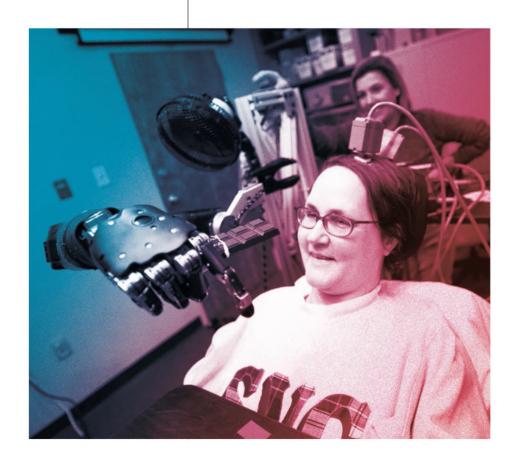
It does not appear that, to date, any brain tools have been employed as weapons, which is not to say their battlefield values aren't currently being considered: Earlier this year, for example, a quadriplegic woman flew an F-35 fighter-jet simulator using only her thoughts and a brain implant whose development was funded by DARPA. It seems the possibility of weaponization might not lie in some distant future—and there is ample precedent for the rapid transition of technology from basic science to disruptive, global menace. After all, just 13 years elapsed between the discovery of the neutron and the atomic blasts in the skies over Hiroshima and Nagasaki.

MIND MANIPULATION BY governments would be safely in the domain of conspiracy theorists and fictional thrillers if world powers didn't have such a checkered past with neuroscience. In one bizarre set of experiments conducted between 1981 and 1990, Soviet scientists built equipment designed to disturb the functioning of neurons in the body and brain by exposing people to various levels of high-frequency electromagnetic radiation. (The results of this research are still unknown.) Over many decades, the Soviet Union spent more than \$1 billion on such mind-control schemes.

Perhaps the most notorious examples of U.S. abuses of neuroscience occurred from the 1950s into the 1960s, when Washington pursued a wide-ranging research program to find ways of monitoring and influencing human thoughts. CIA investigations, code-named MK-Ultra, promoted "research and development of chemical, biological, and radiological materials capable of employment in clandestine operations to control human behavior," according to a 1963 CIA inspector general's report. Some 80 institutions, including 44 colleges and universities, were involved, but they were often funded under the veil of other scientific goals, leaving participants unaware they were carrying out Langley's bidding. The program's most infamous aspects involved dosing individuals—some unwittingly—with LSD. One Kentucky man was administered the drug for 174 consecutive days. Equally harrowing, however, were the MKUltra projects that focused on mechanisms of extrasensory perception and electronic manipulation of subjects' brains, as well as attempts to gather, interpret, and influence the thoughts of others through hypnosis or psychotherapy. Today, there is no evidence that the

United States is similarly abusing neurotechnology for national security purposes. The armed forces, though, remain deeply committed to advancing the field. In 2011, according to figures tabulated by Margaret Kosal, a professor at the Georgia Institute of Technology, the Army set aside \$55 million, the Navy \$34 million, and the Air Force \$24 million to pursue neuroscience research. (The U.S. military, it should be noted, is the primary funder of various scientific fields, including engineering and computer science.) In 2014, the Intelligence Advanced Research Projects

Jan Scheuermann, who has quadriplegia, brings a chocolate bar to her mouth using a robot arm she is guiding with her thoughts. She later flew an F-35 fighter-jet simulator.



Activity, or IARPA, a research organization that develops cutting-edge technology for U.S. intelligence agencies, pledged \$12 million to design performanceenhancing techniques, including electrical stimulation of the brain for "optimizing human adaptive reasoning"—that is, for making the analysts smarter.

The real energy, however, is emanating from DARPA, an agency of international intrigue and envy. It funds about 250 projects at any given time, recruiting and leading teams of experts from academia and industry to work on ambitious, highly defined assignments. DARPA's knack for funding visionary projects that remake the world—the Internet, GPS, and the stealth fighter, just to name a few—is unparalleled. In 2011, DARPA, which has a modest (by defense standards) annual budget of \$3 billion, slated \$240 million for neuroscience research alone. It has also already committed some \$225 million to the first few years of the BRAIN Initiative, only \$50 million less than the project's top funder, the NIH, during that same period.

With DARPA's game-changing model and international cachet, perhaps it was only a matter of time before other world powers began emulating it. This January, India announced that it would reshape its Defence Research & Development Organisation along the lines of DARPA. Last year, Russia's military announced its \$100 million support of the newly minted Foundation for Advanced Research. In 2013, Japan made public the creation of an agency with "DARPA of the United States in mind," in the words of Science and Technology Minister Ichita Yamamoto. (It has been dubbed "JARPA" by some observers.) The European Defence Agency was established in 2001, answering the call for a "European DARPA." And there are even efforts to export the DARPA model to corporations, such as Google.

What role neuroscience will play at these research centers has yet to be determined. However, given recent progress in brain technologies, DARPA's interest in it, and the new hubs' desire to follow the Pentagon's lead, it's likely the field will get at least some-if not substantially more-

attention. Robert McCreight, a former U.S. State Department official who specialized in arms control, among other security issues, for over two decades, says this "competitive environment" could feed into a sort of neurological space race, a contest to control and commoditize neurons. The subsequent risk is that research will be channeled toward weaponization—toward making the brain a tool for fighting wars more effectively.

It isn't hard to imagine what this might look like. Today, a head cap equipped with electrodes gathers from the scalp someone's electroencephalographic (EEG) brain signals relevant only to an intended purpose, like kicking a ball; tomorrow, EEG-capturing electrodes could surreptitiously collect weaponry access codes. Likewise, a BMI could become a data siphon—used, say, to hack into an enemy spy's thoughts. Arguably more frightening, if terrorists, hackers, or other criminals were to acquire such neurotechnologies, they could use the tools to engineer single-minded assassins or steal personal information, such as passwords or credit card numbers.

Troublingly, little seems to be preventing these scenarios from materializing. Very few international agreements or even national laws effectively protect personal privacy, and none pertain directly to brain technologies. When it comes to dual use and weaponization, far fewer barriers exist, exposing the human brain as a vast, lawless territory.

NEUROSCIENCE FALLS INTO a sort of chasm in international law. A neuroweapon that co-opts a brain is "not biological. It's not chemical. It's electronic," says Marie Chevrier, a professor of public policy at Rutgers University. That's a critical distinction, because the two existing U.N. treaties—the Biological Weapons Convention (BWC) and Chemical Weapons Convention (CWC)—that in theory could be used to limit abuses of brain technologies contain no provisions for electronic arms. Indeed, the documents weren't written in such a way as to cover all emerging trends, which means certain weapons can be regulated only after they exist.

Chevrier argues that because neuroweapons would affect the brain, a biological system, the BWC, which prohibits the use of harmful or deadly biological organisms, or their toxins, could be modified to include them. She isn't alone: Many ethicists are pushing for the closer involvement of neuroscientists during the convention's regular reviews, when member states decide upon changes to the treaty. What the process lacks currently, Chevrier says, is a scientific board. (At a meeting pertaining to the treaty this August, one of the key proposals on the table was the creation of such an entity, which would include neuroscientists; the outcome was not known as of press time.) Technical input could spur state parties into action. "Politicians don't have an understanding of how dangerous the threat could be," Chevrier argues.

Even with a board, however, the glacial pace of U.N. bureaucracy would likely prove a problem. BWC review conferences, where states report on new technologies that could be adapted into biological weapons, happen only every five years—all but ensuring that changes to the treaty are considered well after the latest scientific advances. "The general tendency is always that science and technology take ardent strides, and ethics and politics creep up behind," says Giordano, the neuroethicist at Georgetown's Medical Center. "They tend to be more reactive, not proactive." (Ethicists already have a name for this lag: the Collingridge dilemma, named for David Collingridge, who in his 1980 book, *The Social Control of Technology*, argued that it is difficult to predict the potential impact of a new technology and thus impossible to enact policy to stay ahead of it.)

But Moreno, the University of Pennsylvania bioethicist, says this isn't an excuse for inaction. Ethics experts have a duty to ensure that scientific developments and the potential threats they pose are explained fully to policymakers. Moreno argues that the NIH should establish a permanent neuroethics research program. The United Kingdom's Royal Society took a step in that direction five years ago, when it convened a steering group of neuroscientists and ethicists. Since then, the group has published four reports on neuroscience advances, including one on conflict and national security implications. That document calls for neuroscience to be a focal topic at BWC review meetings and urges bodies, such as the World Medical Association, to conduct studies on the potential weaponization of any technologies that affect the nervous system, including those, such as BMIs, not explicitly covered by international law.

Neuroethics, however, is a relatively new field. In fact, its name wasn't properly coined until 2002. Since then, it has grown substantially—spawning the Program in Neuroethics at Stanford University, the Oxford Centre for Neuroethics, and the European Neuroscience and Society Network, among other programs—and has attracted funding from the MacArthur Foundation and the Dana Foundation. Nevertheless, these institutions' influence is still nascent. "They defined the workspace," says Giordano. "Now it's a question of going to work."

Also troubling is scientists' lack of knowledge about the dual-use nature of neurotechnologies—namely, the disconnect between research and ethics. Malcolm Dando, a professor of international security at the University of Bradford in England, recalls organizing several seminars for science departments across the United Kingdom in 2005, the year before a BWC review conference, to educate experts on the potential misuses of biological agents and neurological tools. He was shocked to find that "they didn't know very much"; one scientist, for example, denied that a possibly weaponizable microbe he kept in the fridge had any dual-use potential. Dando remembers it as "a dialogue of the deaf." Since then, not much has changed: Lack of awareness, Dando explains, "certainly remains the case" among neuroscientists.

It is encouraging that neuroscience's moral quandaries are being acknowledged in some key places, Dando points out. Barack Obama charged the Presidential Commission for the Study of Bioethical Issues to prepare a report of possible ethical





and legal issues related to the advanced technology of the BRAIN Initiative, and the EU's Human Brain Project established an Ethics and Society Programme to guide the endeavor's governance.

But these efforts may skirt the particular issue of neuroweapons. For instance, the two-volume, 200-page report on the ethical implications of the BRAIN Initiative, released in full this March, does not include the terms "dual use" or "weaponization." Dando says this gap—even in neuroscience literature, where one might expect the topic to thrive—is the rule, not the exception.

WHEN DUKE'S NICOLELIS created his first brain-machine interface in 1999—a rat, from thought alone, pressed a lever to receive water—he never imagined the device would be used as a rehabilitative tool for paralyzed people. But now, his patients can kick a soccer ball across a World Cup playing field in a braincontrolled exoskeleton. And the applications of his research are growing. Nicolelis is working to put a noninvasive version of the brainet-EEG caps worn by users-in clinics where physical therapists might be able to utilize their own brain waves to help injured people walk. "The physical therapist lends their brain 90 percent of the time, and the patient 10 percent of the time, and by doing that the patient likely will learn faster," he says.

But Nicolelis admits he worries that as his innovations gain traction, they could be put to other nefarious uses. After a project in the mid-2000s, using BMIs to help veterans gain mobility, he now refuses to accept DARPA money. Nicolelis senses that, in the United States at least, he is in the minority. "I think some neuroscientists, at meetings, are foolish enough to brag about how much they got from DARPA to do research, without even thinking about what DARPA might want out of that," he says.

The thought of BMIs, his life's work, becoming weaponized pains him. "I've been trying for the last 20 years," he says, "to do something that might have intellectual benefit for understanding the brain and eventually have clinical benefit."

The fact is, however, that neuroweapons developing alongside the clinical applications of brain technologies is a foregone conclusion. What kind of weapons these will be, when they will emerge, and in whose hands remain to be seen; people today certainly do not need to fear that their minds are on the brink of being compromised. But though a nightmare scenario in which emerging technologies turn the human brain into a tool—more sensitive than a bomb-sniffing dog, as controllable as a drone, or more vulnerable than an open safe—seems a dystopian fantasy, it's worth asking: Is enough being done to rein in the next generation of lethal weapons before it's too late?

TIM REQUARTH (@timrequarth) is a science journalist based in New York. Jack El-Hai (@Jack_ElHai), author of The Lobotomist: A Maverick Medical Genius and His Tragic Quest to Rid the World of Mental Illness, contributed to this article.

Germ Warriors

MEET THE ICHIP, A HECOMING APOCALYPSE?

By Ferris Jabr

Photographs by Christopher Leaman



Kim Lewis collects dirt.

For the past decade, he and his colleaguesall scientists in Massachusetts-have asked friends and family around the United States to send them 1-gallon Ziploc bags of backyard soil. It might not seem like much, but it turns out that a little grime can hold a trove of groundbreaking scientific discoveries.

In 2011, Lewis's team began analyzing a bag of soil from a grassy field in Maine, focusing on bacteria naturally growing inside. The scientists mixed some of the dirt with water and nutrients-proteins, for instance, and potato starch—and poured the mixture over specially designed dominosized plastic blocks punctured with dozens of tiny wells. Each minuscule compartment captured 20 microliters of the slurry, which, thanks to the dilution, contained just a single bacterial cell. Finally, the researchers packed the small plastic slabs in buckets with the remainder of the soil and left them alone for a month.

The procedure's relative simplicity belied its true sophistication. When Lewis, a microbiology professor at Northeastern University, and the other researchers unearthed the blocks, they found just what they were hoping for: The bacteria had multiplied. The wells were teeming with microbes, many of which were species no scientist had ever studied.

The team analyzed 10,000 individual strains of the bacteria and tested whether they could kill other microbes by pitting them against one another in petri dishes. One species, which the scientists dubbed Eleftheria terrae ("free from the earth"),

was an especially successful gladiator. The researchers pinpointed E. terrae's primary weapon, a molecule they named teixobactin, and discovered that it could wipe out the microbes responsible for anthrax and tuberculosis. Teixobactin also saved mice from infections of MRSA (methicillinresistant Staphylococcus aureus), one of the most infamous superbugs-bacteria that are immune to several different drugs. What's more, when the researchers coaxed the microbes to evolve resistance to teixobactin, it didn't work.

In that bag of dirt, Lewis's team had found an entirely new kind of antibiotic, one of only a few to emerge in the past 50 years—and a potent one at that. The findings, published this January, garnered widespread enthusiasm: "New Antibiotic May Conquer Superbugs," declared NBCNews.com. "A New Antibiotic That Resists Resistance," a blog post on National Geographic's website proclaimed.

Even more exciting is the innovation used to discover teixobactin: the unassuming plastic blocks. Each one is called an iChip, short for isolation chip, so-named because of how it captures microbes from soil. Until now, scientists hunting for antibiotics haven't been able to study 99 percent of the world's microbial species because, when ripped from the outdoors and encouraged to grow under desolate laboratory conditions, the vast majority of bacteria die. The iChip overcomes this problem by keeping things dirty: Burying soil microbes in their natural habitat during the culturing process preserves the

organic compounds they need to thrive, enticing previously stubborn microorganisms to multiply under human supervision.

The iChip unveils a universe of unexplored bacterial diversity—and of potential antibiotics. Teixobactin may be only the beginning.

This revelation couldn't be more welcome, because the world's arsenal of antibiotics is rapidly shrinking, with dire consequences. An investigation by a U.K. government task force estimates that the global toll of antibiotic resistance is 700,000 deaths per year—and that it could soar to 10 million by 2050. In the United States, at least 2 million people are infected with antibiotic-immune bacteria annually; some 23,000 die. (The director of the Centers for Disease Control and Prevention has called the estimate "a bare minimum.") All that illness and death exacts substantial economic losses, too: The U.K. task force projects that resistance will sap between 2 and 3.5 percent of the world's GDP—about \$100 trillion—over the next 35 years.

When it released its very first report on the subject in 2014, the World Health Organization (WHO) declared antibiotic resistance a "major threat to public health" that "is happening right now in every region of the world and has the potential to affect anyone, of any age, in any country." This January, Barack Obama's administration announced it was asking for \$1.2 billion to combat the problem—double the dedicated amount from the previous year's budget-and two months later, the White House released a national action plan



for dealing with resistance; facilitating antibiotic research is a top priority.

At stake, quite simply, is the future. Numerous health experts have warned that, without new antibiotics, the world risks a return to the medical dark ages, when the slightest knick or scratch could spawn a lethal infection that doctors had no way to treat. Common surgeries—appendectomies, joint replacements, cesarean sectionscould become life-threatening. The U.K. National Risk Register of Civil Emergencies warned this year that a widespread outbreak of drug-resistant blood infections could kill up to 80,000 people in that country. "A post-antibiotic era means, in effect, an end to modern medicine as we know it," Margaret Chan, the WHO's director-general, said at a 2012 conference in Denmark.

Lewis believes the iChip is the key to avoiding this awful jump back in time. In fact, he thinks it offers a chance to start a new clock altogether. "Using iChip to find and introduce compounds like teixobactin will solve the problem of resistance," he says, "not temporarily, but period."

Even if the iChip launches a new era of antibiotic discovery, however, scientific consensus holds that resistance is a whirlpool humankind can tread but never escape. On top of that, many economic, bureaucratic, and other human-created barriers have long limited antibiotic research and development, and they won't be easy to scuttle. The iChip could prove an essential tool for warding off bacteria's looming assault on humans, but it's not a cure-

all. "Bacteria ... have been fighting this battle much longer than we have," says Gerry Wright, director of the Michael G. DeGroote Institute for Infectious Disease Research at McMaster University in Canada. "Whether you try a drug or a vaccine or whatever you can dream of, there's going to be a way to get around it."

MICROORGANISMS WERE THE FIRST cellular life forms to evolve on Earth, around 3.2 billion years ago. They have been competing for the planet's resources ever since, inventing new ways to injure and kill each other. In the 1930s and '40s, scientists started to grow microbes in giant fermentation tanks, extract the molecules that the microbes use to fight each other, and commandeer them to battle bacteria that make people sick. The most well-known outcome of this process, of course, is penicillin: Derived from mold, the drug was first used to cure an infection in 1930. By 1945, U.S. companies were churning out 650 billion units each month.

Initially, the drug easily warded off Staphylococcus aureus, or staph, which typically infects skin and the respiratory tract. But mass-producing penicillin put intense evolutionary pressure on bacteria to mount stronger defenses. In certain patients treated with the antibiotic, a few microbes survived—those with at least some innate ability to resist the drug—and they then multiplied into hardy colonies; trying to eradicate these clusters with more penicillin started the process all over again. It was natural selection at its finest. (Bacteria can acquire resistance in other ways, too: through chance genetic mutations that alter their cellular structures and through horizontal gene transfer, in which bacteria swap small sections of DNA, including material that supports resistance.)

By the 1960s, 80 percent of staph bacteria were resistant to penicillin. A new drug, methicillin, was introduced in 1959, but immunity developed within two yearsspawning the new superbug, MRSA. By 2002, nearly 60 percent of staph bacteria were resistant to methicillin. Today, these microbes are impervious to even more drugs.

Over the past 75 years, this story has repeated itself as medicine has exposed bacteria to millions of metric tons of antibiotics. By 2004, for example, resistance had emerged to all classes of antimalarial drugs, except for one: artemisinins, derived from an herb called sweet wormwood. Ten years later, artemisinin resistance was firmly established in Southeast Asia. Cephalosporins, the class of drugs that is the last resort for gonorrhea, have already failed in several countries.

Human hubris and carelessness have contributed to this crisis. Doctors have prescribed antibiotics when they were not necessary; patients have taken drugs in the wrong dosages for too much or too little time; and farmers have pumped cattle and chickens full of antibiotics because they plump up the animals (possibly because the antibiotics kill benign gut bacteria that usually take some of the creatures' daily calories for themselves). Together, these practices have given bacteria surplus opportunities to meet their adversaries and evolve to defeat them.

But scientific failure has been a problem too. During the so-called golden age of antibiotic discovery, from roughly 1940 to the 1960s, scientists and pharmaceutical companies introduced more than a dozen new classes of drugs. Then the rate of discovery practically ground to a halt. Researchers were trying to derive antibiotics from the very few soil microbes that readily grew under standard lab protocols: Bacteria were mined from dirt, smeared onto petri dishes filled with a gelatin, and kept warm. Yet that gelatin, known as a growth medium, was simply too barren to sustain most microbes. Only 1 percent of species survived, and by the 1960s researchers had exhausted this sliver of a resource.

Eventually, drug companies' priorities shifted from discovering new antibiotics to creating slight variations of existing ones—a quicker, less expensive, and seemingly less discouraging process. But such "analogues," as they're known, proved more finite than expected and were generally more susceptible to resistance because of their similarity to existing drugs that microbes had already encountered. By 1990, half of the biggest drug companies in the United States had slowed or stopped their antibiotic research programs. Discoveries have been slim ever since. What few new antibiotics have made it to market typically have encountered resistance within two years.

The situation prompted a trio of microbiologists to state bluntly in a 2011 article in the *British Journal of Pharmacology*, "The world is running out of antibiotics"— a sentiment echoed by many scientists. But then, just when it seemed like the supply line for weapons needed to battle bacteria had fallen into permanent decline, a breakthrough happened.

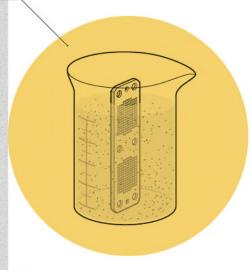
AS WITH MANY great inventions, the concept behind the iChip might seem blindingly obvious: If bacteria won't grow outside their homes, bring their homes into the lab. "Honestly, I have no idea why no one did this before," Lewis says. "I always thought it was a fantastic intellectual challenge."

Lewis started working on this puzzle in 2000. Rather than trying to determine what biological compounds soil bacteria need to flourish-science still doesn't have a precise answer—he focused on the simple fact that many microbes are happy in dirt. By 2002, Lewis and fellow Northeastern University microbiologist Slava Epstein had built a diffusion chamber that would allow bacteria to grow in a lab while still being immersed in their natural environment: a metal washer sandwiched between two porous membranes. The scientists extracted bacteria from beach sand and mixed them with water and agar, a gelatinous substance that can both nurture microbes and hold them in place. They put the concoction in the middle of the washer and stuck the whole chamber in an aquarium filled with the same sand; the membranes allowed chemicals and nutrients from the sand to flow to the bacteria inside. After a week, microbes that had once refused to grow were multiplying like crazy.

Based on the promise of this technology, Lewis and Epstein co-founded NovoBiotic Pharmaceuticals, a drug-discovery company. The iChip is their latest technology, a sleeker and all-around more sophisticated version of the original diffusion chamber. Think of it as a portable nursery for

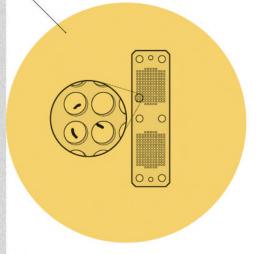
How the iChip Works

Researchers dilute soil in a mixture of molten agar and nutrients so that there is only one bacterial cell in every 20 microliters.



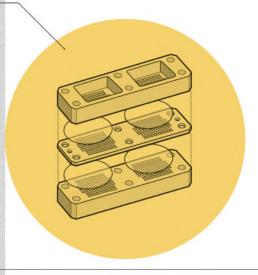
2

Each of the iChip's hundreds of tiny wells receives 20 microliters of the diluted solution, which solidifies, trapping a single microbe in each well on average.



3

Researchers cover the wells with semipermeable plastic membranes and bury the iChip in the bacteria's indigenous soil, allowing organic molecules in the dirt to nourish the microorganisms.



microorganisms: After populating an iChip with bacteria drawn from dirt, scientists place semipermeable plastic coverings on the small blocks. These allow the microbes, held by agar, to soak up everything they need from the soil in which they are buried. The point of ensuring that each well contains just one microbe by diluting some of the dirt into a slurry—a big improvement over Lewis's and Epstein's first designis to save scientists time they otherwise would have to spend differentiating the mess of cells that proliferate while an iChip is interred.

With this culturing method, about 50 to 60 percent of bacterial species found in a soil sample are able to survive in a lab. The iChip is the difference between a telescope that glimpses only the solar system and one that takes in the full breadth of the Milky Way. Amy Spoering, director of biological research at NovoBiotic, says the iChip has already yielded more than two dozen potential antibiotics that are structurally different from existing drugs and are under further investigation. And she believes much more is to come: "We have hundreds and hundreds of iChips that we use on soil all the time."

The goal isn't just to increase the number of antibiotics; it's also to find ones that work better. Not all antibiotics are equally vulnerable to microbial resistance. Some retain their effectiveness longer than others. Because they are screening so much soil and growing so many microbes that have never been grown before, the NovoBiotic scientists think they are bound to hit upon particularly resilient compounds.

Teixobactin is the toughest, most promising find to date because of the novel way it works. Most antibiotics target bacterial proteins encoded by specific genes, meaning that a single DNA tweak can help microbes elude drugs. Teixobactin, by contrast, gloms onto molecules that aren't encoded by genes, but rather are chemically

synthesized through an elaborate process involving many cooperating enzymes. That means bacteria cannot evolve resistance to teixobactin by fine-tuning a gene or two; instead, they must undergo a series of mutations that fundamentally alters the enzymes' activities-a much more convoluted feat of adaptation.

NovoBiotic's website proclaims that teixobactin is "essentially free of resistance," and Lewis is confident that it will take many decades for immunity to emerge. (Vancomycin, a similarly behaving antibiotic approved for use in 1958, remained resistancefree for nearly 30 years.) The iChip will allow researchers to discover other similarly invulnerable antibiotics, Lewis says, buying time until the scientific community has developed a rapid, expedient method of concocting antibiotics synthetically, rather than borrowing properties from microbes. In Lewis's grand vision, when one drug becomes ineffective, researchers will just whip up another—and be sure to have lots on hand for future failures—thus "solving" the crisis of antibiotic resistance.

If only it were that simple.

SOME OF LEWIS'S PEERS don't agree that a stock of teixobactin-like drugs followed by an era of endless synthetic drugs will provide a final solution. As the first and most fundamental stumbling block, they point to biological realities. Microbes typically need around one hour to produce a new generation; the fastest can double their populations in under 10 minutes. And every act of reproduction provides countless opportunities for the sort of genetic adaptation that leads to resistance. "At the end of the day, whatever technology you use, it's still this cycle of innovation, exploitation, desperation," says Wright of McMaster University. "To get rid of resistance, you would have to refute natural selection, and to me that is not possible." Margaret Riley, a professor of microbial evolution at the University of Massachusetts, Amherst, has high praise for the iChip—"I love it"—but echoes Wright on the device's limitations: "No matter what we throw at them, bacteria will evolve resistance," she says. "We can't ever escape that."

Some scientists are developing strategies for the germ wars that, unlike most antibiotics, focus specifically on slowing resistance's development. Riley, for example, points out that the majority of drugs are broad-spectrum, destroying all vulnerable bacteria they meet, including the benign and beneficial, and leaving behind lots of real estate for dangerous, drug-immune colonies to develop. So she has partnered with Sichuan University scientist Xiao-Qing Qiu to hone the power of bacteriocins, toxic proteins that bacteria produce to kill other species. A particular bacteriocin, called colicin Ia, punches a lethal hole in bacterial cells' membranes. By linking colicin Ia to molecules that only bind to certain microbes, Qiu has created highly specific bacteria-killing missiles. He calls them pheromonicins; the Chinese government has committed \$400 million a year to support his work. "We can now create in weeks to months a cocktail of pheromonicins that target exactly the bacteria we are going after," Riley says.

Meanwhile, Brad Spellberg, chief medical officer of the Los Angeles County-University of Southern California Medical Center, thinks the ideal defense is one that doesn't directly destroy microbes at all. "If you are not attempting to kill bacteria," Spellberg explains, "there is minimal selection pressure to evolve resistance." This is because the microbes don't have as clear a target to resist. Spellberg is interested in components of bacterial cell membranes, called lipopolysaccharides (LPS), that trigger strong immune responses-inflammation, fever, organ failure-when microbes infect people. In recent studies, Spellberg and his colleagues have used a drug known as an

THE GOAL ISN'T JUST TO INCREASE THE NUMBER OF ANTIBIOTICS; IT'S ALSO TO FIND ONES THAT WORK BETTER. LpxC inhibitor to render *Acinetobacter baumannii*, a notorious antibiotic-resistant species, incapable of producing LPS. When they've exposed lab mice to both *A. baumannii* and the drug, the animals have remained healthy and have gradually expunged the microbes from their bodies. An LpxC inhibitor, in other words, might help people survive infections by taking an oblique approach to their removal, rather than bludgeoning microbes head-on.

Successfully delivering any innovative treatments to patients, however, requires money—lots of it. And broadly speaking, who pays is one of the biggest hurdles to deferring the post-antibiotic era. From a cold-eyed business perspective, antibiotics don't turn big profits for drug companies.

It costs about \$2.6 billion to develop a single drug and win marketing approval, according to the latest data from the Tufts Center for the Study of Drug Development. In the case of an antibiotic, it takes a pharmaceutical company an exceptionally long time to earn back its investment because the drug is usually taken for just a few weeks or months and is much cheaper than medicines used to treat diabetes, heart conditions, and other chronic ailments. In 2003, for example, Pfizer made \$2.01 billion from its best-selling antibiotic, Zithromax, but more than four times as much-\$9.23 billion—from cholesterol-lowering Lipitor. Further complicating things, the more of a particular antibiotic that a pharma outfit sells, the greater the risk that bacteria, mutating each time they encounter the drug, will evolve resistance-and diminished effectiveness against infection means the drug won't sell as well.

As a result, companies have continued to abandon antibiotic R&D in droves. About 15 years ago, Eli Lilly and Bristol-Myers Squibb shuttered their antibiotic research divisions. In 2011, Johnson & Johnson stopped investing in novel antibiotics and Pfizer closed its primary antibiotic research cen-

ter in the United States, announcing that it planned to open a new one in China; the fate of that facility remains unclear. There are still about 31 companies with antibiotics in clinical development today, according to the Pew Charitable Trusts, but only five are big names that rank among the top 50 by sales; most are start-ups and small biotech outfits with limited resources.

Several proposals have been put forward to revitalize antibiotic R&D. Jim O'Neill, the economist who chairs the U.K. task force on antimicrobial resistance, suggests delinking drugs' profitability from sales. According to his commission's May 2015 report, O'Neill envisions a global organization that pays drug companies lump-sum payments of between \$1 billion and \$3 billion to either defray or cover the costs of antibiotic development and a global innovation fund to support "blue-sky research into drugs and diagnostics." Overall, his plan would cost \$16 billion to \$37 billion over the next 10 years, depending on how exactly its component parts were set up.

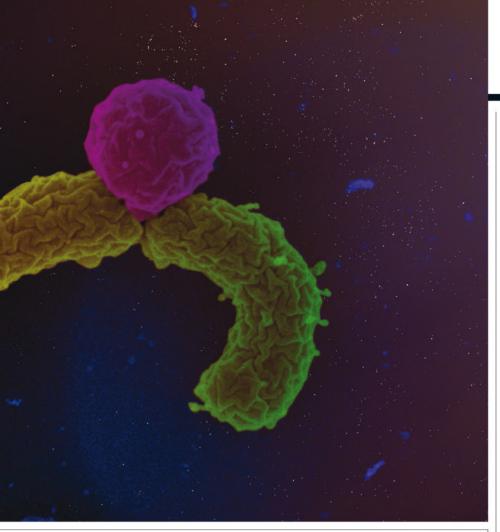
Although some experts agree that delinkage would be beneficial, they say it's unclear how implementation would work. David Shlaes, author of Antibiotics: The Perfect Storm and a former vice president of Wyeth Pharmaceuticals, has called O'Neill's plan "Antibiotics in Neverland." Shlaes suggests an alternative: higher prices for antibiotics. Insurance providers and patients are willing to pay hundreds of thousands of dollars for cancer treatments that may grant only two or three extra months of life, yet they are accustomed to paying only a couple of hundred dollars, at most, for antibiotics that are usually guaranteed to work. That expectation must change, Shlaes says, in order for drug development to be viable from the pharma industry's perspective.

But consider how people reacted to the price of Sovaldi, a cure for hepatitis C that received U.S. Food and Drug Administration (FDA) approval

in 2013 and costs about \$1,000 per pill. This price incited what the *San Francisco Chronicle* called "an all-out revolt" among lawmakers, insurers, pharmacybenefit managers, and patient advocates, who considered the cost exploitative. A similar outcry likely would emerge if antibiotics, long affordable, suddenly were not.

Recognizing the hurdles stymieing antibiotic R&D, the U.S. government has taken steps to help lower them. Much of its focus has been on the regulatory front. In 2012, Obama signed the FDA Safety and Innovation Act, whose Generating Antibiotic Incentives Now provision grants antibiotics "intended to treat serious or life-threatening infections" an extra five years of market exclusivity during which they do not have to com-

WHO PAYS IS ONE OF THE BIGGEST HURDLES TO DEFERRING THE POST-ANTIBIOTIC ERA. FROM A COLD-EYED BUSINESS PERSPECTIVE, ANTIBIOTICS DON'T TURN BIG PROFITS FOR DRUG COMPANIES.



ELEFTHERIA TERRAE, THE BACTERIUM THAT PRODUCES TEIXOBACTIN.

pete with generics; that gives a manufacturer more time to recoup development costs. In September 2014, the President's Council of Advisors on Science and Technology released a report urging the FDA to establish a highspeed lane for new antibiotics. This would involve approving them for limited use by patients who need them most after reviewing data from small clinical trials, rather than waiting for larger and more diverse, but also costlier and more time-consuming, tests. Most recently, in July 2015, the House passed a bill called the 21st Century Cures Act, designed in part to accelerate drug approval.

Some people, however, caution that this legislation could go too far. The New York Times editorial board, for instance, denounced the Cures Act in July: "It would allow a drug to be tested on humans based on only limited evidence that it is safe and effective," the board wrote. What's more, it could contribute to the very crisis of antibiotic resistance that altered regulations are supposed to combat: In providing financial incentives to hospitals to use new, fasttracked antibiotics, the law could end up "encouraging overuse, potentially breeding resistant superbugs."

In other words, replacing a draconian attitude with a reckless one would solve nothing.

AS THEY CONTINUE TO sift through the muddy cache of potential new drugs at their fingertips, the scientists at NovoBiotic are pushing to get market approval for teixobactin. Lewis thinks they can do it in five years, but given other drugs' track records-10 to 15 years is the average time from lab to patient use that's a sanguine estimate.

Even if Lewis's dream comes true, there is still the looming yet little-discussed matter of what would happen next. Maybe researchers have the technical prowess to glean antibiotics from innovations like the iChip; maybe regulations are loosening enough to get drugs to market more quickly. But do people really have the wisdom and the willpower to use antibiotics responsibly?

Recent data don't look promising. The WHO reported in April that, based on a survey of 133 countries, public awareness of resistance is "low in all regions, with many people still believing that antibiotics are effective against viral infections," fostering a misuse of drugs. A few months later, a poll by Consumer Reports found that 27 percent of U.S. respondents thought antibiotics could treat colds and the flu, and 41 percent had never even heard of drugresistant bacteria. Ignorance, clearly, is fueling a global health crisis.

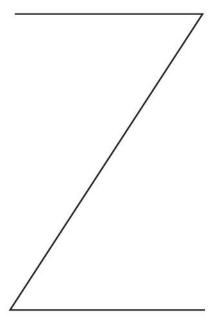
All may not be lost, however. Trickles of evidence suggest that the right kind of psychological nudge can make a difference. In a recent study, University of Southern California's Daniella Meeker and her colleagues asked Los Angeles-area clinicians to sign pledges to avoid prescribing antibiotics inappropriately, and then to display poster-sized 18-by-24-inch copies of those pledges in their exam rooms. The reproductions also offered general information about antibiotic resistance and how to prevent it. After 12 weeks, Meeker and her team found that the posters had decreased needless prescriptions by about 20 percent. "When extrapolated to the entire United States," their final report states, "the posted-commitment-letter intervention could eliminate 2.6 million unnecessary antibiotic prescriptions."

Dismissing simple behavioral interventions as negligible in the face of antibiotic resistance is easy to do-but that would be an egregious error. Psychology is at the heart of the matter. It is instinctual to focus on bacteria as the enemy, and to some extent they are. However, the brunt of resistance begins in, and circles back to, human hands. To keep treading that resistance maelstrom, the world will need to directly address dangerous microbes with innovations like the iChip and others that neutralize bacteria more intelligently than in the past. But an enduring solution will require people to take a hard look within, too.

FERRIS JABR (@ferrisjabr) is a science writer based in Portland, Oregon. He has written for the New York Times Magazine, Scientific American, and Outside, among other publications.







Zhao Bowen strides across the linoleum floors of the Beijing office of QuantiHealth, a biotech start-up, one day in late June. He's wearing an untucked, short-sleeved button-down shirt and brown leather sandals. As he walks, Zhao, the company's CEO, gestures to paintings on a wall-cartoons illustrating the origins of gut bacteria, QuantiHealth's primary focus. The business, which is just a year old, is using genomics to map these microbes and hopefully unlock the secrets of how they help regulate human health. The air in the office, which QuantiHealth has only occupied for a month, smells of new furniture—and of sweat. Zhao says he works about 14 hours each day, supervising a team of researchers, talking to potential investors, headhunting, reviewing budgets, and, in his spare time, reading books about management.

But all that hard work isn't what exhausts him. Rather, he's tired of talking about his age: Zhao is just 23. The international media have dubbed him a "boy genius" and "wunderkind." Zhao complains in English, "When you're running a company, nobody gives a fucking care about your age. If you're 18 or 80, you're equal parts in the market. It actually does not matter."

Whether Zhao likes it or not, however, in China's storied science system, age does matter. Seniority has been perhaps the most significant factor for promotion and professional success in the sector over the past 50 years. Zhao is defying the odds: In 2009, he was a high school dropout. Six years later, after stints with groundbreaking genome research projects, he's running his own company.

QuantiHealth's office, in a nondescript office park in southern Beijing, has an interior layout that at once reveals Zhao's obsessive attention to creative detail and his youthfulness. An area behind the main rows of desks for staffers, of which there are 10, contains small tables with seating sunken into the floor; they exist to encourage people to gather for brainstorming. A large bookshelf against one wall holds a smattering of computer and science books. Zhao has begun to stock it with his own collection, but he also urges colleagues to bring in their favorites, giving it the feel of an eclectic lending library. Meanwhile, Quanti-Health's labs sit behind large windows that allow people to peer inside, like at restaurants where diners can watch chefs at work.

Much as Zhao is eager to revamp China's traditional work culture, he hopes his company can shift the country's approach to medicine. As its name suggests, Quanti-Health is interested in finding clear measures of what makes people healthy and what doesn't—for instance, too much or too little of certain types of gut bacteria—and then applying that knowledge to real-life solutions. "You simply cannot do yoga, tai chi, and Chinese medicine," Zhao says, "trying to cure something you don't really understand."

Zhao's vision and ambition are nothing short of vast. And it seems he's coming of age at just the right moment.

Despite such high-profile successes as achieving manned spaceflight and building the world's fastest supercomputer, China's science sector has for the past two decades been burdened by fraud, theft, and top-down priorities set by bureaucrats in Bei-

jing, as well as by the demands of its strict system of rank and hierarchy. These problems recently exploded into public view: In 2013, the Chinese Communist Party launched an anti-corruption campaign that has since toppled dozens of prominent scientists, academics, and officials for stealing government funds, and international investigations have exposed hundreds of instances of fraudulent data and plagiarism in research journals, as well as a cottage industry of publication rights for sale.

The result is a new space that's opening in Chinese science, one in which some of the best and the brightest are moving out of the traditional system in favor of private or semiprivate research. There, success is driven more by merit, not state approval. It's reminiscent, in some ways, of the idealism that built Silicon Valley, and it reflects the energy already propelling tech start-ups that are changing how Chinese society conducts business, entertains, and interactsincluding with the rest of the world. For instance, WeChat, created by private Internet giant Tencent, today has more than 100 million users outside China, and in 2014, e-commerce company Alibaba had one of the largest initial public offerings in history, at \$21.8 billion on the New York Stock Exchange. These companies haven't just flourished; they've also inspired other Chinese entrepreneurs and investors looking to park their aspirations and money somewhere other than the Chinese stock market or real estate. In 2014, China's privateequity market for new investments reached \$73 billion, nearly doubling from its 2013 size, according to PricewaterhouseCoopers.

New streams of capital are helping to create novel avenues for scientists to try out their ideas. No longer is chasing government-sanctioned research goals inevitable. Slowly but surely, China's young scientists are finding ways to prove that the old way of doing things might no longer be the only way.

If innovators like Zhao are successful, their stories could entice foreign talent to China—and keep domestic talent at home, curbing what even the Communist mouthpiece *People's Daily* in 2013 called "the

world's worst brain drain." (According to the U.S. Energy Department, 85 percent of Chinese people who earned their science or engineering doctorates in the United States in 2006 were still there in 2011.) The more freedom and success Chinese scientists have, the more likely it is that committed young geniuses will follow their lead.

Zhao knows the obstacles he faces, but seeing an opportunity, he's inclined to jump. "It's possible that we will fail," he says, "but it's worth a try."

Zhao began studying at the High School Affiliated to Renmin University of China, located in the heart of Beijing's Zhongguancun Science Park, in 2004. The school regularly places near or at the top in national science rankings and funnels 85 percent of students to the prestigious Peking, Renmin, and Tsinghua universities. Zhao was already at the top of his class when, in 2007, he and his parents attended a dinner in Beijing for migrants from Hunan, the family's home province. There, they met Huang Sanwen, a scientist from the Chinese Academy of Agricultural Sciences (CAAS), who would become Zhao's mentor. Huang set up an internship for Zhao, then 15, on his team, which was sequencing the DNA of a cucumber—a project that earned Zhao a co-author slot on a 2009 paper in

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Nature Genetics. During his two years at CAAS he learned "the lab skills and the theoretical knowledge about genomics and life sciences," Zhao says. "I would skip some classes, especially those like politics, and ride on my bicycle to the institute. I wouldn't go back home until 10 p.m."

The experience also exposed Zhao to the expansive landscape of state-run science organizations across China. Under the CAAS umbrella alone there are 42 research institutes, a graduate school, and a publishing house. And that's just a fraction of the state-sponsored science enterprise: The much larger Chinese Academy of Sciences (CAS) oversees more than 100 institutes, two universities, and 60,000 employees.

This ecosystem has been lavished for decades with generous funding from the government in order to help China compete on a global level. In March 1978, at a national conference in Beijing, leader Deng Xiaoping celebrated science as the key to China's future growth and prosperity: "Without modern science and technology, it is impossible to build modern agriculture, modern industry, or modern national defense," he said. Deng's comments were followed over the years by a series of increasingly ambitious government plans to raise funding and set national research priorities. In January 2006, President Hu Jintao introduced the Medium- to Long-Term Plan (MLP), a document that mapped the country's 15-year strategy for science and technology. According to the proposal, by 2020 China's R&D spending should grow to 2.5 percent of GDP, and 60 percent of the country's economic development should come from scientific and technological achievements. By 2012, R&D spending had quickly approached those expectations, hitting \$163 billion, or 1.98 percent of GDP.

Zhao Bowen walks past the library at the QuantiHealth office in Beijing.

Measured in purchasing power parity—as Cong Cao, an expert on Chinese science policy at the University of Nottingham in the United Kingdom, and Yutao Sun of Dalian University of Technology in China have calculated—the United States is still the top science spender globally, at \$454 billion in 2012. But China comes in second, and according to a 2014 report from the Organisation for Economic Co-operation and Development, it may surpass the United States in research spending as early as 2019.

Yet "money alone doesn't buy innovation," says Denis Simon, an American expert on Chinese science policy and one of the few foreigners whom Beijing has invited to give input on high-level planning, including the MLP. Consider patents and intellectual property (IP): In 2013, China paid \$21 billion for use of foreign IP, according to World Bank data, but collected just \$887 million for use of its own, meaning its IP has limited value on the global market. In contrast, China's smaller neighbors reaped far more from their inventions: Singapore earned \$3 billion; South Korea, \$4 billion; and Japan, \$32 billion. And the United States took in \$129 billion. According to Cao, "China is spending huge amounts of money on science but not yet getting great returns on its investment."

China's leaders now want to "encourage mass entrepreneurship and innovation," as Premier Li Keqiang told world leaders gathered at the World Economic Forum meeting in Davos, Switzerland, in January. But doing so requires more than expanding budgets. It necessitates shifting the norms of Chinese research culture.

The government's obsession with science as a means of catapulting the economy forward is actually often counterproductive. "The tension is always that Chinese science from the beginning has been an incredibly nationalist and patriotic process, a mission to strengthen the motherland," says Adam Segal, a Council on Foreign Relations (CFR) senior fellow who studies global innovation. Creativity is hard to nurture when the government is fixated on certain priorities for instance, defense, space, lasers, and supercomputers—and maintaining chains



Zhao encourages an informal working environment at his start-up.

of authority. "This top-down approach stifles innovation and makes clear to everyone that the connections with bureaucrats and a few powerful scientists are paramount," a pair of respected professors at Tsinghua and Peking universities, both of whom studied in the United States, wrote in a 2010 editorial in Science. "To obtain major grants in China, it is an open secret that doing good research is not as important as schmoozing with powerful bureaucrats and their favorite experts."

To be sure, some state backing is important. "To create conditions for real innovation, there's a general sense that you want government support and investment in research and training," says Segal. "But you don't want the government involved in choosing between projects and creating incentives for specific projects without a lot of independent input from the research community itself."

Today, China's official science system is especially unwelcoming for young researchers, who struggle to scramble up the career ladder and secure adequate funding for projects. "The only way you could achieve \dots something that really matters would be to spend a lot of time climbing from the bottom to top of that hierarchy," Zhao says.

That's why he decided to forge his own path. And he was able to do so thanks to a few pioneers who came before him.

In 2007, well-respected geneticists Wang Jian and Yang Huanming, then in their 50s, began packing up their offices in China's capital. They were embarking on a new experiment: turning Beijing Genomics Institute (BGI), an entity they had co-founded, into an independent research institute. Impossible to know at the time, this move would redefine the relationship between Chinese scientists and their government.

Since BGI's founding in 1999, it had worked closely with the state: According to Nature, CAS secured financing for BGI's contribution to the Human Genome Project and offered grants for subsequent work. In 2003, BGI became a part of the CAS structure, which was a "reward" for creating a SARS diagnostic kit that impressed President Hu.

The arrangement with CAS, however, proved limiting. BGI lacked the freedom to set its own research agenda, internal hiring policies—including the ability to recruit budding scientists without advanced degrees-and external collaborations. CAS limits the size of its institutes, which didn't coincide with BGI's ambitious plans. (It has since grown to about 5,000 employees.)

Then, in 2007, the city government in Shenzhen, a special economic zone, offered BGI \$12.8 million to move there. If BGI became successful, the city would more than recoup the money in tax revenue over time. Eager for independence, Wang and Yang agreed.

Thanks in part to a \$1.58 billion credit line from the China Development Bank, BGI went on a shopping spree in 2010 for state-of-the-art genome sequencers, which run about half a million dollars a pop and allow scientists to turn DNA samples into detailed genetic blueprints for analysis. With this vast technological brigade and BGI's large staff, most of whom were young, the institute could undertake research projects of enormous scale that other institutes and universities simply didn't have the firepower to achieve.

That's why CAAS turned to BGI for help with its 2009 cucumber DNA project. The private company quickly acquired a mystique for Zhao, still a CAAS intern at the time. He recalls that his team would gather a vegetable's genetic information and ship it "to a thing called BGI," where "magically it became data."

Before long, that mystique turned into a career opportunity. During the summer before the teen's senior year of high school, Zhao's mentor, Huang, fatefully suggested that his protégé take an internship at BGI. Just two weeks into the gig, Zhao was sold: "I personally believed that preparing for tests [like gaokao, China's university entrance exam] was a waste of time. After just a few weeks, I had already learned a lot and solved some problems"-such as creating an algorithm for counting gene variations.

Zhao decided to drop out of school and take a full-time job at BGI. To convince his father that dropping out of school and taking a full-time job at BGI was the right choice, Zhao said, "Five years from now, I will be leading my own group or lab. If I continue with my studies, maybe I could go to the best university in China or the U.S.-

and then I could go to BGI and work under a high school dropout." Wang, who once led genome-sequencing projects at the University of Washington, had long idolized Microsoft co-founder Bill Gates and had a soft spot for dropouts. This pushed BGI to the forefront of a global conversation about the norms associated with higher-education degrees. In March 2010, Nature published a provocative editorial—"Do scientists really need a PhD?"—that discussed whether BGI's approach might hold lessons for other countries. "If the BGI can pull it off," the editorial concluded, "it might find itself a model not only for creative approaches to genomics but also for education and training."

Within two years of arriving at BGI, Zhao founded its Cognitive Genomics Lab and began managing a mind-bogglingly complex enterprise: searching for patterns among thousands of discreet gene variations that might shed light on the biological basis of human intelligence. It was the largest research project of its kind in the world. "We all believe that intelligence is what makes us human, but it was not studied very well at that time.... So we thought, why shouldn't we do that?" Zhao says.

Indeed, the program's conception was essentially based on a whim, one that BGI gave Zhao the space and resources to follow. This was in stark contrast to the usual course of research at the state-run science institutes. "In any authoritarian system, you have a lot of resources and funding," Zhao explains, "but that funding gets split and split, so that each person only gets a small amount of small resources BGI's way was to channel resources to achieve something big."

This particular big thing didn't go unnoticed: Wired, the Wall Street Journal, the Washington Post, MIT Technology Review, and CBS News, among other outlets, profiled the intelligence project—sparking an international debate about the possibility of "designer babies." A writer at Vice quipped in 2013, "Within a couple of generations, competing with the Chinese on an intellectual level will be like challenging Lena Dunham to a getting-naked-on-TV contest." Arguably, no state-sponsored science experiment in China had ever attracted the global media attention that the one at BGI's Cognitive Genomics Lab did.

That said, it would be wrong to view BGI as in competition with, or in direct opposition to, Beijing. It receives money from local governments and credit from stateowned banks, and it has collaborated with CAS and CAAS scientists. "Given the gravity and shadow of the Chinese system," Segal of CFR says, "one can never be totally independent from it." Any company that has data servers located on the Chinese mainland will find it difficult, if asked, to withhold information from the government. Moreover, as detailed in the March 2014 issue of Harvard Business Review, "The Communist Party requires a representative to be present in every company with more than 50 employees. Every firm with more than 100 employees must have a party cell, whose leader reports directly to the party in the municipality or province." (These people are present, among other reasons, to ensure that China's rules on censorship are upheld. Even private tech titans, such as Baidu and Tencent, have to comply.)

BGI, it seems, has so far avoided major clashes with Beijing. In doing so, it has been able to rethink what it takes to be a scientist in China-and Zhao is the poster child of that new precedent.

After five years at BGI, Zhao was ready to "graduate," as he puts it. But he didn't want to stray too far. He sought to emulate the type of research and business model that he'd come to know so well. "[BGI's leaders] can do whatever they want, not only about science, but about human resources," he says. "That makes all the difference."

So in 2014, Zhao founded QuantiHealth, with the mission of moving past glamour genomics—designer babies, he now argues, are unrealistic—and finding "real applications" for science "that are useful in our daily lives." Zhao decided to focus on sequencing the DNA of the human gut microbiome, the constellation of tiny organisms that reside inside the stomach. Mapping the microbiome could offer a vault of information about an individual's susceptibility to a range of diseases, including diabetes, rheumatoid arthritis, muscular dystrophy, and even schizophrenia. People are continuously exchanging bacterial matter with the outside world through diets and breathing, Zhao says. "How this process really takes place, it fascinates me."

Currently, the QuantiHealth team is analyzing bacteria in one of its labs using a genome sequencer. The company's profits will depend on whether it can successfully create a service for hire: collecting stool samples and providing "snapshots" of health over a person's lifetime or over the treatment period for a specific medical condition. Zhao says the company is in talks with several health-care providers and that it can currently analyze "several thousand" orders a month; when cheaper and more portable sequencers hit the market-expected this fall-capacity should increase. "I believe a microbiome analysis could be part of a future doctor visit in 2050," Zhao says. "It will be just like a regular blood test one day."

His venture has garnered plenty of media attention in China, in part thanks to the

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INDEPENDENT FROM IT."

fame he earned at BGI. Zhao will "bridge the gap between research and industry," announced a June headline on *China Economic Net*. And *China Entrepreneur* has chronicled in detail his journey "from young scientist into a young businessman."

BGI's lingering influence on Zhao's life is also apparent in QuantiHealth's day-to-day operations. In contrast to China's traditional science institutions, the office has an informal atmosphere: Staffers wear shorts, sneakers, and hoodies and trade ideas over WeChat, rather than in lengthy memos. There's no emphasis on publications or patents—nor is there a clear career path. And Zhao, like BGI's Wang, has affection for dropouts: The company's chief information officer is only 25 and never finished high school.

Zhao finds himself in good company on China's science frontier. In July, Wang Jun, the highly regarded 39-year-old CEO of BGI, stepped down to launch an artificial intelligence (AI) start-up. Wang told *ScienceInsider* that the new company grew out of his insight that "both life science and genomics have now run into a bottleneck in handling data from tens of thousands of samples.... AI and machine learning could do something with big data and for people's health."

Start-up fever, however, isn't limited to BGI alums. In fact, it's even catching on among some senior researchers. Biologist Ji Weizhi, for instance, left the state-run system after three decades to lead Kunming Biomed International (KBI)—a cutting-edge clinical research organization that, in 2014, published a paper in the journal *Cell* documenting an experiment to genetically alter monkeys in order to study complex brain diseases. KBI also hopes to become a top supplier of nonhuman primates for U.S. researchers and drug-development companies.

The trajectories of Zhao and his fellow entrepreneurs are undoubtedly being watched closely by young Chinese scientists who may eventually follow suit. Among them is Chen Yunji, a 32-year-old professor at CAS's Institute of Computing Technology in Beijing. Chen has invented an improved microprocessing chip that can help computers "learn" to recognize objects, convert text

into speech, and translate languages with significantly greater energy efficiency. He believes the only way his research will have a widespread, practical impact is if he starts his own company—and he's investigating possible models.

"Young people in China are more ambitious now," Chen says. "We have heroes to follow."

Going independent, however, requires more than desire and gumption. Scientists need private funding. Finding this money would've been nearly impossible just 10 or even five years ago, before a recent surge in China's private-equity market, in the interest of overseas venture capitalists, and in the willingness of local governments to invest in promising businesses. Part of the growth is due to a generational progression: The first wave of China's mega-entrepreneurs, who largely made money in tech over the past 15 years—smartphone producer Xiaomi's Lei Jun is a prime example—take their fortunes, found venture-capital firms, and hunt for the next big thing.

Since 2008, according to Pricewater-houseCoopers, China has been the top destination for private equity (PE) in Asia, accounting for 41 percent of PE regional investment in 2014. (After retail, high-tech was the most popular sector for investment.) In just the first quarter of 2015, investors pumped \$6.53 billion into venture-backed Chinese firms, an increase of 173 percent from the same period in 2014.

BGI has secured funding from large venture-capital firms, including the Chinabased affiliate of Silicon Valley stalwart Sequoia Capital, which has invested \$50 million. Sequoia is famous as one of the early investors in Google, Apple, and PayPal; today Sequoia Capital China controls a fast-growing portfolio of investments in domestic technology, health care, and genetics companies. Foreign actors are getting into the game too: Arch Venture Partners, based in the United States, participated in the \$50 million investment needed to get Hua Medicine, a Chinese biotech company, off the ground in 2011. This year, Hua received \$25 million in Series B funding to develop new treatments for diabetes.

Meanwhile, many regional and municipal governments want to attract new businesses, with the goal of replacing heavily polluting industries and low-wage work with higher-tech services. So they're handing out grants and other business-friendly benefits. Shenzhen is one such city: It is home to BGI, Tencent, and, more recently, budget mobile-phone maker OnePlus. Another is the fast-growing city of Chengdu, which is attempting to become the center of cloud computing for central and western China; it is offering financial incentives to lure software and related companies to its Tianfu New Area and Chengdu High-Tech Industrial Development Zone.

For its part, QuantiHealth got started with Zhao's personal funds, a common founding story in the tech world. But its current operations, including construction of the Beijing office, are supported by an "angel customer"—a large healthmanagement company focused on lifetime diabetes treatment that paid upfront approximately \$1.6 million for Quanti-Health's services. (The company has requested anonymity.) A natural networker, Zhao says he met the CEO by chance at a social dinner about a year and a half ago in Beijing. But Zhao knows this initial contract won't be enough to sustain QuantiHealth forever, so he's now in discussions with 10 or so other potential investors, including venture capitalists. (Zhao says one challenge in persuading people to back his company is explaining what a microbiome is.)

Ultimately, start-ups must rely on their profits to fund future operations, and that requires balancing research with commerce. BGI has financed its published studies, in part, by hawking its sequencing services. QuantiHealth is following a similar model by offering microbiome analysis. But Cao,

Zhao talks with a co-worker on an August afternoon earlier this year. the Chinese science expert at the University of Nottingham, sees the "half-company, half-research institute" approach as inherently risky. "It's difficult to integrate both roles. These people who play the role of scientists and executives at the same time could potentially compromise both roles," he says. It's a tension that extends to the very top of the tech world: Google apparently bowed to stockholders' concerns and separated its primary revenue generators from its research forays into such projects as human longevity and autonomous vehicles, recently placing the latter ventures under a new holding company, Alphabet. As for Zhao, he never doubts his ability as a scientist, but the business side is still a work in progress: "I thought I was a good boss when I started, but a year later, I don't know what a good boss is."

For the time being, Zhao has no plans to change QuantiHealth's management structure. After all, it's brand new. But he also realizes he'll have to roll with the punches as his business grows.

"Everything is challenging: the money, the people, the business model, unpredicted policy changes—any of them could kill my company," Zhao says. (There's also China's infamous problem of IP theft and proliferating worries about data hacking.) "But those challenges are also what make all the fun."

Zhao and his rebellious ilk may never eclipse China's torpid science system, but their work illuminating a more meritocratic path to success very well may change it. Zhao's old mentor, Huang, recently founded a branch of CAAS in Shenzhen with the aim of creating a research culture in some ways modeled on BGI's and Zhao's work. During visits to Huang's new office, Zhao says he noticed "a lot of people [with] ambition to do big science"—in both scale and meaning—as well as the passion that initially attracted him to BGI. "People working there are there for what they do," he notes, "not for the position, title, or benefits."

Meanwhile, ambitious start-ups are helping to create opportunities for Chi-

nese science to achieve a new global reach. BGI, for instance, has already opened satellite genome-sequencing branches in the United States. Zhao, too, hopes that Quanti-Health and companies like it will encourage Chinese scientists working abroad to return home; he has already hired staffers who've studied or worked in the United States and Germany.

Zhao's gung-ho attitude, and perhaps that of his peers, about shaking up China's science culture can be summarized by his simple philosophy of business management. "When you see two options, you actually have three," he says, sitting on a cozy red sofa in his gleaming office. "The third is to wait and see what happens—and that is almost always a bad decision."

CHRISTINA LARSON (@larsonchristina) is a writer in Beijing who reports across Asia for the New York Times, Science, MIT Technology Review, California Sunday Magazine, Fast Company, and other publications.



THE GUN

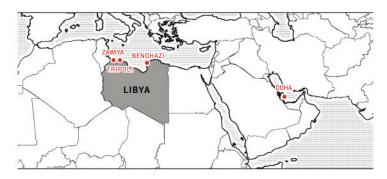
SMUGGLER'S

In 2011, Osama Kubbar ran Qatari-supplied arms to Libyan rebels battling the Qaddafi regime. Today, he is watching from afar as his country is torn apart by two warring governments and a web of rival militias. This is the story of a failed revolution and the people it engulfed. By Elizabeth Dickinson • Photograph by Mathias Depardon



PERCHED IX A SEASIDE VILLA IX

eastern Tunisia, Osama Kubbar had anxiously waited for days for the final news about his guns. It was May 2011, five months into the Arab Spring, and Kubbar, a Libyan smuggler, was remotely tracking the slow movements across the southern Mediterranean of a fishing vessel he'd arranged to transport 600 Belgian FN rifles, 10 machine guns, 200 grenades, 100 bulletproof vests, and 200 kegs for packing explosives. The boat was bound from Benghazi for his hometown, the coastal city of Zawiya, some 370 nautical miles away, where beleaguered rebels were battling the mightier forces of longtime Libyan strongman Muammar al-Qaddafi. Guns, Kubbar hoped, might help shift the tide in the fighters' favor.



The voyage, now in its third week, had been arduous. Through frequent satellitephone calls, Kubbar learned from the crew when the boat's engine broke down in the Gulf of Sidra, necessitating a several-day maintenance detour to Misrata two-thirds of the way through the trip. Once waterborne again, the vessel avoided lurking catastrophe. Not only can spring weather on the Mediterranean be fierce, but Qaddafi's henchmen were scanning the sea for rebel aid and threatening to sink any ship that approached land.

The moment of reckoning had finally arrived: After several days hovering near Zawiya's shore, waiting for an opportune time,

the crew on board told Kubbar that docking wasn't an option. "The boat came close, about five kilometers from shore," Kubbar recalls, "and the guys said, 'We cannot go further."

Kubbar didn't waste any time. He called rebel contacts in Zawiya and told them where the boat was floating; they would have to try to get the guns themselves. So under the cover of darkness, fighters in small rubber boats pushed off from the sand, navigated rough waves, and met up with Kubbar's crew. Then, box by box, they carried the arms ashore.

"I swear to God," Kubbar says, "you can do a movie about this."

Three months and four more arms shipments later, Kubbar's short career as a gunrunner ended when the invigorated opposition officially seized Zawiya. Shortly afterward, Qaddafi was forced from power and killed. "The military was organized. The revolutionaries, it was chaos," Kubbar remembers. "And it worked to our advantage: If you cannot predict the rebels' moves, you cannot really counter them."

Kubbar cuts an unlikely figure for a former smuggler. Muscular and trim, with graying hair and thin-rimmed glasses, he was trained as an electrical engineer. A devout Muslim and vocal opponent of the Qaddafi government, he had been living in exile for more than 15 years when the Arab Spring began. Kubbar halted his day job and started moving weapons to help Libya's resistance movement—which included his own brother—finally break the yoke of dictatorship. And he was able to do it thanks to a formidable backer: Qatar, his adopted home.

The Persian Gulf emirate, eager to flex its muscles in the Middle East, was the first regional state to turn on the Qaddafi regime in 2011. Through the United Nations, the Arab League, and other channels, it publicly urged international action against the dictatorship—a stance that earned it plaudits from humanitarians and foreign-policy hawks alike. Using its two Boeing C-17 cargo jets, among other means, to illicitly ship aid and arms to Libya, Qatar's operation nurtured an ecosystem of clerics, business-

men, ex-jihadis, and other middlemenfigures like Kubbar who quietly fed pockets of the revolution with money, guns, and other support. Once Qaddafi was gone, members of that network—many of them Islamists, long-preferred partners of Qatar across the Middle East—used their positions to jockey for power and influence. Kubbar, for one, says he rode his renown as Zawiya's weapons smuggler to seize property and build a small political career that lasted nearly two years.

Yet the promise of revolution was fleeting. By 2013, Libya had all but collapsednot despite Doha's efforts and those of its opportunistic middlemen, but partly because of them. Supporting certain allies, at the expense of national reconciliation, helped drive dangerous political wedges. To be sure, Qatar was not alone. Other countries, most notably the United Arab Emirates, contributed to Libya's instability by building their own networks on the ground. But where Abu Dhabi also offered material and logistical assistance, Qatar was exceptional in the scale of its provision during the uprising. And while this investment might have paid off at the time, the question now is, to what end? Mieczyslaw Boduszynski, a former U.S. foreign service officer and current professor at Pomona College who has spent time in Libya, wrote in 2014, "[I]t is clear that Qatari engagement has contributed, at least indirectly, to further polarization within the Libyan political scene and to overall state weakness." (A spokesman for the Qatari government declined to answer questions or comment for this article.)

Today, nearly five years since demonstrators began to agitate for Qaddafi's removal, Libya suffers from unpredictable violence. It is riven by lawless militias and two rival governments. The humanitarian toll of the conflict is dire. More than 200,000 Libyans are in need of food assistance, according to the World Food Programme. And "scores of those displaced during the 2011 Libyan revolution have been unable to return to their homes," the Brookings Institution reported in April, "while over a million more have been uprooted in the subsequent violence."



In July 2011, Libyan government forces confiscated a cache of Qatari weapons and ammunition after intercepting boats carrying the arms.

Some of Qatar's proxies have stayed in the chaos, still hoping to find fame, fortune, and power. Others have given up or been forced out, including Kubbar. He's back where he started: living in Doha, watching at a painful remove as the country of his birth splinters. Blending into a crowd of well-to-do expats while sipping a cappuccino one evening at the capital city's Ritz-Carlton, he boasts about his smuggling, calling it "the most courageous operation to my name." But his brow wrinkles when he talks about the present: Libya, Kub-

bar says in his ever-measured voice, "is really messed up."

The ability of outside actors like Qatar, much less a dissident-turnedsmuggler-turned-bureaucrat, to shape Libya's trajectory is rapidly diminishing. For 51-year-old Kubbar, however, the dream remains steadfast. "The path to the solution is still a long way away, but we should not be negative," he insists. "I have a strong belief that ... the right people will be in charge."

IN 1969, WHEN Kubbar was just 5 years old, a charismatic young military colonel unseated Libya's monarch, King Idris, in a coup. Promising sweeping political and economic reforms, Qaddafi's rule blended populist rhetoric with domineering authoritarianism. He used the country's massive oil revenues to fund free education and health care, but also to buy the loyalty of security forces, expand the army with recruits from sub-Saharan African allies, and increase his personal wealth. He was pitiless toward perceived opponents, imprisoning and torturing thousands in a network of detention facilities. Islamists who offered an alternative ideology to Qaddafi's socialist state were targeted as heretics.

Growing up in Zawiya, Kubbar knew of Qaddafi's tyrannical politics, but it was only after moving to the capital to attend university in 1981 that he saw them firsthand. There, he witnessed one of Qaddafi's so-called revolutionary $committees-informal\,surveillance\,networks\,that\,monitored\,dissent-execute$ students who opposed the regime by hanging them on campus.

Although he was horrified, turning political was too dangerous an option. That changed when he left Libya in 1986 to study for advanced engineering

It was no coincidence that Qatar had agreed to help. Over the previous two decades, the small, gas-rich country had been expanding its global leverage aggressively.

degrees at Queen's University in Ontario, Canada. Safely abroad, Kubbar became fascinated with the Muslim Brotherhood opposition so demonized by Qaddafi. He devoured any literature he could find about the organization—he says he later joined the Libyan chapter, banned at home but operating in exile and participated in his university's Muslim Students Association. Sometimes, he delivered speeches at weekly prayer gatherings on campus, decrying Qaddafi's rule.

A few years after he moved to Canada, Kubbar says he learned that officials in Libya's intelligence service had visited his father in Zawiya, inquiring about Kubbar's activities. (Kubbar suspects that one of his classmates alerted the government to his dissent.) Then, in 1995, Kubbar's uncle was denied an exit visa to visit the United Kingdom. "He was rejected because of my name," Kubbar guesses. Estimating that he had landed on a blacklist, Kubbar decided he couldn't safely return to Libya.

For more than a decade, he worked for telecom companies in North America, before moving to Doha in 2009 for a job at Qatar University. He says the Libyans living in the city avoided one another—certainly in public because they feared the Libyan Embassy was monitoring them. Yet a handful of Qaddafi dissidents knew one other, and when the Arab Spring erupted in Tunisia in December 2010, they disregarded potential dangers and started meeting in cafes. They shared videos of protests in Tunis and later Cairo, and they swapped stories about nascent demonstration attempts relayed by family members back home. "Egypt is the center of the Arab world. [That meant] the revolutions were starting to catch on," Kubbar says of that heady time. "We thought that we should start warming up for Libya."

On Feb. 17, 2011, protesters in dozens of Libyan cities heeded social media calls for a Day of Rage. In Benghazi, Tobruk, and even parts of Tripoli, demonstrators—led by youths and students—marched, destroyed regime icons, and burned garbage bins. Soldiers fired live ammunition at them. The uprising had begun.

Kubbar spent hours on Facebook and YouTube, following events. He says one video clip particularly seized his emotions. In it, a woman filming herself in Benghazi hysterically screams that the regime is coming to massacre her family. It "really pumped the blood in my veins," Kubbar says. He rang his brother, Ihab, who was still living in Zawiya. "Go to the streets and tell [the regime], 'It's never going to be peaceful until that lady who screamed in Benghazi sits quiet," Kubbar recalls beseeching.

In another conversation, Kubbar says Ihab held up the phone so that, even in Doha, Kubbar could hear the noise of crowds in Zawiya chanting, "The people want the fall of the regime." On Feb. 24, 2011, Qaddafi's forces killed at least 17 people and wounded another 150 in an attack on the restive city. Afterward, Ihab, then 36, joined neighborhood men who were taking up arms against the government.

Kubbar considered himself just as much a freedom fighter as his brother. "We were just standing up to Qaddafi, and we were naked," he says of the rebels, who had very few arms and little ammunition at that point. (Ihab carried a hunting rifle that could fire two bullets.) "We had no support."

That was soon to change.

N LATE February, one of Kubbar's Libyan acquaintances in Doha, a newspaper editor named Mahmoud Shammam, gathered together local dissidents. (In the interest of disclosure, Shammam previously edited a now-defunct Arabic edition of FOREIGN POLICY.) A close friend of the ruling emir, Shammam had convinced the Qatari royal family to back supporters of the revolution: The family would pay for a new TV channel, Al Ahrar, devoted to the Libyan uprising and a makeshift office for opposition expats. "He [told us], 'OK, I can get some support; let us rent a place where we can have an operations room," Kubbar says. The group secured an apartment in the Kempinski, a luxury high-rise building in Doha's chic West Bay. Upstairs from one of the city's best pastry shops, the Libyans set up computers and phone lines and brainstormed how they could abet the revolution. (The Kempinski's management declined to comment, saying it does not "disclose any information about tenants or guests.")

It was no coincidence that Qatar had agreed to help. Over the previous two decades, the small, gas-rich country had been expanding its global leverage aggressively. Qatar had built alliances with Western countries, including the United States, and had funded the world's most watched Arabic-language network, Al Jazeera. But it had also thrown financial and material support behind Islamic resistance movements across the Middle East, including Hamas, Hezbollah, and branches of the Muslim Brotherhood; the groups' organization, discipline, and geographic spread made them excellent conduits for Qatari influence. "Qatar was not identifying with the Muslim Brotherhood for any ideological reasons," says Salah Eddin Elzein, head of the Al Jazeera Center for Studies, a thinktank arm of the network; rather, he said, Qatar chose to align itself with rising forces. Lina Khatib, director of the Carnegie Middle East Center in Beirut, has written that Qatar savvily pursued an "open-door" foreign policy, "creating friends and avoiding enmities by appealing to all sides at once." Khalid bin Mohammed al-Attiyah, Qatar's foreign minister, told an audience at Princeton University in 2014 that during the uprisings, his country also felt a "moral duty" to help Arab brethren topple dictators.

Kubbar appreciated Doha's early patronage, but he wanted to be closer to the front lines. "I'm not going to be sitting here when my people die," he recalls thinking. So no sooner had the office at the Kempinski opened than Kubbar picked up and moved to Tunisia, from where he believed he could help deliver humanitarian aid—already much needed-to western Libya.

Leaving his wife and two children behind in Doha, Kubbar set out for Ben Gardane, a Tunisian city about 20 miles from the Libyan border. There, he says, he rented a villa with his own money and began to liaise with aid organizations, including a British Islamic charity called Wafa Relief, providing it with lists of goods that Libyan activists and rebels, with whom he was in contact, needed. "It was things like painkillers, and sometimes drugs for chronic conditions."

On March 7, after Kubbar had been in Tunisia for less than two weeks, he received a dreadful call from his sisters: Ihab had been shot in a firefight with government forces. Fellow rebels found him wounded and crumpled on a slope leading away from Zawiya's central square; the fighters managed to get him home, but he died soon after.

Kubbar's father told him not to come home. It was too dangerous, and he couldn't bear to lose another son. But the revolution was now more personal than ever. On a visit to Doha at the end of March, Kubbar spilled his frustrations to his friends. "There are lots of people doing humanitarian aid," he remembers complaining. What he needed to do, he said, was run weapons.

JUST AS KUBBAR WAS losing patience, Qatar was also looking for more direct ways to back Libya's rebels. Qaddafi was using his air force to target civilians, a galling sight for regional leaders. So Doha launched a whirlwind diplomatic campaign to convince the Arab League and the U.N. Security Council to impose a no-fly zone. Other backers of the plan included the United States, the United Kingdom, and France. On March 17, the council approved Resolution 1973, authorizing the safe area and "all necessary measures" to protect civilians. A week later, Qatar became the first Arab state to

Doha's leaders didn't stop there. They began to supply the rebellion with weapons, despite an arms embargo that the United Nations had also just placed on Libya. "For small states like Qatar," says Sergio Finardi, head of the consultancy TransArms, which has tracked several illicit Qatari-linked weapons shipments to Libya, its contribution could be "something covert in order to have a foot and play a role in this situation." (Other countries provided arms too, including the United Arab Emirates and France.) A U.N. panel of experts later found Qatar to be in violation of the embargo, but Doha stated in 2012 that its actions "were in full coordination with NATO and under its umbrella." In a statement provided to FOREIGN POLICY, a spokesperson for NATO said "no country notified or coordinated national weapons deliveries with" the organization.

Qatar channeled many of its arms deliveries through two brothers: Ali and

dent of Doha and close with Qatar's political elite. Soon after rebels

Ismael al-Sallabi, both Libyan Islamists with extensive connections inside the country. Ali al-Sallabi, an exiled cleric who had served time in Qaddafi's notorious Abu Salim prison, was a longtime resi-

> won their first significant victory, routing regime forces in Benghazi on March 20, 2011, Qatari jets began moving weapons and ammunition to Benina's airport, just outside the city. The Sallabis' network then parceled out materiel to rebels. (Despite widespread coverage of their involvement in gunrunning, Ali declined in an interview for this article to confirm that he directly received weapons shipments from Qatar.)

> In Kubbar's telling, fighters were having difficulty shipping weapons to western Libya, which was still firmly in Qaddafi's hands. Qatar's weapons handlers had no point person in Zawiya, Kubbar says, "no contact." Thus, in early April 2011, Kubbar reached out to Ali al-Sallabi. As Libyan expats in Doha, they were neither strangers nor friends, but Kubbar says, "People from

Kubbar's brother, Ihab, was killed fighting in Libya in 2011.



agree to patrol the zone.

the same movement trust each other." Once they were in touch, "everything moved so fast." Kubbar, still in Tunisia, says Sallabi connected him with men in Benghazi who could provide the arms; Kubbar identified a boat and crew; and the first arms were shipped by late April.

Not long after the weapons were unloaded in Zawiya, thanks to the rebels in rubber boats, hostilities there escalated. On the morning of June 11, opposition fighters, some of whom had been trained clandestinely by Qatari, French, and British forces in the nearby Nafusa Mountains, swarmed the city, but it took only 24 hours for Qaddafi's men to push back the advance. Fighting, bolstered by NATO airstrikes, continued throughout the summer, as did deliveries of Kubbar's arms—in all, there were three by sea and two by land, he says.

On a Saturday in early August 2011, during one of only three visits he made to his family in Doha during the uprising, a rebel in Zawiya called him to say that the opposition was preparing for the final assault on Kubbar's birthplace—and then moving on to Tripoli. "You have to come," Kubbar recalls the man saying. So Kubbar flew to Tunisia, and by Aug. 12, he had crossed by land to his hometown. He wanted to witness freedom firsthand. Videos from the time that he has since posted online show that he traded his Western clothing for Libya's traditional robe-like Bedouin dress and visited the families of martyrs. In one clip, with a sense of authority and religiosity he still exudes, Kubbar says, "May Allah grant victory for the rebels, repay them, hold and unite them, and win over this dictator."

Rebels finally took full control of Zawiya on Aug. 20. Three days later, Kubbar claims that his last batch of arms arrived in the city. According to his personal tally, it included 120 cases, each containing 1,500 Kalashnikov bullets; 15 rocketpropelled grenades and 200 munitions for them; and 10 machine guns with 60 boxes of ammunition. This time, his boat was able to dock, and Kubbar says he personally witnessed the distribution of arms to fighters.

Rebels took Tripoli within a matter of days. Transitional leaders didn't proclaim the country free until Oct. 23, 2011, when Qaddafi was found hiding in a drainpipe and was bludgeoned to death. By then, through the likes of men like the Sallabis and Kubbar, Qatar had poured at least 20,000 tons of weapons into Libya.

IN THE NEWLY liberated Libya, power vacuums existed everywhere, as did self-proclaimed heroes of the revolution. Regime property was up for grabs, and Kubbar says he claimed an office in Zawiya for himself: a palatial hall once used by Qaddafi's army deputy chief of staff. "I was the only one who channeled weapons [to Zawiya]," he recalls with bravado, "so even the warlords, they were respecting me big time." Kubbar says he helped start and lead an NGO, the Revolutionary Youth Coalition of February 17, with the goal of restricting the political power of regime defectors. The group issued public statements and organized political meetings. Kubbar imagined his religious allies would be in power in Tripoli in no time; his mission complete, he'd then head home to Doha.

Qatar, meanwhile, also sought to maintain influence in Libya. An October 2011 Wall Street Journal article reported that Qatar's military chief of staff, Maj. Gen. Hamad bin Ali al-Attiyah, attended a meeting in Tripoli aimed



at organizing Libya's militias. Doha also likely kept money flowing through various political proxies, such as Abdel Hakim Belhaj, a hardened rebel commander who had trained fighters during the uprising. "Qatar's strategy is sort of to keep these guys on retainer," explains Frederic Wehrey, of the Middle East Program at the Carnegie Endowment for International Peace. "It's not massive support, but you keep the channels open."

Cracks quickly ran through Libya's political facade, however. During the uprising, Qatar's allies repeatedly clashed with the more secular defectors who dominated the National Transitional Council (NTC), the formal opposition body. The two camps had managed their tensions thanks to a common enemy. With Qaddafi gone, these factions began to attack one another in the media and in public statements. "We saw this explosion of the differences between the Islamists and the non-Islamists start to emerge," remembers Shammam, a secular NTC member. (Despite his early



Libvan rebel fighters react after gaining positions against regime forces in Zawiya in August 2011.

to run for Libya's new national legislature. According to his platform, posted on Facebook, Libya should be a "moderate Muslim state" with the Quran as "our constitution and the only source of legislation." He frequently appeared on Al Ahrar and Al Jazeera to promote his candidacy.

But disappointment followed. That July, in Libya's first democratic election since 1964, Kubbar lost his bid. Broadly speaking, Islamists fared worse than expected. The Muslim Brotherhood-aligned Justice and Construction Party won just 10 percent of the vote. (That said, the fact that the legislature included many

seats reserved for "independents" meant that, by not standing as affiliates, other members were able to get into the body; a German think-tank analysis later determined that more than half of independents in the legislature actually had ties to a political party.) Most embarrassing for Qatar was the dismal performance of al-Watan (Homeland), a party formed by rebel commander Belhaj: It failed to win a single seat.

Kubbar was stunned—and bitter. "Leave, and take your council with you," he wrote in a Facebook diatribe against interim leader Mustafa Abdul Jalil, a former justice minister under Qaddafi. "I feel nauseous whenever I see your face or read a story about you. I swear to you that the country will not be worse than it is in your presence."

appreciation of Qatar's help, Shammam says he repeatedly warned Doha against sticking around after Qaddafi was gone.) Many religiously oriented freedom fighters, including some who had Qatar's backing, believed Libya should look something like Turkey, a democracy run by religious moderates. Ali al-Sallabi was a key architect of this vision. Regime defectors also saw a democracy, but one that wasn't so colored by religion.

With the political battleground firmly drawn, many of Libya's new government officials grew intolerant of Doha's ongoing aid to their rivals. "Qatar was among countries which have provided us with the greatest military, financial, and political support" in ousting Qaddafi, Libya's U.N. envoy, Mohammed Abdel Rahman Shalgam, told Reuters in November 2011. "We don't want them to spoil this great feat through meaningless acts of meddling."

As tensions heated up, Kubbar's NGO called for former regime figures to resign. In March 2012, Kubbar moved to Tripoli

EXCLUDED FROM OFFICE, Kubbar joined the

self-proclaimed High Council of Libyan Revolutionaries, a national organization that, similar to his Zawiya NGO, promised to advocate on behalf of freedom fighters. (By this time, Kubbar had largely abandoned his work with the Revolutionary Youth Coalition of February 17; the organization foundered less than a year after it was created.) As the High Council's first deputy, Kubbar fixated on the need to pass a proposed political-isolation law that would ban former regime figures from holding public office, including many former NTC leaders and two former prime ministers. The law was widely supported by the groups persecuted under Qaddafi, including tribal and Islamist figures, who hoped to secure further power in the new Libya. "I, Osama Kubbar, support all kinds of escalations," Kubbar shouted to a crowd gathered outside the legislature in December 2012. "We don't want this government."

As the vote over the bill approached the following May, several militias, including ones allied with the High Council, blockaded the Foreign Affairs and Justice ministries as a not-subtle threat to anyone who might consider voting against the bill. Under duress, just four legislators out of 200 dared to do so. Kubbar was thrilled: "It was a step forward," he said.

The morning after the law passed, Kubbar says he got a call from one of Zawiya's rebel leaders, a man named Mohammed, who had benefited from his weapons deliveries. Mohammed asked whether Kubbar, whom he called "Dr. Osama," could meet him at Tripoli's harbor just a few miles from the headquarters of the High Council of Libyan Revolutionaries. Kubbar went alone and found Mohammed standing near the water.

But just as Kubbar approached on foot, a Land Cruiser drove up and Mohammed pulled a gun. "Come here," he said, gesturing to the vehicle, where a handful of passengers revealed their own weapons. "Who sent you to kidnap me?" Kubbar remembers asking. The men stayed silent, driving Kubbar to a cell in Tripoli where he says he was kept for two days.

Kubbar won't discuss the specifics of his captivity, including why he was eventually let go. He believes, however, he was taken in retaliation for his stance on the political-isolation law.

The kidnapping was a wake-up call. Before then, there had been few consequences for Kubbar as he openly ridiculed political opponents and encouraged takedowns of many of Libya's new leaders. Now, he realized, Libya had changed; new rivalries were emerging, even between onetime friends, and violence was a daily risk.

So Kubbar returned to Doha, where he began working as an advisor on regional strategy for the Qatari armed forces' Strategic Studies Centre. (He still holds the post today.) Then, alongside others in the capital city who'd once hoped revolution would bring stability, he watched as conflict sank its teeth firmly into Libya.

IN MAY 2014, forces loyal to former army general Khalifa Haftar launched Operation Dignity, a coordinated assault against Islamist and jihadi militias in Benghazi and Tripoli. The following month, Islamists lost in national polls marred by violence and low turnout. They refused to recognize the new government, however, and instead joined several local armed groups in a loose alliance called Libya Dawn. The body declared itself in charge of the country and, by August, had retaken Tripoli from Haftar's men. Over the following months, the two sides raced toward civil war: In the last half of 2014, between 1,000 and 2,500 people, including many noncombatants, died as a result of aerial bombardments, ground attacks, and other violence.

Today, grim circumstances persist. Militia members have ballooned into the hun-

Militia members have ballooned into the hundreds of thousands, up from just 17,000 at the height of the 2011 uprising.

dreds of thousands, up from just 17,000 at the height of the 2011 uprising, according to NATO figures. No political faction can hope to control them. And new extremists have begun to stake claims. In early 2015, the Islamic State announced its arrival in the coastal city of Derna. By March, the U.S. State Department estimated the group had between 1,000 and 3,000 fighters in Libya, enough to give it a dangerous springboard into the rest of North Africa.

Foreign powers have remained enmeshed in the conflict. Haftar's forces, for instance, have reportedly enjoyed air and material support from Egypt and the United Arab Emirates. Qatar, for its part, continued to support proxies until at least 2014, which likely included funneling weapons to Libya Dawn fighters, according to allegations in a 2015 U.N. report. Yet despite these efforts, Qatar has seen its clout shrink mightily as bedlam has descended on Libya. "Qatar is a curse word in Libya," says Jason Pack, president of the consultancy Libya-Analysis. "Even in Tripoli, they don't like the Qatari hand. [Qatar is] not somewhere you want to be associated with."

Many of Qatar's early beneficiaries are now only marginal players in the post-revolutionary game. Ali al-Sallabi moves between Istanbul and Doha, hosting conferences and meetings, but he says he has stepped back from politics. "There were mistakes," he says of the revolution, including a failure to prioritize reconciliation between defectors and Islamists. Meanwhile, Shammam has returned to his former life as a journalist, opening an independent online newspaper in Cairo. His regrets echo Sallabi's: "We could not really understand the difficulty of a transformation."

For his part, Kubbar says he traveled to Tripoli last December and January to meet with friends in Libya Dawn—"the guys," he calls them. The effect of the trip was deflating. "The freedom fighters," Kubbar says, a look of disgust crossing his face, "don't really have a vision and project for the country."

Kubbar's life in Doha is now built around offering commentary on Libya. He writes reports for the Qatari military, joins panel discussions, and still regularly speaks on Al Jazeera. He isn't fond of U.N.-brokered peace talks underway to end the crisis in his home country—they leave too many doors open for regime defectors—but he also acknowledges that a bad deal may be better than no deal at all. "So many people just want a solution," he says. "They have had enough of this chaos and need to build a country."

In another breath, however, he speaks of returning to Libya one day and rekindling the snuffed flame of revolution. "If you have never lived under oppression, you can't understand," Kubbar says. "It's loyalty to this huge investment of bloodshed and martyrs and dignity.

"You cannot really turn your back on this and say, 'I'm going to walk away."

ELIZABETH DICKINSON (@dickinsonbeth), a member of the Deca journalists cooperative, is a writer based in the Arabian Peninsula.



APPLYING TO GRAD SCHOOL

IN INTERNATIONAL AFFAIRS

HELPING YOU TO ASSEMBLE THE STRONGEST GRAD SCHOOL APPLICATIONS, FEATURING TIPS AND Q&AS WITH ADMISSIONS LEADERS FROM FIVE TOP SCHOOLS OF INTERNATIONAL AFFAIRS.

TO ENHANCE YOUR GRAD SCHOOL APPLICATION



Introduce yourself and express interest to the school before you apply.

A great way to stand out in the application process is to make the effort to build a relationship with admissions leaders before you apply. The pre-application period offers an unparalleled opportunity to show admissions directors just how interested you are by asking informed questions about program options and opportunities.

Do an interview, if possible.

Whenever there is the opportunity for an interview or one-on-one time with admissions leaders or alumni, a great way to enhance your application is to make this a priority.

Make an effort to visit the campus.

For admissions directors, the students who come and visit are demonstrating their interest through their actions (reserving time to visit, incurring any costs associated, etc.). It also shows that you have thoroughly considered whether or not the campus is a good fit for you, making you even more attractive as a candidate.

Identify your post-graduation objectives.

What is it that you'd like to achieve or accomplish in your career that graduate school will help you to do? List them out, connect the dots between skill sets and career objectives and link back to the programs that interest you.

Explain why the school and the program are right for you.

> Admissions directors want to know what attracts you to their program's unique mix of offerings. As you make your list of top choices, jot down the reasons why these programs made your list and emphasize these in your application.

Refine your personal statement.

THIS MONTH'S FP GUIDE IS FOCUSED ON

A refined personal statement is often the only way to show your candidacy beyond the numbers. Admissions directors are looking for students who know why they are applying to graduate school and to their particular program.

Know your weaknesses and address them in the application.

The tough reality is that you can't hide a weakness; admissions directors will see it. The good news, however, is that each part of the application offers an opportunity to counteract that weakness. Low verbal score on the GRE? Get a recommendation from your boss on your great presentation skills. Weak GPA? You better study for the GRE.

Showcase how you would add diversity to the class.

> Peer-to-peer learning and network development are core value propositions of many graduate school programs. Consequently, you can enhance your application by demonstrating the unique value that you bring to the table, such as a different social, political, or economic perspective, beyond your strong academic and professional credentials.

Leverage recommendations to demonstrate something about you that you can't show on your own.

> As you think about who you'd like to request recommendations from, think about those who can speak to something specific and detailed that you want admissions directors to know about, but that they can't see in your personal statement, transcripts, GRE scores, resume, writing sample, etc.

Apply on time—particularly for scholarship consideration.

Every school has its own set of deadlines and timelines, and while most say that applying early doesn't have an impact on your chances of admission, a surprising number of applicants apply late, which significantly weakens their chance of admission. Furthermore, if you are seeking any type of funding, applying by the school's listed deadline is virtually a requirement.



University of Denver

JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES

BRAD MILLER, DIRECTOR, GRADUATE ADMISSIONS

"KORBEL STUDENTS AND ALUMNI AREN'T AFRAID TO GO TO THE FIELD AND GET THEIR HANDS DIRTY.



THEY ARE
PROACTIVE AND
ALWAYS LOOKING
FOR OPPORTUNITIES TO TAKE THE
INITIATIVE. THAT'S
WHAT WE'RE
LOOKING FOR IN
APPLICANTS."

-BRAD MILLER, DIRECTOR OF ADMISSIONS

WHAT CHARACTERISTICS MAKE A SUCCESSFUL APPLICANT TO KORBEL?

Beyond a demonstrated record of academic and professional success, we really want to see three characteristics in an applicant. First, they know what they want and why Korbel will help them achieve it. Second, they demonstrate how their work experience has informed their ambitions for graduate school and beyond. Third, they don't just want any graduate program, they want Korbel.

All of that said, we know students' interests change. We take it as our responsibility to help students redirect their interests and objectives in a strategic way so they make the most of their time in graduate school. One example of this is our MA in Global Finance, Economics, and Trade. That major consistently has the fewest start in it, but is one of the largest at graduation, because students see that economics is the language of policy makers, and more importantly, they see that they can master it at Korbel.

HOW MUCH DOES THE GRE MATTER IN YOUR ADMISSIONS REVIEW?

Generally speaking, we give the GRE less weight than the sum of the rest of the application. By that I mean, we are looking for "fit" and less for raw standardized test scores. We require the GRE because it is one more piece of information to use as we evaluate applicants. For students with a low GPA, a strong GRE score can help us to see their academic potential. On the other hand, if someone has a strong application, including a high GPA, a weak GRE score is unlikely to ruin their chances of admission.

DOES APPLYING EARLIER INCREASE CHANCE OF ADMISSION?

There is not much of a difference in applying early or by the deadline, but there is a huge disadvantage to applying late. We consider all our applicants for scholarship funding, but applying after our priority date dramatically decreases the chances of receiving an award. In the case of Korbel, a campus visit before you apply can make a significant impact on your consideration for both admission and funding opportunities.

HOW MUCH DOES WORK EXPERIENCE MATTER?

Work experience matters a great deal. It is the great equalizer across our applications. Regardless of what undergraduate institution someone attended, how high their GPA was or how strongly they scored on the GRE, work experience tells us what they're able to accomplish professionally. That said, we are less interested in a "minimum" or "average" number of years of work experience than we are in the things the applicant has accomplished in their career. For example, experience working abroad in the field—whether the applicant is 22 or 28—demonstrates to us and to employers who recruit at Korbel that the individual has the dedication and stamina to work in international affairs.

WHAT TYPES OF RECOMMENDATIONS ARE MOST EFFECTIVE?

Successful Korbel applicants seek recommendations that are thoughtfully written by someone who can attest to valuable information about the applicant that cannot be demonstrated elsewhere on the application. A good example is an applicant seeking graduate admission but with no demonstrable work experience outside of internships. The applicant would be wise to see a professional recommendation from a previous supervisor who knows them well and can speak to their motivation, performance, and accomplishments. Students should avoid recommendation letters that merely "check the box," those being the type that are clearly generic templates with information that we can easily find elsewhere in the application (such as their grades).

Program Options: MA, Conflict Resolution; MA, Global Finance, Trade and Economic Integration; MA, International Administration; MA, International Development; MA, International Human Rights; MA, International Security; MA, International Studies (Note: Students can switch degree programs once they are enrolled.)

Application Deadlines: Winter 2016 Enrollment – Priority application deadline: November 1, 2015

Fall 2016 Enrollment - Priority application deadline: January 15, 2016

Application Fee: \$65 payable online or via check

Work Experience: Not required, but strongly recommended, particularly field work

Standardized Exam Scores: GRE required; scores must be from within the last five years

Recommendation Letters: Two required

Application Checklist: http://www.du.edu/korbel/media/documents/ma-application-checklist-2015.pdf



JOSEF KORBEL SCHOOL OF INTERNATIONAL STUDIES



Kyleanne Hunter is a former officer in the United States Marine Corps, serving as an AH-1W Super Cobra attack pilot. Now she's a Sié Fellow at the Josef Korbel School's Sié Chéou-Kang Center for International Security & Diplomacy. As such she's working alongside world renowned faculty doing relevant research on today's most pressing global issues.

To learn more about our master of arts programs and our two-year full tuition scholarship, the Sié Fellowship, call 303.871.2544 or email korbeladm@du.edu.



Johns Hopkins University

SCHOOL OF ADVANCED INTERNATIONAL STUDIES (SAIS)

SIDNEY IACKSON, DIRECTOR OF ADMISSIONS

"IN ADDITION TO PROFESSIONAL EXPERIENCE, ACADEMIC PREPARATION, AND INTERNATIONAL EXPOSURE, JOHNS HOPKINS SAIS EMPHASIZES A CANDIDATE'S QUANTITATIVE APTITUDE.



THAT A SOUND UNDERSTANDING OF ECONOMICS IS INSTRUMENTAL TO BUILDING COMPETENCE AS AN INTERNATIONAL AFFAIRS PROFESSIONAL."
-SIDNEY JACKSON

WE BELIEVE

-SIDNEY JACKSON, DIRECTOR OF ADMISSIONS

WHAT CHARACTERISTICS MAKE A SUCCESSFUL APPLICANT TO SAIS?

The answer to this question is slightly different for each of our programs, but generally speaking, we look for applicants who are creative, passionate, and driven, and demonstrate that they are poised for success. Of course there are several ways of illustrating these characteristics in an application, but there are a few commonalities: most successful applicants come to Johns Hopkins SAIS with significant international exposure—either having worked, studied, volunteered, or traveled outside of their home country. They also demonstrate strong analytic and quantitative aptitude—as evidenced through previous coursework, professional experience, and/or standardized test scores. Finally, our students are often proficient in one or two foreign languages.

HOW MUCH DOES THE GRE MATTER IN YOUR ADMISSIONS REVIEW?

The admissions committee takes a holistic approach to reviewing candidates and looks for indicators throughout the admissions cycle that will predict success at Johns Hopkins SAIS. Although standardized tests such as the GRE and GMAT can demonstrate an applicant's quantitative and qualitative aptitude, they are not the determining factor in the admissions review. For example, there are some candidates who do very well on the GRE or GMAT, but lack appropriate work experience. (Johns Hopkins SAIS requires the GRE or GMAT for most degree programs; the GMAT is quite popular with applicants pursuing a dual MA/MBA program.)

DOES APPLYING EARLIER INCREASE CHANCE OF ADMISSION?

Johns Hopkins SAIS seeks talented and motivated candidates who wish to further develop their expertise and build a globally-minded career. Candidates should apply as soon as they feel their application best highlights their academic and work experience, extracurricular activities, and personal or professional leadership roles. While the school offers an early notification enrollment option for some Master's degree applicants, the acceptance rate is comparable in both early notification and regular decision pools. For the most competitive applicants, an early acceptance reduces the need to apply to other programs.

HOW MUCH DOES WORK EXPERIENCE MATTER?

Work experience helps the admissions committee to see that a student's goals are informed by practical exposure to the subjects they wish to study. Students with relevant work experience are called upon to contribute in classroom discussions. That said, about ten to twelve percent of our incoming Master of Arts students arrive at Johns Hopkins SAIS directly from undergraduate programs, and they typically distinguish themselves by having had a strong academic record, unique internship experience, or received a fellowship supporting their graduate study.

WHAT TYPES OF RECOMMENDATIONS ARE MOST EFFECTIVE?

If the candidate is employed, the committee would prefer that at least one recommendation come from an immediate supervisor. Also, the longer someone has been out of school, the more emphasis will be placed on their professional accomplishments and career trajectory. Many undergraduate applicants will have professors write academic recommendations, however, the committee welcomes recommendations from an internship supervisor or a volunteer organization. Applicants should avoid recommendations from someone who does not know them well, but rather seek out a recommender who can talk about their interpersonal skills, character, leadership, and ability to succeed in the program.

Program Options: (Campus Locations)
Master of Arts; (Bologna, Italy; Nanjing, China; Washington, DC)
Master of Arts in International Affairs (Bologna, Italy)

Master of Arts in International Studies (Nanjing, China)
Master of Arts in International Economics and Finance (Washington, DC)

Master of Arts in Global Policy Program (Washington, DC)
Master of International Public Policy (Bologna, Italy; Washington, DC)

Fall 2016 Application Deadlines: Varies by program.

See deadline dates for the program that interests you at: http://www.sais-jhu.edu/content/admissions#important-dates

Application Fee: \$85 payable online or via check Work Experience: Strongly recommended Standardized Exam Scores: GRE or GMAT required

Recommendation Letters: Two required

Application Checklist: http://www.sais-jhu.edu/sites/default/files/

Application_Instructions_2015.pdf

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Boston University

FREDERICK S. PARDEE SCHOOL OF GLOBAL STUDIES

BILL GRIMES, ASSOCIATE DEAN FOR ACADEMIC AFFAIRS PROFESSOR OF INTERNATIONAL RELATIONS AND POLITICAL SCIENCE

"THE PARDEE SCHOOL TRAINS ITS STUDENTS TO UNDERSTAND GLOBAL CHALLENGES AND OPPORTUNITIES FROM MULTIPLE PERSPECTIVES. WE ARE LOOKING FOR



ARE INTELLECTU-ALLY CURIOUS, ADAPTABLE, AND PASSIONATE."

-WILLIAM W. GRIMES, ASSOCIATE DEAN FOR ACADEMIC AFFAIRS

WHAT CHARACTERISTICS MAKE A SUCCESSFUL APPLICANT TO PARDEE?

For all of our programs, we want to see a demonstrated commitment to a career in international relations as well as international experience. In terms of academic preparation, we pay particular attention to writing ability and foreign language skills. We are interdisciplinary at our core, so we look for applicants who are open to various approaches and methods. We teach our students not only how to look at the world from multiple perspectives, but also how to choose the right analytical approach for any given issue. Our programs are problem-driven rather than methodology-driven, so we do not emphasize applicants' quantitative preparation above other attributes.

HOW MUCH DOES THE GRE MATTER IN YOUR ADMISSIONS REVIEW?

The GRE is required for all of our programs except for the dual-degree programs with Law and Business, but it is not the main filter. We pay special attention to the elements of the application that reveal applicants' insights and engagement with global issues, as well as the quality of their reasoning and writing. GRE scores are just one piece of the overall picture of whether we expect an applicant to thrive at the Pardee School.

DOES APPLYING EARLIER INCREASE CHANCE OF ADMISSION?

Applications for the fall semester are open until April 15, and applying early does not make a difference in admissions decisions. However, in awarding aid, priority is given to applicants who submit a complete application by January 15. Most programs also accept applicants for the spring semester, with a deadline of October 15.

HOW MUCH DOES WORK EXPERIENCE MATTER?

We value work experience, but it is not required. Internships, volunteer work and other forms of community and social engagement can also provide evidence of the applicant's potential for future professional success. As with the GRE, work experience is one piece of the larger picture.

WHAT TYPES OF RECOMMENDATIONS ARE MOST EFFECTIVE?

We require three letters of recommendation, one of which should be from a university professor, if at all possible. Letters that address the applicant's work experience are also encouraged. Recommenders should speak to the applicant's academic strengths, leadership abilities, and commitment to global policy.

Program Options: Master of Arts in International Affairs (MAIA); Master of Arts in Global DevMaster of Arts in International Affairs (MAIA); Master of Arts in Global Development Policy (GDP); Master of Arts in International Relations & Environmental Policy (IREP); Master of Arts in International Relations & International Communication (IRIC); Master of Arts in International Relations, Mid Career (IREL); Master of Arts in International Relations & Religion (IRRN); Master of Arts in Latin American Studies (LASMA); Master of Arts in International Relations & Juris Doctor (IR/JD); Master of Arts in International Relations & Master of Business Administration (IR/MBA)

Fall 2016 Application Deadlines: Priority Deadline: January 15, 2016 (for financial aid consideration)

Final Deadline: April 15, 2016

Application Fee: \$95 payable online or via check **Work Experience:** Helpful but not required

Standardized Exam Scores: GRE required, except for IR/JD and IR/MBA

TOEFL (For most international applicants)

Recommendation Letters: Three required; one must be from a university professor

Application Checklist:

http://www.bu.edu/pardeeschool/prospective-students/ prospective-graduate-info/



UNIVERSITY



University of Minnesota

HUMPHREY SCHOOL OF PUBLIC AFFAIRS

AMY LUITIENS, DIRECTOR OF ADMISSIONS

"THE HUMPHREY
SCHOOL OF PUBLIC
AFFAIRS IS DEEPLY
ENGAGED WITH
ADDRESSING GRAND
CHALLENGES,
AND APPLICANTS
WHO THINK
GLOBALLY AND
ACT LOCALLY, WHO



ARE COMMITTED TO THESE ISSUES, WILL FIND THAT THE SCHOOL IS AN EXCELLENT LABORATORY FOR THEIR GRADUATE WORK."

-AMY LUITJENS, DIRECTOR OF ADMISSIONS

WHAT CHARACTERISTICS MAKE A SUCCESSFUL APPLICANT TO HUMPHREY?

The Humphrey School mission, which honors our namesake, is to inspire and educate leaders to advance the common good in a diverse and changing world. With a broad swath of offerings across a number of degree programs, students engage in grassroots community development, policy making at international organizations, and everything in between. The School, housed in one of the world's top research institutions, provides an academic home base from which students study with internationally-renowned researchers across disciplines. Opportunities such as these provide a collaborative climate necessary to address global grand challenges. Applicants who have a deep desire to align themselves with this impactful and critical work, and are able to articulate how their experiences and interests have prepared them for success in an interdisciplinary, academically rigorous, and practical learning environment are of great interest to the admissions committee.

HOW MUCH DOES THE GRE MATTER IN YOUR ADMISSIONS REVIEW?

The Humphrey School reviews each application it receives holistically, taking into account all of the components of the application submitted. GRE scores are helpful as one piece of the application, because they can demonstrate an applicant's verbal reasoning, quantitative, and analytical writing skills—all of which are important building blocks for the fields of study offered at the School—along with academic history, professional and leadership experience, contribution to diversity of views and experiences, and commitment to public service, strong GRE scores may make a candidate more competitive for merit based aid funding.

DOES APPLYING EARLIER INCREASE CHANCE OF ADMISSION?

Applicants do not increase their likelihood of admission by applying earlier than the application deadlines posted on our website. Any applications received by the respective deadlines will be considered equitably.

HOW MUCH DOES WORK EXPERIENCE MATTER?

The Humphrey School's average entering age for most master's degree students is 26, and the majority of incoming students have held positions across sectors. While work experience is not required, it is very attractive to the admissions committee, and often has served as a catalyst for what leads applicants to a deeper desire to serve in the spirit of our mission [see above]. Our programs, led by well-known practitioners and researchers alike, enable students to expand upon the vision they may have developed while working and use that as a spring board to develop into effective public servants. Successful applicants who do not possess professional experience typically have a well-articulated plan for how their enrollment will assist them in achieving their goals, as well as how they are prepared to contribute to a community of peers and faculty collaborating on grand challenges.

WHAT TYPES OF RECOMMENDATIONS ARE MOST EFFECTIVE?

Letters of recommendation are critical in the admissions process, and well-written letters can play a large role in the application's outcome. Prospective students should plan ahead and talk with their letter writers in advance of the deadline; chances are, recommenders are writing a lot of letters for others, and advance notice is essential. The letters of recommendation give letter writers the opportunity to advocate for an applicant—the applicant should feel confident that the letters are meeting that goal. Too often, admissions committees see vague letters of recommendation or regurgitations of the applicant's transcript or other application materials. The most effective letters come from individuals familiar with the applicant's work during undergraduate studies as well as internship and work experiences.

Program Options: Master's of Development Practice in International Development, Master of Public Policy, and other degree programs **Application Deadlines:** Postmark deadline for university fellowship

consideration: December 15

Postmark deadline for Humphrey School scholarship consideration: January 15

Postmark deadline for admission: April 15

Application Fee: \$75 for domestic students, \$95 for international students

Work Experience: Strongly recommended but not required

Standardized Exam Scores: GRE required

Recommendation Letters: Three required; writers should be applicant's professors or work supervisors

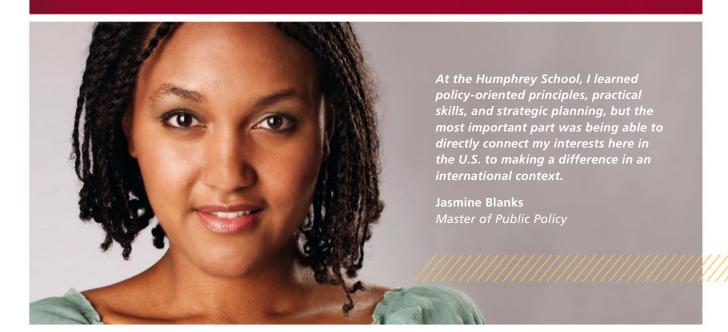
Application Checklist:

https://www.hhh.umn.edu/admissions/howtoapply.html



HUMPHREY SCHOOL OF PUBLIC AFFAIRS

University of Minnesota



INSPIRING LEADERS TO

ADVANCE THE COMMON GOOD

As one of the country's top-ranked professional public policy and planning schools, we match your passion with the knowledge, skills, and experience needed to advance the common good in a diverse world. The Humphrey School of Public Affairs is widely recognized for its role in examining public issues and shaping policy and planning at the local, state, national, and international levels.

FIVE MASTER'S DEGREES

- Master of Development Practice
- Master of Public Affairs (Mid-career)
- Master of Public Policy
- Master of Science in Science, Technology, and Environmental Policy
- Master of Urban and Regional Planning

PhD IN PUBLIC AFFAIRS

GLOBAL INTERDISCIPLINARY OFFERINGS





"AS A SCHOOL AND
AS A UNIVERSITY
WE ARE COMMITTED
TO DIVERSITY. WE
WANT THE NEXT
GENERATION OF
INTERNATIONAL
AFFAIRS LEADERS TO
LOOK A LOT MORE
LIKE THE DEMOGRAPHICS OF THE
COUNTRY AND THE



-REBECCA DAVIS,
ASSISTANT DIRECTOR,
GRADUATE
ENROLLMENT
MANAGEMENT

American University

SCHOOL FOR INTERNATIONAL SERVICE

REBECCA DAVIS, ASSISTANT DIRECTOR, GRADUATE ENROLLMENT MANAGEMENT DIRECTOR, DIVERSITY & INCLUSION INITIATIVES

WHAT CHARACTERISTICS MAKE A SUCCESSFUL APPLICANT TO SIS?

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HOW MUCH DOES THE GRE MATTER IN YOUR ADMISSIONS REVIEW?

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WHAT TYPES OF RECOMMENDATIONS ARE MOST EFFECTIVE?

There are two types of recommendation letters that can be particularly effective for SIS applicants. The first kind is the one that speaks to the applicant's commitment to public service, work ethic, and can cite specific examples that we can't see elsewhere in the application. While those attributes can certainly come across in a personal statement and on a resume, having a third party speak to this in the recommendation can certainly enhance the application. Secondly, when students apply it's worth putting some thought into what their weaknesses are. If a student has weak quantitative scores, for example, a letter from a boss who managed their quantitative analysis at work could be a great use of the recommendation letter.

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Work Experience: Recommended

Standardized Exam Scores: See www.american.edu/sis/admissions/requiredmaterials.cfm for more on test requirements.

Recommendation Letters: Two required for MA; three required for PhD

Application Checklist:

http://www.american.edu/sis/admissions/requiredmaterials.cfm



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HOW DO WE LINK ENVIRONMENTAL SUSTAINABILITY WITH SOCIAL JUSTICE?

Just ask Garrett Graddy-Lovelace and Malini Ranganathan, both geographers, political ecologists, and professors at the School of International Service. While Ranganathan studies urban water access and flood risk in India and the US, Graddy-Lovelace researches grassroots agrarian politics in the Andes, Appalachia, and beyond.

Learn how you can join these professors and their colleagues in meaningful conversations at www.american.edu/sis.



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To be eligible for the 2016 Lionel Gelber Prize, books must be published between 1 January 2015 and 31 December 2015. The deadline for submissions is 31 October 2015. Manuscripts to be published between 31 October and 31 December 2015 may be submitted in galley form. A \$50 per entry handling fee is required. Please make all cheques payable to the University of Toronto. Complete rules of eligibility are available on our website at www.utoronto.ca/munk/gelber.

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observation deck



MAPPA MUNDI

There are no certainties in our networked world, only contradictions. | P. 98 NATIONAL SECURITY

The American public is in the dark about its government's cyberaggressions. | P. 102

ECONOMICS

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Mexico is saying goodbye to resource nationalism. Will its neighbors follow? P. 106 BOOKS & CULTURE

Comics and anime are pushing gender boundaries in conservative Japan. | P. 108 THE FIXER

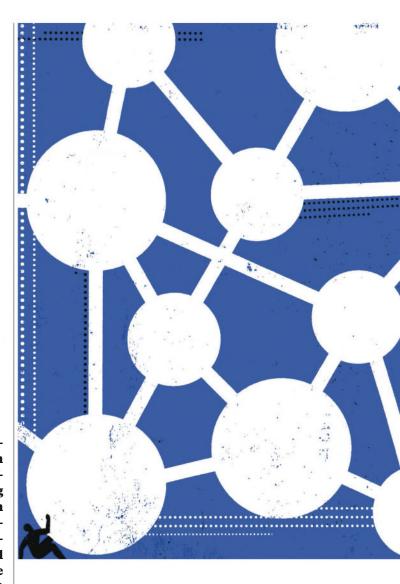
Flavia Liz Di Paolo on where to walk through a 1,000-year-old tree in São Paulo. P. 110



Illustration by SAM CHIVERS FOREIGNPOLICY.COM 97

The Network **Paradox** Who, exactly, will claim the virtual high ground?

There's a whole lotta technophilia going on. The wave upon wave of digital disruptions buffeting and inalterably changing global society—we have been told by a chorus of Silicon Valley CEOs, hyperventilating bestselling authors, and digital fan-boys and -girls-will be democratizing, will undercut the brutes who traditionally have wielded and abused power, will lift up the masses. This power of connection, so it goes, will transform such masses, educate them, and elevate us all above the boundaries and barriers that have separated us throughout history. Consequently, they say, we will find ourselves in a future in which we will work less and laugh more. It's a great era in which to be alive. ¶ But as any student of even the very best chapters of human history might expect, with progress come new, sometimes greater challenges. That is, having all the



world's people linked to the Net can empower and educate them, but it can also expose them to new threats and potentially open the door to new kinds of exploitation and domination.

Acceleration plus amplification produces volatility. Connection breaks down barriers and brings us closer, but it also creates new vulnerabilities. Redistribution plus decentralization of power can produce the Islamic State, the world's first open-architecture terrorist group; it has recognized that the most effective force multiplier is using modern communications techniques to let anyone join, harnessing the power of the alienation of thousands by co-branding it with a single perverse and evil message. It is a leap forward from the ways of hierarchical, closed, club-like terrorist organizations such as al Qaeda or the FARC. But it is hardly the kind of progress we wanted to be making.

While poor societies may leapfrog ahead thanks to mobile money, distance health and education, and smart distributed energy infrastructure, this may be offset by the fact that they are regularly buffeted by the whims, emotions, and ambitions of tech superpowers that feel empowered to intervene in their lives on a low-cost basis. These superpowers, without so much as the use of a single human on the ground, could devastate these poor societies, not to mention others in their weight class, via the Internet or autonomous robot armies deployed on land and in the sky. This is a looming threat in this new world: that the digital divide morphs into a kind of digital colonialism in which the tech haves, without much fear of meaningful retribution, feel empowered to impose their views and values on the tech have-nots.

The central reason for these contrasts has to do with a defining reality of the interconnected world, the world we are entering, in which essentially every human is part of a man-made system for the very first time. Call it the "network paradox," a phenomenon by which joining a network can both strengthen and create new vulnerabilities for those on the network.

A corollary to the paradox, however, might be called the "network power paradox," which is what happens when the network both empowers all those on it and enables a constant shifting of that power, creating more independence and capability than ever before, both for those at the fringes of the network (at the bottom in the traditional power distribution) and for those at the center or top in traditional hierarchies or hubs of power.

As illustrated by the revelations about the National Security Agency and the behavior of countries such as China and other authoritarian states that seek to control the Internet within their borders and administer it like any other of the domains over which they have sovereignty, big governments that are able to bring to bear the greatest capital, as well as technological and human resources, can gain even more disproportionate power in this new world. Big companies, too, can gain in ways that give them absolutely extraordinary and previously unthinkable influence. Consider the companies with billions of users or those that control information or key technological monopolies or near monopolies.

Who conceivably has the ability to influence more people: a major power, like the United Kingdom, or Google or Facebook? The power that used to control the waves or the ones that dominate the airwaves and the mind share of today? With an economy in which the building blocks of wealth are bits and bytes rather than acres or vaults of gold, whoever is best able to monetize connections, capture intelligence, or create unique new forms of value or advantages wins. Indeed, those who succeed are more likely to be those who have the means at multiple levels to gain the virtual high ground—the concentrations of data, the control over nodes and networks, the means to create the algorithms and codes that encrypt and destroy and create.

In our networked world, economic, political, social, and military power increasingly flow via the network. Thus, the terrain of the network-defined by infrastructure, regulations, concentration of valuable resources and capabilities—becomes as critical as was geographic terrain. In politics, security matters, and business, understanding that terrain and the new rules of power that pertain to it becomes especially important, as does understanding how component aspects or elements of the network impacting its speed, ease of use, security, etc. will influence the conditions for success or failure of those on the network.

But as the nature of exchanges on the network changes, another critical advantage will emerge: Those who master machine intelligence may gain significant power even as they are shifting significant power to the machines. How they harness that machine power, or whether they do or do not, will be of crucial consequence. From a military-affairs perspective, the 20th century was the era of industrialized warfare. The 21st will be the era of network warfare and therefore increasingly the era of automated warfare.

Setting aside hyperbole and simplistic visions is essential when planning for a future that is going to become dramatically different in many complex ways. When threats and capabilities or opportunities and risks are assessed, however, we see that this is good practice not just because it really never →



Alfa Fellowship **Program**

PROMOTING UNDERSTANDING **OF RUSSIA**

Alfa-Bank and Cultural Vistas are pleased to announce a call for applications for the Alfa Fellowship Program, an 11-MONTH PROFESSIONAL DEVELOPMENT initiative, which has been in existence for over a decade. At a time of increasing need for specialists with Russia expertise, this program affords young American, British, and German leaders the opportunity to receive meaningful professional experience in Russia.

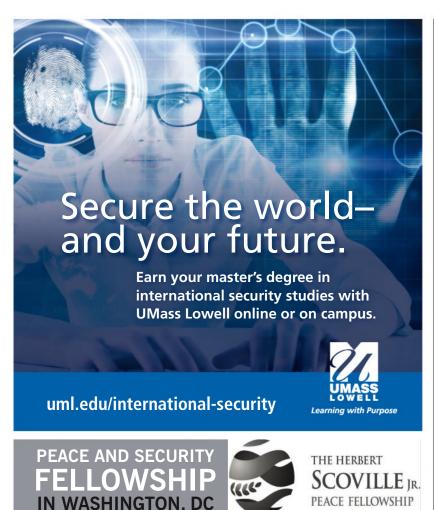
The program begins with **LANGUAGE TRAINING** in the U.S., U.K., or Germany, followed by a language course in Moscow starting in mid-June. Throughout the summer, Alfa Fellows attend a SEMINAR PROGRAM with key public and private sector officials to discuss current affairs in Russia. Fellows then WORK AT PROMINENT ORGANIZATIONS IN RUSSIA, including private companies, media outlets, think tanks, and foundations.

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- Deadline to apply for the 2016-2017 program year: December 1
- Additional details and the online application can be found at: www.culturalvistas.org/alfa

For more information, please contact: alfa@culturalvistas.org or 212 497 3510.

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The Herbert Scoville Jr. Peace Fellowship invites recent college and graduate school alumni to apply for six to nine month fellowships in Washington, DC, focusing on arms control, peace, and international security issues. Founded in 1987 to develop and train the next generation of leaders on a range of peace and security issues, the program has awarded 161 fellowships to date.

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The next application deadline is October 1, 2015 for the spring 2016 semester

Fellows are supervised by and learn from senior level staff and often have the opportunity to publish articles or reports. The program also arranges meetings for the fellows with policy experts. Many former Scoville Fellows have gone on to pursue graduate degrees in international relations and taken prominent positions in the field of peace and security with public-interest organizations, the Federal Government, academia, and media.

Candidates must have an excellent academic record and a strong interest in issues of peace and security. The program is open to all U.S. citizens and non-U.S. citizens living in the U.S. eligible for employment. Benefits include a salary, health insurance, board and alumni mentoring, travel to Washington, DC to begin the fellowship, and a small stipend to attend meetings or take a course.

Check out our new Medium.com listicle 14 Reasons to Get a Job in Peace and Security:



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Providing Opportunities for Tomorrow's Leaders in Peace and Security

pays to be simplistic or to fall for the hype, but because the new reality is that threats will come at all of us, faster than before, from all precincts of the network. Naturally, those with greater resources will have greater power to dominate, and those on the fringes will primarily have greater power to disrupt, but as important as both these facts is the Net's ability to swiftly transfer power from node to node or to enable ad hoc alliances to emerge quickly as actors seek strength through collaboration.

Seventeen years ago, Columbia University's *Journal of International Affairs* published an article I wrote, titled "Cyberpolitik: The Changing Nature of Power in the Information Age," in which I addressed the contradictory phenomena of the new era:

The revolution ... breaks down hierarchies and creates new power structures. It amplifies the capacity to analyze, reduces reaction times to allow only for impulse and can be a tool for amplifying emotions or rationality. ... It can make the United States so strong militarily that no one dares fight her in ways in which she is prepared to fight, while enabling opponents to take advantage of new options in asymmetrical conflict. It cedes some state authority to markets, to transnational entities and to non-state actors and, as a consequence, produces political forces calling for the strengthening of the state. It is the best tool for democrats and the best weapon for demagogues.

I went on to say that, given all the contradictions, it was probably too early to assert what certainties would be associated with the then-budding revolution. (The article came out six months before Google was founded, six years before Facebook, and nine before the iPhone.) Now, nearly two decades later, there is one clear certainty: Contradictions are themselves an essential aspect of this new era and should inform us as we seek to command a virtual landscape, one that we have made but whose form keeps shifting and whose horizons we cannot see.

DAVID ROTHKOPF (@djrothkopf) is CEO and editor of the FP Group.

SPONSORED CONTENT

The Economics of Chaos and its Aftermath

Understanding the Arab Spring and the MENA Region's Future in the Context of Power Struggles and Economics

Reinventing the Middle East BY ANTOINE SREIH AND JOSEPH DIVANNA. Leonardo and Francis Press, 2015, 146 pp. £9.95

Available on Amazon.co.uk

Amidst the countless analyses of the Middle East and North Africa (MENA) region since the start of the so-called "Arab Spring" uprisings in 2011, Sreih and DiVanna's new book attempts to contextualize the recent regional transformation and its future in economic terms.

By drawing on a wide variety of quantitative sources, including World Bank, IMF, official government data, and many others, the authors piece together an economic explanation for the Arab Spring itself, looking at the region within the constraints of global resource politics, changing employment patterns, and growing structural patterns.

In Reinventing the Middle East, the authors connect the dots between the economic challenges to pre-Arab-Spring regimes' governing legitimacy and their attempts at using fiscal policy to stem the tide of civil unrest. The story played out differently in each national context.

Despite differences across national borders, virtually all countries in the region share similar challenges and opportunities: changing social contexts and demographics, the evolution of financial markets and access to credit, and the inexorable advance of communications technologies which render older mechanisms of political control obsolete. On top of all of these remains the elephant in the proverbial MENA room: a regional political economy which hinges on hydrocarbon production and export.

One a senior banker/Chairman and one

a management consultant, Sreih and Divanna aren't the first to note that the region's future is uncertain. However, based on the available data, they do provide a helpful outline of two senarios that could occur in the region; the first focused on continued destabilization and the second on sustainable economic development. Recent events following the book's release have demonstrated that, unfortunately, the first scenario is actually happening and two of the main regional powers (i.e., Saudi Arabia and Turkey) are directly interfering in the escalation.

Whatever the future holds for the MENA region, *Reinventing the Middle East* is a must read for anyone who wants to understand strategic risk and opportunity in the region. It is a data-rich but accessible analysis of a complex and constantly transforming region of the global economy.



America isn't being honest about its cyberwars.

To Stephen Gerwin, chief of the Howard County Bureau of Utilities, it was "a peculiar project." His workers were told they needed to get background checks and sign nondisclosure forms before they could begin work on a wastewater pump station in a forested area near the Little Patuxent River. "You sign a document that says if you say anything," he told the Washington Post in 2014, "you go to jail for a million years." ¶ According to restricted documents and blueprints that I reviewed, what makes the pump station so sensitive is that it is intended to supply upwards of 2 million gallons of water each day to a massive, highly secretive construction project codenamed Site M. TLocated adjacent to the National Security Agency (NSA) at Fort Meade, Maryland, and scheduled to be completed in 2016, Site M is the future home of U.S. Cyber Command, an NSAaffiliated organization created six years ago to direct the United States' digital wars. It will host a mammoth cyberbrain-a 600,000-square-foot, \$896.5 million supercomputer facility called the High Perfor-

mance Computing Center-2.



Because technology of that size requires a vast amount of water for cooling, the NSA is paying \$40 million for the new pump house.

As buildings, computer labs, and research spaces go up at Site M, the United States is entering a new era of warfare. In both the media and the public conscience, concern over a cyberattack has overtaken the Cold War fear of a nuclear confrontation. Or perhaps, in some ways, the fears are merging: Cyberweapons crossed the "kinetic" threshold with the U.S.-Israeli Stuxnet digital strike on Iran's nuclear centrifuges in 2010, progressing from erasing hard drives and stealing data to disrupting or destroying physical objects. (The same technique employed in Stuxnet—implanting a virus to send a system out of control—could be used to derail a train or bring down a dam.) And U.S. President Barack Obama has refused to take off the table the use of nukes in response to a severe cyberattack.

As the Internet turns into a battlefield with dangerous real-world implications, there's an urgent need for the United States to begin



thinking of ways to de-escalate this new kind of warfare. But that requires extensive dialogue and debate, both of which are impossible without cyber-transparency. People should know what digital arms America owns, how they are used, and the rules that govern them. The same openness that has long allowed the public to gain an understanding of the risks and benefits of nuclear weapons should apply to digital ones as well.

Instead of transparency, however, the Obama administration is offering the public a distorted view of cyberwarfare. It's not just that officials aren't talking about the topsecret likes of Site M. They're also hammering an incomplete narrative: that foreign governments—or other actors—are constantly attacking America. What people don't know is how aggressively and for how long the United States has been the one doing the striking.

When Iran launched a cyberassault on banks in the United States in 2012, the public was left to believe that the event was unprovoked. In reality, it was retaliation for the far more destructive Stuxnet incident, an illegal act of war according to the Defense Department's own definition. Similarly, the White House has accused Russia, China, and North Korea of unprovoked assaults on U.S. systems—but how extensive confrontations are in the opposite direction is not public information.

This dearth of transparency greatly distorts the public's perception of Cyber Command. Many people wrongly believe its primary purpose is to defend against attacks. This is a topic I brought up with Edward Snowden when I interviewed him in Russia for a PBS Nova documentary on cyberwarfare that's due to air this October. As a former "infrastructure analyst" for the NSA, a job which involved developing ways to penetrate the Internet and computer systems, Snowden knows the subject well. "Cyber Command itself has always been branded in a sort of misleading way from its very inception," he told me. "It's an attack agency.... If you ask anybody at Cyber Command or look at any of the job listings for openings for their positions, you'll see that the one thing they

don't prioritize is computer-network defense. It's all about computer-network attack and computer-network exploitation at Cyber Command."

The trove of documents leaked by Snowden in 2013 also shows that with cyberwarfare, everyone could be a potential target. As part of an enormous, topsecret program known as TreasureMap, the NSA is developing a system it claims will track every person on the planet who is connected to the Internet. An official PowerPoint presentation on TreasureMap describes the program as a "Capability for building a near real-time, interactive map of the global internet.... Any device, anywhere, all the time." Among the "wide range of missions" are "Computer Attack/Exploit Planning" and "Network Reconnaissance," meaning TreasureMap would enable tracking to turn into striking. Another operation, code-named Turbine, involves secretly placing "millions of implants"—that is, malware—in computer

he asked. "What if it was a Chinese hacker launching an attack from an Iranian computer targeting the United States?... We're opening the doors to people launching missiles and dropping bombs by taking the human out of the decision chain."

For years, these types of concerns have gone unaddressed. In fact, they've largely gone unnoticed—because the public and even much of Congress have been deliberately kept in the dark about the dimensions of U.S. involvement in cyberwarfare. There need not be, say, a revealing of algorithm designs, but not allowing Americans to have vital information about their national defense and to discuss it honestly is in violation of the democratic project.

The reality of cyberconflict today is one of offense. "Somebody has used an entirely new class of weapon to effect destruction," retired Gen. Michael Hayden, former director

THE SAME OPENNESS THAT HAS LONG ALLOWED THE PUBLIC TO **GAIN AN UNDERSTANDING** OF THE RISKS AND BENEFITS OF **NUCLEAR WEAPONS SHOULD APPLY** TO DIGITAL ONES AS WELL.

systems worldwide. They could be used for both spying and cyberassaults.

In our conversation, Snowden also highlighted a secret program, code-named MonsterMind, that was still in development when he left the NSA. It is intended to detect suspicious malware entering the United States by spotting known algorithms as they zip through communications links. But there were indications it could also include an automated strike-back capability, allowing it to instantly initiate a counterstrike at a piece of malware's source. An error in such an autonomous system, Snowden pointed out, could lead to an accidental war. "What happens when the algorithms get it wrong?"

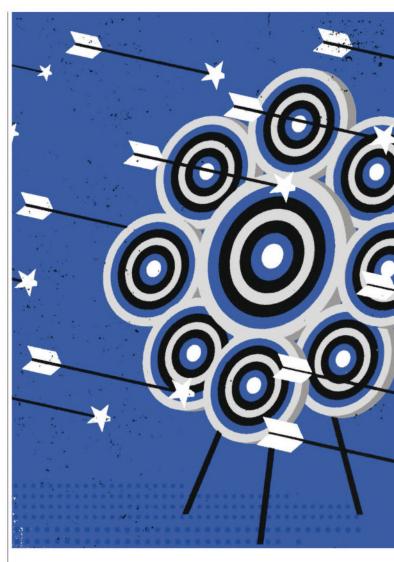
of the NSA and CIA, told me in 2014. "Somebody's army has crossed the Rubicon, and we've got a legion on the other side of the river now, and it's not going back."

What Hayden failed to mention is that Caesar broke the law by traversing the infamous river. To keep America from reaching the point of no return in cyberwarfare, the public must be let on board.

JAMES BAMFORD (@WashAuthor) is a columnist for FOREIGN POLICY and the author of The Shadow Factory: The Ultra-Secret NSA From 9/11 to the Eavesdropping on America. He also writes and produces documentaries for PBS.

Crash and Burn Why Silicon Valley's notion that failure leads to success won't work for the rest of the world.

FailCon is a winning endeavor. Billed as a one-day conference for entrepreneurs, investors, developers, and designers, it unabashedly celebrates failure, urging its attendees to "start exchanging stories of what didn't work" and promising to provide "guidance or safe spaces for failure." Launched in 2009 in San Francisco, FailCon had grown by this summer to include events in 21 cities around the world-including Dubai, Tokyo, and Tehraneach inviting attendees to pay a small entrance fee to reaffirm that "it's okay to fail." ¶ FailCon is hardly alone. Similar mantras echo across the business space, clustering in particular around high-technology ventures and would-be entrepreneurs. The Harvard Business Review published a "failure issue" in 2011. Fail Forward, a consultancy, offers a range of tools for advancing the "practice of intelligent failure," including instructions for creating "failure reports"-studies that help organizations learn from their disappointments—and



a guide to sharing accounts of missteps. ("Include emotions, character motivations, hopes, dreams, and fears," it instructs.) In 2014, a *Fast Company* columnist suggested provocatively that "the most successful people are the ones who take big risks, which often means spectacular flameouts."

In the frenzied hills of Silicon Valley, going bust is common. Research attests that close to half of start-ups supported by venture capital chew through most or all of their backers' money and that the majority never achieve their projected returns on investment. But failure, the now trendy argument holds, is the key to long-term triumph; if you fail fast and frequently, you gain a sense of what really works.

To a certain extent, this equation rings true. Some of the tech industry's most promising stars dimmed quickly or were rendered irrelevant by subsequent waves of innovation—yet founders and funders swiftly rebounded. Netscape's co-founder, Marc

Andreessen, now runs Andreessen Horowitz, one of Silicon Valley's most prosperous venture-capital firms. Napster's Sean Parker became the founding president of Facebook and an early investor in Spotify. America Online's Steve Case founded Revolution, an investment company. It is their stories, along with those of dozens of less famous but still very affluent founders of businesses, that inspire the failure-assuccess narrative.

The problem is that such stories remain both relatively rare and distinctly American. There is nothing inherently wrong with sites and services that have cropped up around the celebration of failure. There is a real danger, though, in assuming that business practices that work in one part of the world will translate seamlessly to others, and in separating a specific aspect of one business culture from the legal and social environments that support it. Failure may not be a sin. Yet it's hardly a virtue either, and learning from it is a far cry from applauding its merits.

Silicon Valley is an idiosyncratic place, boasting a combination of specific factors that cannot be easily replicated or reproduced. It has one of the world's greatest universities in its backyard and eager pools of local capital. Because it has been a hotbed of innovation since Dave Packard and Bill Hewlett invented the audio oscillator in a Palo Alto garage, it also has developed deep and overlapping networks of entrepreneurial support services—law firms and marketing specialists and rental spaces that cater to start-ups. When an entrepreneur fails in Silicon Valley, he (or occasionally she) is doing so in a highly conducive environment where an abundance of new opportunities awaits.

More importantly, Silicon Valley entrepreneurs benefit from supportive rules and norms. Central among these is bankruptcy law; a key tenet of U.S. financial legislation since 1938, it provides the muscle that allows entrepreneurs to start over and over again. Any commercial entity can file for bankruptcy under Chapter 11 or Chapter 7, which effectively allows a court to resolve a firm's assets and liabilities. The owners of a bankrupt firm can lose their investment, but they are not held personally responsible for the firm's debt. Individuals can also file for bankruptcy, assuming some longterm constraints but no permanent handicaps: After a fixed term (usually three to five years), debtors, who are on schedule with their payments, are discharged without any legal obligations or social stigma.

U.S. law is similarly kind to investors. Most of Silicon Valley's leading venturecapital firms are organized as limited partnerships. Typically, they invest capital raised from a syndicate, meaning that the cash they lend is not their own. As a result, they have considerable leeway in spreading those funds and making have long been the major funding providers for industry, venture-capital coffers are proportionately more anemic, giving would-be entrepreneurs fewer channels of money. And in China, the lack of legal protection for intellectual property rights raises the bar on risk for many firms while lowering their probable profits.

There are pockets around the world— Israel and Finland, for example—where the laws and norms of commerce support different styles of high-risk, highly innovative business. But where these rules are absent, the damages inflicted by failure are considerably larger.

It's important to ensure that the ideas of FailCon and similar ventures do not spread unchecked because, in the end, failure—true, abject failure, the kind from which one cannot recover—is no cause for

FAILURE MAY NOT BE A SIN. YET IT'S HARDLY A VIRTUE **EITHER, AND LEARNING FROM** IT IS A FAR CRY FROM **APPLAUDING ITS MERITS.**

multiple big bets. They can afford to fund failure because the risks of doing so are relatively low and more than compensated for by a few big wins. Additionally, Silicon Valley benefits from a strong national system of intellectual property rights and an immigration regime that is open to outsiders and that is particularly welcoming to those with high-technology skills.

Other countries, by contrast, are far less amenable to failure. In places such as Greece and Italy, where personal bankruptcy laws are more restrictive, start-up cultures are understandably less vibrant because the costs of not succeeding are so much greater. In Germany, where banks

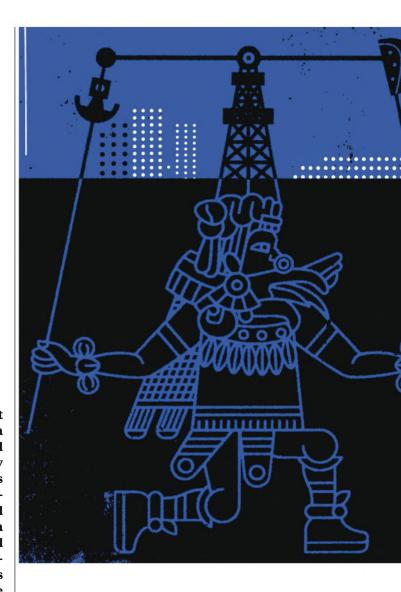
celebration at all. Armed with a faith in crashing and burning, small-time investors who make big bets on a country's nascent stock exchange may risk losing their families' savings and plunging into poverty. Nothing about this is carefree.

Indeed, despite what Silicon Valley says, without the infrastructure required to bounce back, failure is not a learning opportunity. It's a crisis.

DEBORA L. SPAR (@deboraspar) is a columnist for FOREIGN POLICY, the president of Barnard College, and the author, most recently, of Wonder Women: Sex, Power, and the Quest for Perfection.

Crude Capitalism Mexico is providing a model for a new Latin American energy policy. But will it work?

When, in 2013, Mexican President Enrique Peña Nieto announced a broad reform package that would end the government's monopoly over the country's oil sector, his argument was fairly straightforward: Foreign investment could be just the thing to reverse a decade of production declines and revitalize a state that has historically relied heavily on oil for its income. Dazzled by the promise of numbers, Peña Nieto suggested that, by wrenching open the long-closed sector, Mexico could attract more than \$60 billion in investment within just a few years, while adding at least a percentage point to its annual GDP growth and creating 2 million jobs. The president's idea was a revolutionary one in a country whose modern identity was forged thanks to the nationalization of its black gold in 1938. Critics, unsurprisingly, were quick to argue that Peña Nieto's reform was nothing less than a wholesale dismantling of Mexico's heritage.



But the president knew that, without a shock to the system, his country could soon turn into a net importer of oil. That meant giving up, at least in part, the keys to the energy industry.

Mexico, along with Russia, has long been a poster child for resource nationalism, or the tendency for governments to claim outright ownership of all mineral resources and to monopolize pretty much all parts of the energy sphere. Nearly 80 percent of global oil reserves are under the control of national oil companies, according to a 2007 report by the Baker Institute at Rice University, leaving relatively little energy in the hands of multinational corporations. Mexico's southern neighbors in Latin America are no exception: Over the past decade or so, these countries have moved to nationalize their industries, undoing what progress came after a bout of liberalism in the 1990s. Although that has played well with populist publics, such moves have kneecapped energy-producing potential.



Now, Argentina, Brazil, and Venezuela have little choice but to track Mexico's experiment closely, considering that they all compete for the same investment dollars and that Big Oil will go where it sees the best prospects with the best terms. What's more, these countries have an even stronger, inescapable reason to follow Mexico's lead: Resource nationalism is a long-term recipe for disaster.

Take Argentina. It has the world's second-largest shale reserves but is currently a net energy importer after nearly a century of whipsawing between nationalism and an open market. Foreign capital created windfalls in the 1920s and 1930s, but greedy governments snatched back those oil wells in the 1940s, until production dwindled; they then returned, cap in hand, to wildcatters and oil majors just a decade later —a Groundhog Day pattern that continues today. Most recently, in 2012, Argentina lurched toward nationalism again, expropriating its former national oil company from Spain's Repsol. Argentina now has the unenviable task of trying to lure foreign money and know-how to help tap Vaca Muerta (Dead levels in 1997. Much more than in Mexico, such decline threatens societywide economic and political meltdowns because Venezuela gets about 95 percent of its export earningsand half of government revenues-from oil sales. The shrinking pie has imperiled social programs and has limited the country's ability to import basic staples, such as toilet paper, and even to keep the lights on.

Of the Latin American producers, Brazil, given the discovery offshore almost a decade ago of massive oil fields, was expected to play the most significant role in meeting the world's future energy needs. Yet, blinded by the allure of future riches, the state tightened its grip on the industry, inflicting restrictive terms on foreign investment—a misguided effort to get as much as it could while offering as little as possible. Foreign capital largely turned its back, and Brazil's oil promise burned: Recently the country slashed its five-year oil-production targets by 1.4 million barrels a day, roughly half its current output. Mexico can show a better way forward by requiring, for example, less onerous terms on investment, thereby makin the legislature. Fast-forward to this July, when, for the first time in nearly 80 years, Mexico auctioned off some shallow-water tracts in the Gulf of Mexico to foreign firms; onshore tracts in northern and eastern Mexico will be awarded this winter.

Mexico didn't offer attractive enough terms, however, and the auction in July flopped. As a result, the country has postponed the auction of deep-water blocks, while it tries to strike the right balance between enticing foreign firms and ensuring that enough revenue still makes it to the national treasury.

If successful—a big if—the president's experiment could finally kick-start production in the Gulf of Mexico and the desert. And if companies like ExxonMobil can turn oil potential into oil reality without prompting another revolution in Mexico's streets, other Latin American countries would almost be forced to follow-or watch tens of billions of dollars of potential foreign investment pass them by.

Of course, such change won't be easy, particularly because global oil prices have recently tanked, dampening investment appetite everywhere. Then there are security threats from narcotraffickers, especially around Mexico's potentially energy-rich northern fields. And while proximity to the United States is in many ways a blessingthe world's best service companies are a short flight away-it's also a curse: Why make a risky play south of the border when the U.S. shale revolution remains steady?

Even still, for Latin America's once and future oil giants, there's something to be said for being in the right place at the right time. Demand for energy, especially oil and natural gas, is shifting east: In 2013, for the first time ever, oil demand in developing countries (led by China) surpassed that of rich countries. At the same time, production is shifting west: Since 2008, the United States alone has boosted its output by upwards of 4 million barrels a day—more than Iraq pumps. If Latin American countries want to join that party, they may have little choice but to exorcise their nationalism demons.

KEITH JOHNSON (@KFJ_FP) covers the geopolitics of energy for FOREIGN POLICY.

IF SUCCESSFUL, THE PRESIDENT'S EXPERIMENT COULD FINALLY KICK-START PRODUCTION IN THE **GULF OF MEXICO AND THE DESERT.**

Cow), a shale formation roughly the size of Belgium that it cannot develop on its own. The next wave of Argentina's leadership is undeniably watching to see whether Mexico has found the formula to keep foreign investment steady and to maximize both production and the government's cut.

Meanwhile, Venezuela has the world's largest crude reserves, yet it too must import some basic fuel. For a brief period in the liberalizing 1990s, the government attracted foreign capital and boosted production. But in the 2000s, under strongman Hugo Chávez, resource nationalism returned with a vengeance; oil production in the country has fallen by about one-quarter from its peak ing it quicker and cheaper to turn prospects into gushers.

Mexico, of course, has also been crippled by resource nationalism. It coasted for years on the back of hugely prolific offshore fields discovered in the 1970s, but production at those fields peaked around 2004, falling by about three-quarters the following decade. That left Mexico with a bloated, inefficient state oil company that was responsible for a big chunk of the Mexican treasury but had little wherewithal to reverse the slide or to embrace new technologies.

So in 2013, when Peña Nieto proposed upending the energy industry, he managed to pass reforms without any real challenge

books & culture

by BRITT PETERSON



Serial Dissent Why comics are at the vanguard of transgender rights in Japan.

Wandering Son, a well-loved manga, or Japanese comic, tells the story of close friends Shuichi, "a boy who wants to be a girl," and Yoshino, "a girl who wants to be a boy." The teens struggle with the usual ups and downs of adolescence, but also with Japan's unflinching gender norms. The pair, for instance, are frustrated by their school's dress code. When Yoshino steals a stiff-collared, dark-gray boy's uniform from her older brother and wears it to class, her schoolmates praise how "cool" she looks. But when Shuichi wears Yoshino's compulsory, girlish sailor suit, his teachers send him to the nurse's office and then home to change. (The manga uses female pronouns

for Yoshino and male for Shuichi, a choice reflected here.)

Manga, which command more than \$5 billion in annual sales in Japan and are gaining traction abroad, have long presented gender-bending characters: heroic tomboys, villainous cross-dressers, and princesses disguised as princes. But Wandering Son broke new ground. Originally published in the 25,000circulation Comic Beam magazine from 2002 to 2013, adapted into a TV series in 2011, and read by more than 1 million people in book form, the comic offers a sympathetic look at modern-day young people who grapple with gender identity in a deeply conservative society. Other manga have followed suit, introducing more authentic transgender characters.

If these series' popularity is any indicator, readers are signaling some level of acceptance at a time when Japan, well behind many of its peers, is slowly moving into a new phase of reckoning with LGBT rights. Although national law still labels them as suffering from "gender identity disorder," since 2003 the country has allowed people who undergo reassignment surgery (decriminalized in the late 1990s) to legally change their gender on passports and other ID cards. And just this April—echoing the preoccupations of Wandering Son's characters—the Japanese Education Ministry issued a broad set of protections for transgender students, including the right to choose a male or female school uniform and locker room.

Manga have not caused these changes. But the genre's recent attention to trans characters is connecting an isolated community to mainstream culture—and vice versa—at a pivotal social moment.

In a country persistently hidebound about gender roles, Japanese arts and letters have reflected a fascination with gender fluidity for centuries. In the anonymously composed 12th-century novel *The Changelings*, a brother and sister, each disguised as the opposite gender, arrive at court and conduct a diversity of love affairs. Rigidly gendersegregated Japanese theater—allmale Noh and Kabuki dramas, and the



Instead of being treated metaphorically, magically, or as part of a sexy plot twist, Yoshino's and Shuichi's gender exploration when puberty hits is dealt with relatively realistically. Consequently, the collected series was a featured book at Tokyo Rainbow Week in 2014. Among transgender readers in Japan, Thorn says, "a lot of transwomen ... saw themselves in Shuichi."

Other subsequent works dealing with trans themes in a more true-to-life way include *IS*, a 2003-2009 manga series and 2011 live-action TV drama about an intersex high school student who is bullied. Based on true stories, the show was popular among Japan's frequently closeted trans community, according to research by

crimination, according to a 2014 poll by Nijiiro Diversity, an LGBT rights nonprofit organization. Japanese law continues to pathologize trans people and offers no legal recourse for job discrimination.

Still, the opportunity to see their lives mirrored more closely in pop culture is a revolutionary shift. "When we think about the effect on LGBT folks growing up who have access to this media," says James

all-female Takarazuka Revue—has been, by necessity, a dragged-up art form.

Manga (and its animated cousin, anime) have carried on this tradition. Until recently, however, gender mutability was usually a plot device, something included to titillate or amuse readers. Characters changed gender for external, usually temporary reasons: A character splashed with enchanted water, for instance, would later turn into the opposite sex. The newly inhabited identity was opportunistic, and secondary.

This isn't to say manga haven't been thoughtful on matters of gender and sexuality. A subgenre now known as yaoi, or boys' love, has been around since the 1970s and focuses on romantic and sexual relationships between male characters. Although criticized by some for offering gauzy depictions of homosexuality, yaoi authors have included more serious story lines, including one on HIV/AIDS as early as 1985. A category of manga called yuri has occasionally given similar treatment to female characters. As it happens, both genres target female readers, and Matt Thorn, a manga scholar at Kyoto Seika University and the English translator of Wandering Son, thinks that when it comes to Japanese women's more accepting attitude toward LGBT rights—in comparison to their male counterparts'—"a lot ... has to do with manga." (According to a 2014 survey by Kyodo News, Japanese women support same-sex marriage at higher rates than Japanese men.)

When first released, *Wandering Son* was at the forefront of a new wave of manga that has departed from long-standing literary artifices used to deal with gender fluidity.

"PEOPLE ARE FINE WITH THE CROSS-DRESSING PERSON ON TELEVISION, BUT WHEN THEIR OWN DAUGHTER OR SON SAYS, 'OH, I'M NOT THIS GENDER'—THEY'RE LIKE, 'WHOA. DON'T GO CRAZY NOW.'''

gender scholar Sonja Dale at Sophia University in Tokyo. *Smells Like Green Spirit*, which ran from 2011 to 2013, features two gender-fluid protagonists who face disdain and sexual assault. And *Bokura No Hentai*, an ongoing series that started in 2012, features junior-high-age boys who cross-dress, including one who wears a girl's uniform to school and another who dresses as his dead sister.

To be sure, manga alone can't destigmatize a long-marginalized community. Kumiko Saito, a scholar of Japanese culture at Bowling Green State University, notes the social understanding in Japan that teens are often allowed to experiment with gender identity—until adulthood: "You never see LGBT people accepted in actual business settings." Indeed, people who identify as transgender are often ghettoized in jobs such as hostessing at trans bars; a majority have faced workplace dis-

Welker, a history professor at Kanagawa University, "at least young people can see that they aren't alone. And surely that gives them some hope."

According to Thorn, herself transgender, the idea that "you can have a totally normal life and just be trans" is only starting to exist in Japan: "People are fine with the cross-dressing person on television, but when their own daughter or son says, 'Oh, I'm not this gender'—they're like, 'Whoa. Don't go crazy now." Sympathetic manga, in ways large or small, may be helping readers to see that adolescent revelation as utterly sane.

BRITT PETERSON (@brittkpeterson), a Washington-based writer and editor, pens the Boston Globe's Word column and is a contributing editor and columnist for Washingtonian magazine. She is a former editor for FOREIGN POLICY.

São Paulo, Brazil

Flavia Liz Di Paolo on where to find moquecas, tree-trunk tunnels, and live bossa nova—and how to kiss a local.



WHERE TO FIND AN **ARCHITECTURAL GEM**

PINACOTECA DO **ESTADO** is the city's oldest art museum and home to local art. A bastion of brick-and-mortar neoclassicism among downtown's concrete and steel, the building was designed by the famous architect Ramos de Azevedo in 1895 and restored by Pritzker Prize winner Paulo Mendes da Rocha in the 1990s. (+55 11) 3324-1000



SÃO PAULO IS HOME TO some 12 million Paulistanos, as locals are called, overshadowing New York City by nearly 4 million people. It's a labyrinth of grit and glamour: Shantytowns, or favelas, dot the city's surrounding hillsides, while modern steel skyscrapers anchor its center.

Navigating this sprawl is all in a day's work for Flavia Liz Di Paolo, who, for more than a decade, has helped international journalists cover everything from fashion trends to religious fanatics. "São Paulo is a very difficult city, even for locals," she says. "Nobody speaks English, and there are no proper signs. Even most guides and concierges don't know the basics of the city."

Di Paolo, though, is known for her authority on the evolution of Sampa, the city's local nickname. Centro is its historic heart, the stomping ground for Portuguese Jesuits in 1554. By the turn of the 20th century, São Paulo had become the kingdom of coffee barons; the subsequent demand for labor slavery was abolished in 1888—opened the door for waves of immigrants who would create a vast multiethnic society. That legacy is evident in the city's large Arab, Italian, and Japanese diaspora communities; it boasts 6,000-plus pizzerias and the world's most populous Japantown.

Today, São Paulo is Brazil's industrial and financial center, responsible for at least onefifth of the country's GDP. Nonetheless, art and culture also define the city. A dizzying lineup of museums, experimental theaters, and world-class restaurants complement a thriving nightlife of live samba music, botecos (neighborhood watering holes), and Latin America's largest LGBT party scene.

On a recent afternoon, Di Paolo guided FOREIGN POLICY through a place that inspires such loyalty that Paulistanos are willing to put up with record-setting traffic jams for the metropolis they love.



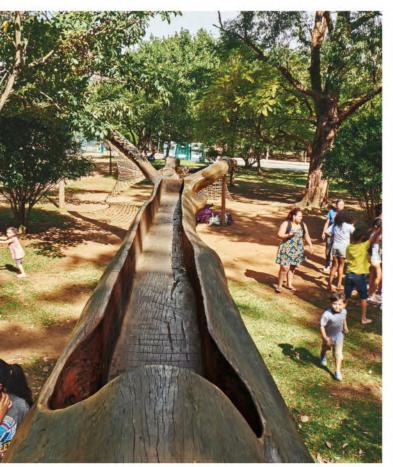
WHERE TO HEAR LIVE **MUSIC BARETTO** is an intimate and cozy bar that reminds me of the 1930s since it's located in Hotel Fasano, a reproduction from that era. It's the best spot for iazz and bossa nova. especially when singer Alissa Sanders performs; she has such a beautiful voice.

WHERE TO EAT We probably have the best Japanese restaurants outside Japan, **HUTO** is the restaurant of chef Fábio Honda: it has a tasting menu that changes daily and is delicious. The first Michelin guide was published for São Paulo this year; Huto is on the list. (+55 11) 5052-6804

(+55 11) 3896-4000

WHERE TO SEE ART

GALERIA NARA ROESLER is the best for modern and contemporary art. The gallery represents photographersculptor Vik Muniz, among other top local artists, and participates in international art shows such as Art Basel. (+55 11) 3063-2344



THE SPOT THAT SAYS "SÃO PAULO"

ALTINO ARANTES BUILDING, known as Banespão, is a skyscraper designed by Plínio Botelho do Amaral in 1947: he was inspired by the Empire State Building and Frank Lloyd Wright. It's free of charge, showing that São Paulo can be for every pocket, and it's in Centro, where the city was born.

(+ 55 11) 2196-3730



WHERE TO SEE AND BE SEEN PARIS 6 is a

24-hour French bistro in Jardins, a district crowded with celebrities such as Brazilian TV star Miguel Falabella. Many of the dishes are named after stars and socialites; the shrimp in champagne cream sauce is an homage to the popular MPB [música popular brasileira] singer

Maria Rita. (+55 11) 3085-1595

LOGISTICS

LAST CALL

It can range anywhere from 2 a.m. to 5 a.m. (or beyond, if you're clubbing).

DINNERTIME

Never before 7 p.m. TIPPING

A 10 percent service charge is added to the bill at most restaurants. Only exceptional circumstances warrant anything beyond that.

SPENDING

Average big night out: R\$300 to R\$1,000 [about \$96 to \$3321.

CULTURAL FAUX PAS

When introduced to somebody of the opposite gender, it is traditional to kiss once on the left cheek. It's really embarrassing if you stick out your hand for a handshake as the Brazilian is leaning in for a kiss.

MIND THE DRIVERS

Foreigners, especially Europeans and New Yorkers. often don't take appropriate precautions when crossing the streets. They think they have the right of way. Even if vou are in the crosswalk, Brazilian drivers are not likely to stop for you.

WHERE TO FIND THE HOTTEST DESIGNER

HUGO FRANCA is a furniture designer and contemporary sculptor who works with trees that are more than 1,000 years old. Some of his pieces are even interactive: His sculpture at the entrance to Sampa's Ibirapuera Park is a tunnel and bench-a dead tree trunk—that pedestrians can walk through and sit on. Everybody loves it. (+55 11) 3045-6575

WHERE TO **EAVESDROP** Politicians and government ministers love to go to BRA-SIL A GOSTO, one of the best Brazilian restaurants in São Paulo. Even former President Luiz Inácio Lula da Silva went. They do a particularly nice job with moquecas [Brazilian seafood stews] and camarão crocante [crunchy shrimp] in manioc purée. (+55 11) 3086-3565





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by JAKE SCOBEY-THAL



Fahrenheit 451, Ray Bradbury's 1953 classic, describes small devices worn directly in ears that play "an electronic ocean of sound, of music and talk."

Published in 1903—

the futurist

more than 10 years
before tanks
were deployed on a
battlefield—H.G.
Wells's short story,
"The Land Ironclads," imagines
a nearly 100-footlong weapon built
on "very strong
steel frameworks
carrying the
engines, and borne
upon eight pairs of
big pedrail wheels."

William Gibson is often credited with being one of the minds behind wearable computers. In his 1984 novel, Neuromancer, characters can access cyberspace through electrodes, known as "dermatrodes," that are applied directly to their skin.



Isaac Asimov, in his 1954 short story, "It's Such a Beautiful Day," portrays District A-3, a suburb of San Francisco, whose citizens use a teleportation device, known as "Doors," to move from place to place.



Jules Verne

9 9

John Brunner's
1968 novel, Stand
on Zanzibar, paints
a dystopian, but
eerily prescient
picture of the
future in 2010. In
this world, drugs
to improve sexual
performance are
on the market and
electric cars dot
the roads.



In his 1968 novel, 2001: A Space Odyssey, Arthur C. Clarke depicts a conscious, intelligent computer that responds to spoken instructions and communicates audibly with astronauts on a spacecraft.

In his 1865 novel, From the Earth to the Moon, Jules Verne reimagines the "Columbiad" as a cannon that shoots a projectile, manned by three people, out of Earth's atmosphere with the goal of landing on the moon.

could the classic texts of science fiction actually have influenced the modern tech boom? Theoretical physicist Stephen Hawking said as much when, in 1999, CNN commentator Larry King asked him whether sci-fi is "harmful or helpful or neither." "Useful," Hawking responded, "both for stimulating the imagination and for defusing fear of the future." As both a muse for innovators and a sneak preview of a conceivable reality to come, science fiction often becomes science fact: Literary giants such as Jules Verne, Isaac Asimov, and Ray Bradbury imagined space travel and wearable computers long before Apollo 11 or Google Glass. So though sci-fi may be imaginary, it is anything but fantasy.

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