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WIRED

MAGAZINE

BY MRSIMPLE

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Jul 25, 2023 6:00 AM

The AI-Powered, Totally Autonomous Future of War Is Here

Ships without crews. Self-directed drone swarms. How a US Navy task force is using off-the-shelf robotics and artificial intelligence to prepare for the next age of conflict.

Art: Julien Gobled; Getty Images

A fleet of robot ships bobs gently in the warm waters of the Persian Gulf, somewhere between Bahrain and Qatar, maybe 100 miles off the coast of Iran. I am on the nearby deck of a US Coast Guard speedboat, squinting off what I understand is the port side. On this morning in early December 2022, the horizon is dotted with oil tankers and cargo ships and tiny fishing dhows, all shimmering in the heat. As the speedboat zips around the [robot](#) fleet, I long for a parasol, or even a cloud.

The robots do not share my pathetic human need for shade, nor do they require any other biological amenities. This is evident in their design. A few resemble typical patrol boats like the one I'm on, but most are smaller, leaner, lower to the water. One looks like a solar-powered kayak. Another looks like a surfboard with a metal sail. Yet another reminds me of a [Google Street View car](#) on pontoons.

These machines have mustered here for an exercise run by Task Force 59, a group within the US Navy's Fifth Fleet. Its focus is robotics and artificial intelligence, two rapidly evolving technologies shaping the future of war. Task Force 59's mission is to swiftly integrate them into [naval operations](#), which it does by acquiring the latest off-the-shelf tech from private

contractors and putting the pieces together into a coherent whole. The exercise in the Gulf has brought together more than a dozen uncrewed platforms—surface vessels, submersibles, aerial drones. They are to be Task Force 59’s distributed eyes and ears: They will watch the ocean’s surface with cameras and radar, listen beneath the water with hydrophones, and run the data they collect through pattern-matching algorithms that sort the oil tankers from the smugglers.

A fellow human on the speedboat draws my attention to one of the surfboard-style vessels. It abruptly folds its sail down, like a switchblade, and slips beneath the swell. Called a Triton, it can be programmed to do this when its systems sense danger. It seems to me that this disappearing act could prove handy in the real world: A couple of months before this exercise, an Iranian warship seized two autonomous vessels, called [Saildrones](#), which can’t submerge. The Navy had to intervene to get them back.

The Triton could stay down for as long as five days, resurfacing when the coast is clear to charge its batteries and phone home. Fortunately, my speedboat won’t be hanging around that long. It fires up its engine and roars back to the docking bay of a 150-foot-long Coast Guard cutter. I head straight for the upper deck, where I know there’s a stack of bottled water beneath an awning. I size up the heavy machine guns and mortars pointed out to sea as I pass.

The deck cools in the wind as the cutter heads back to base in Manama, Bahrain. During the journey, I fall into conversation with the crew. I’m eager to talk with them about the war in Ukraine and the heavy use of drones there, from hobbyist quadcopters equipped with hand grenades to full-on military systems. I want to ask them about a recent attack on the Russian-occupied naval base in Sevastopol, which involved a number of Ukrainian-built drone boats bearing explosives—and a public crowdfunding campaign to build more. But these conversations will not be possible, says my chaperone, a reservist from the social media company Snap. Because the Fifth Fleet operates in a different region, those on Task Force 59 don’t have much information about what’s going on in [Ukraine](#), she says. Instead, we talk about AI image generators and whether they’ll put artists out of a

job, about how civilian society seems to be reaching its own inflection point with artificial intelligence. In truth, we don't know the half of it yet. It has been just a day since [OpenAI](#) launched [ChatGPT](#), the conversational interface that would break the internet.

Art: Julien Gobled; Getty Images

Back at base, I head for the Robotics Operations Center, where a group of humans oversees the distributed sensors out on the water. The ROC is a windowless room with several rows of tables and computer monitors—pretty characterless but for the walls, which are adorned with inspirational quotes from figures like Winston Churchill and Steve Jobs. Here I meet Captain Michael Brasseur, the head of Task Force 59, a tanned man with a shaved head, a ready smile, and a sailor's squint. (Brasseur has since retired from the Navy.) He strides between tables as he cheerfully explains how the ROC operates. "This is where all the data that's coming off the unmanned systems is fused, and where we leverage AI and machine learning to get some really exciting insights," Brasseur says, rubbing his hands together and grinning as he talks.

The monitors flicker with activity. Task Force 59's AI highlights suspicious vessels in the area. It has already flagged a number of ships today that did not match their identification signal, prompting the fleet to take a closer look. Brasseur shows me a new interface in development that will allow his team to perform many of these tasks on one screen, from viewing a drone ship's camera feed to directing it closer to the action.

"It can engage autonomously, but we don't recommend it. We don't want to start World War III."

Brasseur and others at the base stress that the autonomous systems they're testing are for sensing and detection only, not for armed intervention. "The current focus of Task Force 59 is enhancing visibility," Brasseur says. "Everything we do here supports the crew vessels." But some of the robot ships involved in the exercise illustrate how short the distance between unarmed and armed can be—a matter of swapping payloads and tweaking software. One autonomous speedboat, the Seagull, is designed to hunt mines and submarines by dragging a sonar array in its wake. Amir Alon, a

senior director at Elbit Systems, the Israeli defense firm that created the Seagull, tells me that it can also be equipped with a remotely operated machine gun and torpedoes that launch from the deck. “It can engage autonomously, but we don’t recommend it,” he says with a smile. “We don’t want to start World War III.”

No, we don’t. But Alon’s quip touches on an important truth: Autonomous systems with the capacity to kill already exist around the globe. In any major conflict, even one well short of World War III, each side will soon face the temptation not only to arm these systems but, in some situations, to remove human oversight, freeing the machines to fight at machine speed. In this war of AI against AI, only humans will die. So it is reasonable to wonder: How do these machines, and the people who build them, think?

Glimmerings of autonomous technology have existed in the US military for decades, from the autopilot software in planes and drones to the automated deck guns that protect warships from incoming missiles. But these are limited systems, designed to perform specified functions in particular environments and situations. Autonomous, perhaps, but not intelligent. It wasn’t until 2014 that top brass at the Pentagon began contemplating more capable autonomous technology as the solution to a much grander problem.

Bob Work, a deputy secretary of defense at the time, was concerned that the nation’s geopolitical rivals were “approaching parity” with the US military. He wanted to know how to “regain overmatch,” he says—how to ensure that even if the US couldn’t field as many soldiers, planes, and ships as, say, China, it could emerge victorious from any potential conflict. So Work asked a group of scientists and technologists where the Department of Defense should focus its efforts. “They came back and said AI-enabled autonomy,” he recalls. He began working on a national defense strategy that would cultivate innovations coming out of the technology sector, including the newly emerging capabilities offered by machine learning.

This was easier said than done. The DOD got certain projects built—including *Sea Hunter*, a \$20 million experimental warship, and Ghost Fleet Overlord, a flotilla of conventional vessels retro-fitted to perform autonomously—but by 2019 the department’s attempts to tap into Big Tech were stuttering. The effort to create a single cloud infrastructure to support

AI in military operations became a political hot potato and was dropped. A Google project that involved using AI to analyze aerial images was met with a storm of public criticism and employee protest. When the Navy released its 2020 shipbuilding plan, an outline of how US fleets will evolve over the next three decades, it highlighted the importance of uncrewed systems, especially large surface ships and submersibles—but allocated relatively little money to developing them.

In a tiny office deep in the Pentagon, a former Navy pilot named Michael Stewart was well aware of this problem. Charged with overseeing the development of new combat systems for the US fleet, Stewart had begun to feel that the Navy was like Blockbuster sleepwalking into the Netflix era. Years earlier, at Harvard Business School, he had attended classes given by Clay Christensen, an academic who studied why large, successful enterprises get disrupted by smaller market entrants—often because a focus on current business causes them to miss new technology trends. The question for the Navy, as Stewart saw it, was how to hasten the adoption of robotics and AI without getting mired in institutional bureaucracy.

Others at the time were thinking along similar lines. That December, for instance, researchers at RAND, the government-funded defense think tank, published a report that suggested an alternate path: Rather than funding a handful of extravagantly priced autonomous systems, why not buy up cheaper ones by the swarm? Drawing on several war games of a Chinese invasion of Taiwan, the RAND report stated that deploying huge numbers of low-cost aerial drones could significantly improve the odds of US victory. By providing a picture of every vessel in the Taiwan Strait, the hypothetical drones—which RAND dubbed “kittens”—might allow the US to quickly destroy an enemy’s fleet. (A Chinese military journal took note of this prediction at the time, discussing the potential of *xiao mao*, the Chinese phrase for “kitten,” in the Taiwan Strait.)

Art: Julien Gobled; Getty Images

In early 2021, Stewart and a group of colleagues drew up a 40-page document called the *Unmanned Campaign Framework*. It outlined a scrappy, unconventional plan for the Navy’s use of autonomous systems, forgoing conventional procurement in favor of experimentation with cheap

robotic platforms. The effort would involve a small, diverse team—specialists in AI and robotics, experts in naval strategy—that could work together to quickly implement ideas. “This is not just about unmanned systems,” Stewart says. “It is as much—if not more—an organizational story.”

Stewart’s plan drew the attention of Vice Admiral Brad Cooper of the Fifth Fleet, whose territory spans 2.5 million square miles of water, from the Suez Canal around the Arabian Peninsula to the Persian Gulf. The area is filled with shipping lanes that are both vital to global trade and rife with illegal fishing and smuggling. Since the end of the Gulf War, when some of the Pentagon’s attention and resources shifted toward Asia, Cooper had been looking for ways to do more with less, Stewart says. Iran had intensified its attacks on commercial vessels, swarming them in armed speed boats and even striking with drones and remotely operated boats.

Cooper asked Stewart to join him and Brasseur in Bahrain, and together the three began setting up Task Force 59. They looked at the autonomous systems already in use in other places around the world—for gathering climate data, say, or monitoring offshore oil platforms—and concluded that leasing and modifying this hardware would cost a fraction of what the Navy normally spent on new ships. Task Force 59 would then use AI-driven software to put the pieces together. “If new unmanned systems can operate in these complex waters,” Cooper told me, “we believe they can be scaled to the other US Navy fleets.”

As they were setting up the new task force, those waters kept getting more complex. In the early hours of July 29, 2021, an oil tanker called *Mercer Street* was headed north along the coast of Oman, en route from Tanzania to the United Arab Emirates, when two black, V-shaped drones appeared on the horizon, sweeping through the clear sky before exploding in the sea. A day later, after the crew had collected some debris from the water and reported the incident, a third drone dive-bombed the roof of the ship’s control room, this time detonating an explosive that ripped through the structure, killing two members of its crew. Investigators concluded that three “suicide drones” made in Iran were to blame.

The main threat on Stewart's mind was China. "My goal is to come in with cheap or less expensive stuff very quickly—inside of five years—to send a deterrent message," he says. But China is, naturally, making substantial investments in military autonomy too. A report out of Georgetown University in 2021 found that the People's Liberation Army spends more than \$1.6 billion on the technology each year—roughly on par with the US. The report also notes that autonomous vessels similar to those being used by Task Force 59 are a major focus of the Chinese navy. It has already developed a clone of the *Sea Hunter*, along with what is reportedly a large drone mothership.

Stewart hadn't noticed much interest in his work, however, until Russia invaded Ukraine. "People are calling me up and saying, 'You know that autonomous stuff you were talking about? OK, tell me more,'" he says. Like the sailors and officials I met in Bahrain, he wouldn't comment specifically on the situation—not about the Sevastopol drone-boat attack; not about the \$800 million aid package the US sent Ukraine last spring, which included an unspecified number of "unmanned coastal defense vessels"; not about Ukraine's work to develop fully autonomous killer drones. All Stewart would say is this: "The timeline is definitely shifting."

Hivemind is designed to fly the F-16 fighter jet, and it can beat most human pilots who take it on in the simulator.

I am in San Diego, California, a main port of the US Pacific Fleet, where defense startups grow like barnacles. Just in front of me, in a tall glass building surrounded by palm trees, is the headquarters of Shield AI. Stewart encouraged me to visit the company, which makes the V-BAT, an aerial drone that Task Force 59 is experimenting with in the Persian Gulf. Although strange in appearance—shaped like an upside-down T, with wings and a single propeller at the bottom—it's an impressive piece of hardware, small and light enough for a two-person team to launch from virtually anywhere. But it's the software inside the V-BAT, an AI pilot called Hivemind, that I have come to see.

I walk through the company's bright-white offices, past engineers fiddling with bits of drone and lines of code, to a small conference room. There, on a large screen, I watch as three V-BATS embark on a simulated mission in

the Californian desert. A wildfire is raging somewhere nearby, and their task is to find it. The aircraft launch vertically from the ground, then tilt forward and swoop off in different directions. After a few minutes, one of the drones pinpoints the blaze, then relays the information to its cohorts. They adjust flight, moving closer to the fire to map its full extent.

Art: Julien Gobled; Getty Images

The simulated V-BATs are not following direct human commands. Nor are they following commands encoded by humans in conventional software—the rigid *If this, then that*. Instead, the drones are autonomously sensing and navigating their environment, planning how to accomplish their mission, and working together in a swarm. -Shield AI’s engineers have trained Hivemind in part with reinforcement learning, deploying it on thousands of simulated missions, gradually encouraging it to zero in on the most efficient means of completing its task. “These are systems that can think and make decisions,” says Brandon Tseng, a former Navy SEAL who cofounded the company.

This version of Hivemind includes a fairly simple sub-algorithm that can identify simulated wildfires. Of course, a different set of sub-algorithms could help a drone swarm identify any number of other targets—vehicles, vessels, human combatants. Nor is the system confined to the V-BAT. Hivemind is also designed to fly the F-16 fighter jet, and it can beat most human pilots who take it on in the simulator. (The company envisions this AI becoming a “copilot” in more recent generations of warplanes.) Hivemind also operates a quadcopter called Nova 2, which is small enough to fit inside a backpack and can explore and map the interiors of buildings and underground complexes.

For Task Force 59—or any military organization looking to pivot to AI and robotics relatively cheaply—the appeal of these technologies is clear. They offer not only “enhanced visibility” on the battlefield, as Brasseur put it, but the ability to project power (and, potentially, use force) with fewer actual people on the job. Rather than assigning dozens of human drone operators to a search-and-rescue effort or a reconnaissance mission, you could send in a team of V-BATs or Nova 2s. Instead of risking the lives of your very expensively trained pilots in an aerial assault, you could dispatch a swarm

of cheap drones, each one piloted by the same ace AI, each one an extension of the same hive mind.

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Still, as astonishing as machine-learning algorithms may be, they can be inherently inscrutable and unpredictable. During my visit to Shield AI, I have a brief encounter with one of the company's Nova 2 drones. It rises from the office floor and hovers about a foot from my face. "It's checking you out," an engineer says. A moment later, the drone buzzes upward and zips through a mocked-up window on one side of the room. The experience is unsettling. In an instant, this little airborne intelligence made a determination about me. But how? Although the answer may be accessible to Shield AI's engineers, who can replay and analyze elements of the robot's decisionmaking, the company is still working to make this information available to "non-expert users."

One need only look to the civilian world to see how this technology can go awry—face-recognition systems that display racial and gender biases, self-driving cars that slam into objects they were never trained to see. Even with careful engineering, a military system that incorporates AI could make similar mistakes. An algorithm trained to recognize enemy trucks might be confused by a civilian vehicle. A missile defense system designed to react to incoming threats may not be able to fully "explain" why it misfired.

These risks raise new ethical questions, akin to those introduced by accidents involving self-driving cars. If an autonomous military system makes a deadly mistake, who is responsible? Is it the commander in charge of the operation, the officer overseeing the system, the computer engineer who built the algorithms and networked the hive mind, the broker who supplied the training data?

One thing is for sure: The technology is advancing quickly. When I met Tseng, he said Shield AI's goal was to have "an operational team of three V-BATs in 2023, six V-BATs in 2024, and 12 V-BATs in 2025." Eight months after we met, Shield AI launched a team of three V-BATs from an Air Force

base to fly the simulated wildfire mission. The company also now boasts that Hivemind can be trained to undertake a range of missions—hunting for missile bases, engaging with enemy aircraft—and it will soon be able to operate even when communications are limited or cut off.

Before I leave San Diego, I take a tour of the USS *Midway*, an aircraft carrier that was originally commissioned at the end of World War II and is now permanently docked in the bay. For decades, the ship carried some of the world's most advanced military technology, serving as a floating runway for hundreds of aircraft flying reconnaissance and bombing missions in conflicts from Vietnam to Iraq. At the center of the carrier, like a cavernous metal stomach, is the hangar deck. Doorways on one side lead into a rabbit's warren of corridors and rooms, including cramped sailors' quarters, comfy officers' bedrooms, kitchens, sick bays, even a barbershop and a laundry—a reminder that 4,000 sailors and officers at a time used to call this ship home.

Standing here, I can sense how profound the shift to autonomy will be. It may be a long time before vessels without crews outnumber those with humans aboard, even longer than that before drone mother-ships rule the seas. But Task Force 59's robot armada, fledgling as it is, marks a step into another world. Maybe it will be a safer world, one in which networks of autonomous drones, deployed around the globe, help humans keep conflict in check. Or maybe the skies will darken with attack swarms. Whichever future lies on the horizon, the robots are sailing that way.

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[Rowan Moore Gerety](#)

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Jul 13, 2023 6:00 AM

The Dark Secrets Buried at Red Cloud Boarding School

How much truth and healing can forensic tech really bring? On the sites of Native American tragedies, Marsha Small has made it her life's mission to find out.

Marsha Small is one of the very few Indigenous researchers who use ground-penetrating radar—and the only one with significant experience using the technology at boarding schools. Photographs: Tailyr Irvine

Justin Pourier was working maintenance at the Red Cloud Indian School in 1995 when a supervisor asked him to check out a leak in the school's heating system. It was early winter in Pine Ridge, South Dakota, when daytime temperatures often dip well below freezing. At the time, Red Cloud's 500 students—ranging from kindergartners to high school seniors—relied on a network of steam pipes to keep warm. At 28, Pourier wasn't much older than some of the kids, and like most, he was a citizen of the Oglala Lakota Nation.

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Tracing the old plumbing, Pourier made his way through the bowels of the oldest structure on campus, Drexel Hall. Built in 1887—back when Red Cloud was a Jesuit mission and boarding school called Holy Rosary—Drexel Hall originally housed classrooms and a dormitory. Now it was a drafty red-brick admin building where a steam boiler hissed and sputtered belowground. Broad-shouldered and over 6 feet tall, Pourier had to stoop as

he descended a narrow wooden staircase that led to an out-of-the-way corner of the basement. At the bottom, he says, he opened the door to a low-ceilinged room with a dirt floor.

Pourier doesn't recall whether he spotted the leak or not. But what he did find startled him. There, he says, aligned in a row, were three loaf-shaped dirt mounds, each about as long as one of Red Cloud's youngest students is tall and, as Pourier remembers it, topped with small white, wooden crosses.

At the sight of them, Pourier turned around and climbed the stairs, certain about what he'd seen—and frightened by what it implied. "I knew it was wrong for them to be in Holy Rosary," he said. "With all the cemeteries in these hills, why were they in the basement?"

That afternoon, when Pourier told his supervisor, one of the handful of Jesuits who still ran the school, about what he'd seen, he recalls that the response was swift and sharp: "Quit bleeping nosing around! Stay out of there!" Later, Pourier told his girlfriend and a few close friends about what he saw, but he didn't bring it up again at work. "I just let it go," he says. "It bothered me, but at the time I just took care of myself with prayer and sweat lodge ceremonies. I knew it was there, and I knew somehow, eventually, it was going to come to light." He soon left his job at Red Cloud. Two years later, work crews began renovations on Drexel Hall, and whatever Pourier had seen in the basement was covered with a thick concrete slab.

The Red Cloud Indian School opened in 1888 under the name Holy Rosary, one of the hundreds of boarding schools in the US for Indigenous children that functioned as instruments of colonialism.

Photograph: Tailyr Irvine

Pourier put aside the memory of what he'd found for two and a half decades. Then in May 2021, evidence of unmarked graves of as many as 200 Native children was discovered at a former boarding school in Kamloops, British Columbia. The finding, which came years after the Canadian government began examining its role in the history of Native American boarding schools, made headlines amid a broader, rolling North

American reckoning with white supremacy. In the US, though, it wasn't until 2021, when secretary of the interior Deb Haaland became the first Indigenous person to hold a cabinet level position, that the federal government first attempted to compile a list of the boarding schools it had operated or supported, as part of her [Federal Indian Boarding School Initiative](#). (Last summer, Haaland embarked on a yearlong "Road to Healing" tour.) Between the two countries, some 500 boarding schools for Indigenous children served as instruments of colonialism—not just in the distant past, but through the middle of the 20th century. Countless Native children were taken from their homes, forced to give up their languages and cultures, and in many cases made to suffer and die from neglect, abuse, and disease.

At the hundreds of boarding schools in the US and Canada, countless Native children were taken from their homes, forced to give up their languages and cultures, and in many cases made to suffer and die from neglect, abuse, and disease.

Photograph: Tailyr Irvine

All of that context was painfully familiar to Native communities. The notion that missing children had died and may have been buried at boarding schools wasn't new or surprising. For many, the shock of the Kamloops news wasn't the discovery so much as the sense of awful validation. In the US, the Boarding School Initiative's first investigative report ultimately identified 53 burial sites "with more site discoveries and data expected as we continue our research."

Back in Pine Ridge, Pourier thought of coming forward about those three mounds in Drexel Hall for the first time in 26 years. In that time, Red Cloud had undergone major shifts. In 2019 the school hired its first non-Jesuit leader, and many of Red Cloud's administrators are now tribal members who grew up on the reservation. Key concepts from the Lakota clinical social worker Maria Yellow Horse Brave Heart have become central to how the school operates. She saw kinship between the Lakota experience and that of Jewish descendants of Holocaust survivors, in the sense that the devastating losses of genocide had come to form a pivotal part of Lakota identity. Disease, war, forced assimilation: "The rapidity and severity of

these traumatic losses, now extended by high death rates from psychosocial and health problems, has complicated Lakota grief,” she writes. Red Cloud adopted Yellow Horse Brave Heart’s model for addressing such trauma, a sequence with four stages: confrontation, understanding, healing, and transformation.

Maka Black Elk, who attended Red Cloud, is leading the school’s process of “truth and healing.”

Photograph: Tailyr Irvine

By spring 2021, the school was already more than a year into its process of “truth and healing,” led by Maka Black Elk, who had attended high school at Red Cloud and spent five years as a history teacher there. Black Elk’s role was a complicated and delicate one. Red Cloud still has some ties to the Catholic Church, an institution that was complicit in the centuries-long, hemisphere-spanning genocide, and the Pine Ridge community has long harbored its own accounts of the school’s abuse of students, including its demands for them to speak only English. At the same time, some elders offer fierce defenses of the education the school provided. Today, Red Cloud offers a Lakota-language dual immersion program. Even Justin Pourier sends his kids there. When the news of the unmarked graves at Kamloops broke, old stories about the hard labor and corporal punishment that students endured at Holy Rosary took on renewed significance. Blood-red graffiti went up on churches around the reservation: “Remember our children.”

That June, Pourier sent a text to Tashina Banks Rama, the executive vice president at Red Cloud and an old friend of his. “I had an experience and I wanted to share it with you,” he wrote. “What’s a good time?” Banks Rama called him immediately and took notes as they spoke.

Banks Rama’s grandmother and great aunts all attended Holy Rosary, and she herself sent all 10 of her children to Red Cloud. Following the Kamloops news and after hearing Pourier’s story, she too found herself reexamining what she thought were settled feelings about the place, which some of her colleagues still referred to as a “perpetrator institution.” Banks

Rama promised to follow up with Pourier. “I told him we would do everything we could to pursue the truth,” she recalls.

Following the Kamloops news and after hearing Justin Pourier’s story, Tashina Banks Rama, the executive vice president of Red Cloud, also found herself reexamining what she thought were settled feelings about the place.

Photograph: Tailyr Irvine

She invited him to campus the next day, and with the school's vice president of facilities, they retraced his steps down to the basement of Drexel Hall, to the concrete floor of an empty room crisscrossed by HVAC ducts. A few days later, school administrators escalated the issue: Black Elk brought Pourier's account to the National Native American Boarding School Healing Coalition, a nonprofit that has spearheaded a campaign to investigate historical trauma from the boarding school system. (Black Elk served on its board.) The coalition's director connected him to one of the very few Indigenous researchers who use ground-penetrating radar, and the only one with significant experience using the technology at boarding schools: a doctoral student at Montana State University named Marsha Small.

The Red Cloud administrators asked Small to help them find resolution to the old mystery given new urgency: Were children buried in Drexel Hall's basement?

Small reacted to the invitation with a blend of excitement and skepticism. Above all, she wanted to be sure the survey wasn't simply a way for the Catholic Church to clear its name. It was hard to believe that the same institution that had presided over so many abuses—not only in founding and operating boarding schools, but in its long-standing cover-up of sexual predation by priests—would be prepared to entertain a process that yielded uncomfortable results. “You should know who you're dealing with here,” Small remembered thinking when she got that first email. “Because I hate you.”

At the same time, Small recognized that Red Cloud—which sits just 10 miles from the site of the 1890 massacre of Lakota people at Wounded

Knee—was at least in part a genuinely Lakota institution, led by people like Banks Rama and Black Elk. And for years Small had been hoping for an opportunity like this: to survey a boarding school with the support of both the church and the surrounding tribe as it pushed for greater accountability. The fact that the invitation had come through the National Native American Boarding School Healing Coalition was no small thing. A couple weeks later, with caution, she responded to the school's email and accepted the gig.

Students sit outside of Drexel Hall.

Photograph: Tailyr Irvine

Small's visit to Red Cloud in May 2022 began with a public presentation in the school gymnasium. If the community was going to be able to process the results of any survey that engaged with, or perhaps even contradicted, Pourier's testimony, Small knew that people needed to understand how ground-penetrating radar works—how it can't *see* underground so much as detect evidence of past digging. To operate a ground-penetrating radar machine, the user methodically pushes it back and forth in a grid, sending pulses of high-frequency radio waves into the ground and registering their reflections. Each pass, or transect, creates a series of traces that can be assembled into a radargram, a 2D snapshot that provides clues about the composition and density of what's belowground. But they are only clues. What the radar pulses really detect is change, so that the clarity of one spot on the map is only relative to the spot next to it. Using specialized software, practitioners can combine all the radargrams side by side into a 3D image, which can then be sliced horizontally so that each image shows the survey's entire area at different soil depths. Hearing Small's explanation, one elder in the audience pointed out that a scan at Red Cloud would undoubtedly find all kinds of disturbances: the place where a vegetable garden was dug, where trash was buried, where a large chicken coop was kept. Without some means of triangulation, Small cautioned—testimony, archival records, aerial imagery—all kinds of anomalies could look like graves.

Small was also at pains to emphasize the limits of what technology could do to reconcile the past. By relying only on ground-penetrating radar, or any other scanning technology, “you're not healing,” she said. “All you're doing is pointing fingers.” For the technology to serve any larger purpose at Red

Cloud, it would have to work in unison with Lakota traditions of ceremony and storytelling, the same practices that boarding schools had striven to root out.

After lunch, community members took turns pushing a ground-penetrating radar machine, which looks like a small lawnmower, back and forth in an open field. At the same time, within sight of the GPR demonstration, a group of activists from the local chapter of the International Indigenous Youth Council—including former Red Cloud students—arrived on horseback and rode circles around the school's chapel, where they'd placed a sign that read, “We are the grandchildren of the Lakota you could not remove.” One of the activists burned a copy of the Catholic Church’s “Doctrine of Discovery”—the justification of its support of colonial expansion (which the Vatican just repudiated this March).

The Youth Council seemed unsure whether to consider Small an ally or an enemy. In an Instagram post made during her visit, they noted that Small had invited one of their members to work alongside her as an intern. “We honor our brother for taking on such an important role for healing and justice,” they wrote, and expressed thanks to Small and others for helping to bring Lakota children home. But the Youth Council had been pushing Red Cloud to scan its entire campus with GPR, not just one room of one building. In broad terms, the activists were just as skeptical about the auspices of the project as Small had been: “Why are we allowing the oppressors to investigate themselves?” the group's spokesperson asked at a tribal council meeting.

Small went ahead with her survey of the room in the Drexel Hall basement, pacing each square meter slowly as the ground-penetrating radar took its readings; it took an entire afternoon to cover an area not much bigger than a couple of parking spaces. Once she gathered and analyzed all the data, she found two anomalies consistent with possible graves. The only way to confirm it, however, was to come back and dig.

A priest walks in front of Drexel Hall. Photograph: Tailyr Irvine

Sixty-four years old and just about 5 feet 5 inches tall, with high cheekbones and a round face, Small carries the irreverent air of someone

who's used to being ignored by people in positions of authority. Her manner is by turns stern, direct, and playful. Born and raised on the Northern Cheyenne reservation in Montana, Small was the youngest child in a ranching family whose members had largely scattered by the time she turned 10. Her parents, who had both been sent to boarding schools, split up. Her mother began spending weekdays working in a town off the reservation, and her father went to live with a new family 12 miles up the road. One brother, a year older, went back and forth between home and a family friend's house, and Small's other siblings went off to college. Small herself was the only one who remained in the family's original home full-time. Her father didn't see the point in teaching his children to speak Cheyenne. Her mother, who came from a lineage of medicine men and women, clung tightly to the seasonal rituals of gathering plants and keeping sacred songs. But there was one legacy that both of her parents seemed to share: "They never learned how to be good parents, and that's from boarding schools: a straight pipeline."

One of three Native students in her class at a majority-white public school, Small says she spent much of her childhood "running or fighting." As a single mother in her early twenties, she developed an addiction to cocaine, then to methamphetamines. For two decades, she worked a string of jobs as a union boilermaker and lived on and off the streets, as her daughter lived mainly with Small's mother. "I didn't do my daughter justice," Small told me. It was only after becoming a grandmother that Small began repairing her relationship with her daughter, and she went to live with her in Oregon for a time. But she was still adrift. During this stay, in 2007, Small's daughter encouraged her to find a sense of purpose, perhaps by returning to school.

One morning, Small emerged from the fog of a weekend spent partying at an old friend's house, and walked to a bus stop at the corner. "It was 50 cents to go anywhere," she said. "I put my 50 cents in and just kept on riding." About 15 miles later, when she got off in Ashland, she heard drums coming from what turned out to be Southern Oregon University. "Those aren't hippie drums," she said to herself. "Those are Indian drums." She followed the music to a powwow being held in a small theater. Small introduced herself to a woman from Alaska, who offered her ice cream

made with seal fat and cloudberry. “It was the most disgusting thing I ever tasted,” she said. “The grease just coated my mouth, but too, it reminded me: That was her stuff. Where was my stuff?” By the time Small left, she’d decided she wanted to follow her daughter’s advice and go back to school.

Small completed a bachelor’s degree in environmental science and policy at Southern Oregon in 2010 and discovered that she loved ecological fieldwork. Then she started a master’s degree program in Native American studies at Montana State University, but she didn’t know how to fuse her interests. That’s when Robert Kentta, a friend and longtime cultural resources director with the Siletz Tribe in Oregon, offered Small a suggestion that pertained to an old Native boarding school in Salem: “Hey, why don’t you go over there to Chemawa and get one of those machines that looks like a baby buggy—see how many kids they got in that cemetery? A lot of people have been wondering for years.”

For the first time in her life, a path opened up with ease, with what she took as nudges (“and sometimes shoves”) from her ancestors—a travel grant here, funding for lodging at a conference there. So she followed Kentta’s advice. That summer, between the first and second years of her master’s program, she reached out to the historic preservation office of the Confederated Tribes of Grand Ronde. Members of the tribe counted relatives among those buried at Chemawa, and the tribe owned a brand-new ground-penetrating radar system. The preservation office proposed that Small conduct her survey of Chemawa as an internship: Small would get an institutional affiliation that might help smooth the way to accessing federal property and getting academic credit, and the tribe might finally get some answers.

When Marsha Small fused her interests in Native American studies and ecological fieldwork, a path opened up with ease for the first time in her life. Photograph: Tailyr Irvine

Beginning in 1880, children were sent to Chemawa from dozens of tribes, sometimes from hundreds or thousands of miles away. The cemetery, which has been neglected for decades, is separated from the boarding school—still in operation today—by a set of railroad tracks. Over the years, Grand Ronde elders told stories about grave markers being removed and replaced,

so it was no longer clear—if it had ever been—how many bodies were buried there.

When Small entered the cemetery for the first time in the summer of 2012, she burned sweetgrass—a plant with spiritual significance across Native cultures. “The sweetgrass brings the spirits in, wakes them up,” she said. She spent her first days walking through the rows, cross-referencing a list of burial plots with the names carved into each grave marker. One day at dusk, when she reached the fence at one end, she gazed to the horizon. The sun was setting, and Small's eyes followed the long shadows reaching back toward the school. All the graves, she noticed, were laid out according to Christian custom with their feet pointing east—blatant disregard for the multitude of burial practices and belief systems that different tribes hold around death.

“I got super emotional,” Small recalled. “I couldn't write no more, couldn't focus no more—because there were so many of them. And a lot of them were babies. A lot of them were sisters and brothers. I seen the family name Davis in there three, four times, and I thought, ‘You wiped out a whole family! A generation.’ It just took my breath away.” She walked to her car and sat silently in the driver's seat.

After a while, a train rumbled past the cemetery. She got out and walked over to the tracks—the same line that would have brought children to Chemawa 100 years earlier. “I was trying to focus on that moment,” Small explained. “The horror of it, the unfamiliarity. Maybe even, for some, the excitement of it, doing something new.” She bent down and touched her cheek to the cool steel of the rails.

By the time Small had been using the GPR machine in the cemetery for a couple of days, she felt transfigured by a sense of calling. Standing there among the graves of children who'd never gotten to go back home, she felt like there was important work to be done, work she knew she could do if she continued to push forward. “I felt I found my place in the whole spirit of things,” she said. “Not just the world, but in the universe.”

But she still had a tremendous amount to learn, and few clear paths to professional enlightenment. Typically employed as a tool to study

groundwater, soils, and bedrock, ground-penetrating radar was first used by a researcher in 1929 to measure the depth of a glacier in the Austrian Alps. The technology is commonly used today to identify buried utility lines. Both utility lines and graves are dug in sites with a history of other uses, each leaving their own traces underground, but because trenches for utilities differ so much from the surrounding soil and contain metal pipes, water-filled plastic, gravel, or sand, they are easier to identify.

Any anomaly—a pocket of air, a layer of soil that's holding moisture differently than what surrounds it—can show up either as a visual gap (in the way that soft tissue can be nearly invisible on an x-ray) or as a solid, a bright spot, like a hard drive going through an airport baggage scanner. Modern data processing software can help, but underground surveying can still be a vexing, often ambiguous, process.

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When Small submitted a partial survey of the Chemawa cemetery comparing the location of graves and grave markers for her master's thesis, she also shared some of her GPR imagery with the company that had supplied the machine. She was hoping for affirmation. Instead, an anthropologist there who works on forensic applications of GPR politely explained that Small's imagery didn't necessarily show graves where she said it did. She realized she'd been badly misguided as she conducted her survey and interpreted the data. She'd done most of her fieldwork without supervision, and no one at Montana State had direct experience with GPR used in this way. "It was defeating, really defeating," Small said. "At the time, I still thought you could see bones with the damn thing."

But Small didn't give up; even as she entered her PhD program, the calling to get reliable data on Chemawa stuck with her. Realizing she "needed someone to teach me GPR on a nuclear level," she found her way to Jarrod Burks, an archaeologist who lives in Columbus, Ohio, and conducts surveys for the Defense POW/MIA Accounting Agency on recovery missions for missing soldiers. He agreed to join her doctoral dissertation committee. In 2017, Small invited Burks to help produce a new report on Chemawa. After

five days of meticulous work at the cemetery, the new data that Burks and Small gathered cleared up where she'd gone wrong. He confirmed the basic limitation of Small's earlier analysis—tree roots and grave shafts can look alike in raw radar data, and Small had neither the experience nor a large enough data set to tell the difference. "Marsha, I don't see any graves here," Burks said, pointing to a spot where she had thought there were some.

Confronted with Chemawa's maze of Douglas fir roots, Burks and Small relied on secondary instruments—a magnetometer, which detects changes in the Earth's magnetic field, and an electromagnetic induction meter, which measures the velocity of liquid—to cross-reference the data they'd generated through GPR. The resulting report, completed in 2019 for the Boarding School Healing Coalition, offered a cogent analysis and was written with striking moral clarity. There were, according to the data, at least 222 potential graves in the cemetery and only 204 markers, with "a good possibility that additional, undetected graves are present." And, because of the mismatch between the location of markers and the location of potential graves, there was no easy way to identify who was buried where. "Some of these children were brutally taken away from their families and all they had ever known; some were not," Small wrote. "Some voluntarily entered the boarding school system but died there and are now lost. Our goal is to find as many as possible."

As Small gained more expertise in GPR, she saw that the demand for the technology was growing. In a June 2021 statement timed to the launch of Secretary Haaland's Federal Indian Boarding School Initiative, the Interior Department states that the primary goal of the initiative is to "identify boarding school facilities and sites; the location of known and possible student burial sites located at or near school facilities; and the identities and Tribal affiliations of children interred at such locations." Small wanted to protect tribes from placing their faith in the technology without a clear sense of what it could deliver, and from the rush of cynical companies that she foresaw. She'd already gotten one call from a tribe that wanted her help using ground-penetrating radar to investigate the case of a missing boy. When Small asked about the machine they'd be using, she learned that the tribe had spent close to \$10,000 on a device that provided readings no

deeper than a few inches below the surface—better suited to archaeological work like scanning for ancient tool fragments than for locating grave shafts.

Together with two Native historians of boarding schools, Farina King and Preston McBride, Small began developing a set of suggested practices for “Tribal nations and Indigenous communities that are beginning to survey Indian boarding school cemeteries and burial sites for their children who never returned home or are lost in the on-reservation Indian boarding school cemeteries.” To Small’s mind, even tribes that could afford to hire independent experts or work with public agencies faced a host of potential pitfalls—including contractors who might not follow spiritual requirements or enlist tribal members as real collaborators, illegible or useless data, and failures to plan for the human and community consequences of a scientific process.

The protocols, published in the summer of 2021 during the flood of publicity that followed the revelations at Kamloops, are organized around the principles that tribes should be careful to consult with elders and members who may have hesitations about any activity on burial sites, that Native people should be involved in every step of survey work, and that tribes should control how the results are used. “I don’t need you to surface, ‘Oh, we got 418 lives lost,’”” Small says. “We need the numbers, but I’m not *concerned* with the numbers. I want the healing to happen.”

The stained-glass windows of the chapel at Red Cloud were designed by Francis He Crow and a group of high school students in 1997.

Photograph: Tailyr Irvine

Graduates of Red Cloud have carved their names into the bricks of Drexel Hall.

Photograph: Tailyr Irvine

Last October, Small returned to Red Cloud to proceed with a full excavation of the tiny room that had haunted Justin Pourier for half his life. Small’s nephew, a hulking man with a long ponytail and glasses who was there to assist her, led an opening ceremony. He crumbled a handful of sage—a

purifying plant for both the Cheyenne and Lakota—in a small ceramic dish and lit it on fire. He walked to each corner of the basement and paused for a moment to let the smoke coil to the low ceiling. Then he swept the dish around the edges of each doorway. He presented the dish to Black Elk, who used cupped hands to spread the wispy clouds of smoke over his head, then down each shoulder and along his chest, arms, and legs. Then Small's nephew repeated the process, known as smudging, with everyone in the room.

After the ceremony, Small turned to Black Elk: “I absolutely adore you,” she said. “I don’t know how this is gonna end.”

“I’ve talked to a lot of elders, and I think they want the church gone,” she went on—meaning they wanted Red Cloud to end its relationship with the Catholic Church. “Are you prepared for that?” she asked. Black Elk let out a deep breath.

“I’m scared,” Small continued. “I’m scared we’re gonna find something, and I’m scared we’re not gonna find something. Because if we don’t find something, they’ll say the church bought us off.”

Cutting up and removing the concrete took most of that Friday. Over the weekend, Small and I drove an hour and a half to Rapid City to get supplies for the dig. As we cruised in the fast lane, north on Highway 41, she began explaining how her approach to ground-penetrating radar differs from non-Native practitioners. “I have to visualize what that energy’s doing,” she said. “They just think in terms of velocity and gradient and RPM.” Just at that moment, I noticed a small herd of grazing bison on the side of the highway. Small reacted in ecstasy. She slowed to 40 miles an hour, veered to the right lane to get a better look at the hulking animals, and began shouting out the window. *“Hotoa'e, hotoa'e, hotoa'e! Néá'eshe!”* (Bison, bison, bison! Thank you!) And then, in English, she said, “Do you know me? I know you.” Giggling in delight, she reached into the compartment on the driver’s side door and pulled out a sprig of sage, which she extended into the wind as an offering, crumbling it between her fingers. “That was cool,” she said, thanking me for spotting them as she stepped on the gas. “It makes you feel we’re still part of the circle.”

Photograph: Tailyr Irvine

Photograph: Tailyr Irvine

Periodically, Small reached into a paper bag to grab a maple doughnut. Unopened packs of Skittles and Reese's Pieces lay on the floor of the rented minivan. Her sugar cravings, she said, were triggered by the stress of leading a dig in a setting she regarded as both a sacred site and a potential crime scene. She repeated a prophecy attributed to the 19th-century Northern Cheyenne leader Sweet Medicine: A young white child will come to you, and if you follow him, the children will howl like coyotes, and you'll go crazy. "For a long time, I thought it was meth," she said. "Now I think it's sugar."

At the Lowe's in Rapid City, Small pushed a flatbed cart rapidly through the aisles, shoes shuffling as she walked. She picked up trowels, buckets, a roll of black plastic drop cloth, paint brushes, and wooden boards to help with sifting dirt. She seemed to be conjuring a mental model of the area outside Drexel Hall as she peered at the shiny floor of the hardware store, squinting and using a finger to trace the outline of the ground she'd have to cover with tarps. Standing before a wall of cleaning supplies, Small rehearsed the brushing movements she'd be making to clean off objects during excavation, first with a hard-bristled scrubber, then with a soft dustpan brush, before throwing them both onto the cart. "Every once in a while, I get impostor syndrome," she said, looking at her haul. "What am I doing?"

After Small gathered and paid for her supplies, we stopped at a kiosk for coffee, where the barista, whose knuckles bore a tattoo of the chemical formula for caffeine, said that it had taken her 14 years to find her calling. "It only took me about 50 years," Small replied. "The ancestors said, 'You have to find the kidnapped children in the Indian boarding schools.' And then I said, 'I don't want to.' And then they said, 'You have to.' I don't like the work, but I do like bringing kids home."

When we arrived at Red Cloud the next morning, a maintenance crew was assembling a tent and chain-link fence to establish a perimeter around Drexel Hall. Burks and three assistants had flown in from Ohio, and now they got to work unloading Small's minivan. Two FBI agents in fleeces, crew cuts, and cowboy boots took pictures of the basement. The atmosphere

was somber but leavened by familiarity. The feds worked most of their cases with the tribal police detectives who were also there. “They’re our bosses, basically,” one federal agent said. Everyone else seemed connected by the ties of small communities and large families. Justin Pourier was there with a travel coffee mug that read “*Mah piya Lúta Owáyawa*”—Lakota for “Red Cloud School.” Someone brought around a tray of hot sausage biscuits from the cafeteria.

Things proceeded slowly at first. Burks and one of his assistants outlined 16 sections of the ground, each measuring 1 square meter, to be excavated one by one. Then they got to work with their trowels, methodically filling bucket after bucket with dirt as they dug down 20 centimeters at a time. It would take several days to dig out the full meter down. The rest of Burks’ team took turns with the federal agents, hauling full buckets up the stairs then pressing clods of dirt through steel-mesh screens. Anything they found that wasn’t dirt, rock, or wood was gently brushed off and placed in a ziplock bag labeled with the square from which the object was taken.

Small directed traffic and reminded people to take breaks and eat the fruit and doughnut holes lined up on a bench nearby. She encouraged a teenage Red Cloud graduate, who’d come to help haul buckets, to speak up if she felt anyone was disrespecting the site, telling her, “Remember, you’re the Native here.”

As the procession of dirt continued, the Lakota detectives passed around photos of an architectural drawing that had been prepared for the 1997 renovation of Drexel Hall, in which the room adjacent to the boiler room—the space they were now excavating—was marked “Graveyard.” Banks Rama said the label referred to an old Halloween tradition, the supplies for which were stored in the basement. Nonetheless, the detail seemed to validate both Pourier’s memory and the lingering traumas so many in the community still associate with Red Cloud.

Later that morning, Small emerged from the basement holding a triangular piece of bone, textured on one side and smooth on the other, and stood outside looking at it with a jeweler’s loupe. “Some kind of large, flat bone,” one of Burks’ assistants said. “Right off the ulna,” Small said. Burks, walking by, offered a skeptical rejoinder: “A large animal bone.” (The

actual assessment of any objects sifted from the dirt was done by a forensic analyst later that week.)

“I’m looking forward to getting some conclusiveness,” Small said. But conclusiveness never comes quickly in her line of work, if it comes at all. It would be several months before she and Burks finalized the report on what they’d found at Red Cloud.

The day after the Drexel Hall excavation, Rosalie Whirlwind Soldier was among several survivors of boarding schools to deliver testimonies to Secretary Deb Haaland at the Rosebud Sioux reservation.

Photograph: Tailyr Irvine

The Indigenous protocols that Small helped to write offer plenty of guidance for tribes surveying burial sites—always consult elders, follow the majority’s opinion, take ownership of the data—and the Red Cloud excavation followed that guidance. But there’s one outcome the protocols don’t anticipate: What should happen in the event that a survey doesn’t find evidence of buried children? How, then, is a tribal community to proceed toward healing?

Weeks after the Drexel Hall excavation, though Small and Burks were still months from finalizing their full report, the Red Cloud administration, eager to share some sense of what had happened, published its own statement describing the survey’s key results. The excavation found only two anomalies, the school said. “The first anomaly was related to building products (mortar for laying bricks and nails). The second anomaly was related to animal activity (several places where rodents burrowed).” The statement noted that the FBI and community members were present throughout the entire excavation. The school was careful to avoid saying that no children had been buried in the basement, but offered, rather, that “no human remains were found in the soil survey.”

When I visited Pine Ridge, people around town, including many former Red Cloud students, had only a hazy notion of the chain of events that had brought Small to the reservation. But everyone had heard something, and

they all referred to the situation with an ominous shorthand, along the lines of “I heard they found some bodies over there.”

That none were found doesn't disprove Pourier's testimony, and may not change anyone's mind. GPR results are never absolute, and the excavation had only covered a small area—there was no way to account for the possibility that Pourier had misremembered the spot where he'd seen the mounds, or that graves might exist elsewhere. Whatever the school's present reputation, many people on the reservation regard it still as a place haunted by a dark history. They tell stories about swings that move without children in them, doors that open and close by themselves, bells that ring on their own on a windless day.

“I don't even remember going to school,” said Shirley Bettelyoun, who went to Red Cloud starting at age 6. “All we did was work.” Dale McGah, 70, was kicked out of school before he graduated, but he still remembers Mr. Schak, a teacher who hit students on the head with a metal ring heavy with keys, and he recalls being told to guard a fellow student who had tried to run away. Yet McGah's own grandchildren attend Red Cloud today. “It's probably one of the better schools on the reservation,” he said. Another elder, Phyllis White Eyes DeCory, who had previously worked for the Catholic Diocese in Rapid City, was offended by even the suggestion that Red Cloud needed to investigate. She told me sharply, “They're not gonna find anything but dirt down there.”

In the months after Small completed the excavation, she went back and forth with administrators at Red Cloud about how best to characterize the fact that no human remains were discovered. She wouldn't rule out the possibility that there had been graves there at one time. The school was trying to demonstrate that it had nothing to hide.

Small seemed torn between hewing to the dry language of geophysical inquiry and reflecting the genuine Lakota anger toward the Catholic Church, anger with which she identified so deeply. For all the careful work she'd done to ensure that tribes were prepared for the healing that would follow the discovery of unmarked graves, evidence that pointed in the other direction presented its own set of complications. If the school has indeed completed the first of Maria Yellow Horse Brave Heart's four stages for

healing from historical trauma—confrontation—then they stand at the precipice of the second, understanding. Even though the school's administrators may want to move on, the inconclusiveness of Small's survey is hard for many in the community, including Small herself, to begin to understand.

When I asked Small how she thought the community would react to her survey results, she said, “What I see on the horizon is that community rising up against that church. And if they do it right, they'll kick 'em out. Then they'll bring me in, or they'll bring somebody else in, and we'll find bodies. They still have that breath of fire.”

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Jun 29, 2023 6:00 AM

Meet the Psychedelic Boom's First Responders

With more tripping will come more psychic terror. A new movement of volunteers will guide you through your brain melt.

ILLUSTRATION: OYOW

Everything was insane and fine. The walls had begun to bend, the grain in the floorboards was starting to run. Jeff Greenberg's body had blown apart into particles, pleasantly so. When he closed his eyes, chrysanthemums blossomed.

A tech executive of 54, Greenberg had eaten 5 grams of psychedelic mushrooms that afternoon. He, like your cousin and your coworker and maybe you yourself, had discovered in recent years the world-expanding powers of [psilocybin](#). But world expansion can be dicey. At some point that afternoon, Greenberg's thoughts took a dark turn, and soon dark melted into horrifying.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

The psychiatrist Stanislav Grof called psychedelics “nonspecific amplifiers” of the psyche. Any thoughts, feelings, or memories on hand are subject to unplanned wild magnification. Frequently that results in a thrillingly revelatory experience. Occasionally it toggles over into indescribable terror, which in turn comes in many flavors: Paranoia. Ghastly hallucinations. Intense grief. Fear of insanity, fear of death.

Greenberg thought of his puppy. He and his ex-wife shared it from when they'd been married, and now a memory came tumbling out of some corner of his mind: One day, in the aftermath of the divorce, he'd dropped off the dog with his former father-in-law. The two had always enjoyed a friendly relationship, but once the handoff was complete, the older man had slammed the door in his face.

And now it wouldn't stop slamming. How had he done something so awful that a fellow human would slam a door on him after being handed a puppy? A dam burst. The difficult elements of Greenberg's life—family, career, parenting—began exploding in dark technicolor. What had happened? Who was he? He felt the mushrooms clamping his head in front of a massive screen showing the movie of his life. According to his Fitbit, his heart rate spiked from 90-something to 150.

Greenberg was looping. Passing thoughts became black holes clawing him to untold depths, playing and replaying in a mad, warping whirlpool. Tricks that would have typically changed the channel—classical music, a splash of water to the face, waiting it out, crying it out—had no effect. Worst of all, he had no help. This wasn't a guided journey, after all, just a man alone in his house, losing his mind. Who do you call in such a state? Who could possibly understand this otherworldly misery with its indescribable new dimensions, its billowing revelations, its slithering dream logic?

Of course, Indigenous communities spent thousands of years mastering that very stuff: the understanding, the preparation, the support structures that help make a brain-exploding experience positive. But Western culture, having gotten its hands on these substances, showed little interest in that wisdom—at least until recently.

By chance, Greenberg found himself in one of those rare moments when the cultural plates begin to shift. In response to the growth of psychedelics, a new figure has emerged on the psychic landscape. Call them psychedelic first responders, versed in the science of existential first aid and operating, at times, apart from the traditional sphere of psychiatrists and therapists. Where once you might take a free CPR class on a Saturday, you now can learn to escort the addled through the thickets of their own heads.

So it was that, in a fleeting instant of lucidity, Greenberg remembered to reach into his pocket.

I'm not here to herald the current psychedelic boom; it's been heralded. What interests me is something that gets discussed far less often: the horrific and sometimes life-altering experiences many of those people will have. What do we do with that?

Go Down the Rabbit Hole

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I don't mean to sound alarmist. Skiers sometimes smack into trees, and I still consider theirs a worthwhile activity. But mountains have ski patrols. The help available to someone spinning out on psychedelics has historically been limited. Moreover, despite the popularity of using these substances with a professional guide, a shaman, or on an organized retreat, most won't. The majority of journeys are unsupervised and unsupported—at a concert, at a party, at home reeling from a puppy-based memory.

One summer night 20-plus years ago, a friend and I ate a goodly amount of mushrooms. The idea had been to peel back a few layers, behold unfamiliar vistas, and generally become unstuck in our perceptions. It worked! In *Frontiers in Pharmacology* terms, the reduction of my serotonergic control, ascendance of my dopaminergic system, and expansion of functional connectivity in my primary visual cortex was “producing a more unified brain, with connections between disparate regions that normally lack communication with each other.” For the first hour I created the universe anew. Vast processions scrolled through my mind, as ornate and elaborate as Chartres.

Then, and with apologies for being 22 at the time, I slipped into what I can only call a post-structuralist crisis. The world, suddenly, was a hollow facade of itself. I suppose some residue of college was working itself out: For four years I'd poked recklessly at ideas and traditions and constructs with no regard for consequences; now, staggering around Lower Manhattan, I saw the flimsy Potemkin reality I'd been so eager to expose, entire ecosystems of meaning drained of substance.

At some point my friend and I made it back to the apartment I shared with my girlfriend. For the next God-knobs-how-long, the poor woman assured me the stories in my head were chemical-induced delusions—nightmares, essentially. I lay on my rooftop a long time, willing my sanity to return. But it never did.

Kidding! I'm fine! By dawn I had fully returned to consensus reality. I was unspeakably grateful. Only later, in the months and years that followed, did I realize I had feelings besides relief. A kind of irresolution began to haunt me. *Why* were those ideas so scary? What unresolved concerns were trying to surface in my cretin mind? Terrifying as the ordeal had been, it had undeniably contained information—the kind you don't get access to every day. Instead of willing the nightmare to end, what if I'd somehow pushed through?

Which brings me back to Greenberg. The day before his trip, he'd downloaded an app he'd seen mentioned somewhere. Called Fireside Project, it billed itself as a “psychedelic peer support line,” reachable by phone or text. Now, fishing out his phone, he managed to hit the call button.

What happened next was life-changing, Greenberg told me. A volunteer named Jasmine picked up the phone. Immediately she emitted a gentle, knowledgeable, and grounded vibe. She didn't try to distract him from his anguish or minimize it. On the contrary, she validated what he was feeling and gave him permission to explore his pain further. “Very quickly she turned it into something I felt that I could go through,” he said.

Greenberg spoke with Jasmine for nearly an hour and a half, then called again later, as the crisis softened into something more like curiosity. With her help, his angst metabolized into a searing peek under the hood. Where before he'd felt abject terror, he now saw an invitation to make real changes in his life.

I set out to learn about the Jasmines of the world, and the burgeoning movement they belong to. But as I looked into the Fireside Project and similar operations, I watched a slightly different story come into focus. In the emergence of this new citizen tripsitter is a broader story about how

we've historically conceived of wellness, how we conceive of suffering—and how we respond to our own minds when they venture off course.

ILLUSTRATION: OYOW

It's not like everyone's out there having experiences like Greenberg's; the planet's drug of choice will probably always be alcohol. But what these substances lack in booze-level numbers they make up for in the sheer depth of their impact. Insofar as the decade-of-therapy-in-a-day adage holds true for the millions of people using psychedelics every year, that strikes me as a remarkable disruption of our psychological status quo.

Historically, the options available to someone in rough shape ranged from indifference to county lockup. To the extent that anyone attempted to alleviate such psychic distress, efforts centered around obliteration. Such was the mindset on a rainy Friday in 1969, when a soggy battalion of medical workers began fanning out across Max Yasgur's upstate New York farm. Acid had already become a feature of festivals. (At San Francisco's Human Be-In two years earlier, Owsley "Bear" Stanley famously distributed some 300,000 tabs of white lightning to the crowd.) But Woodstock promised all new levels. So the medical workers came armed with Thorazine, a powerful antipsychotic that resolves a frightening drug experience much as a ballistic missile resolves a ground skirmish.

Enter Wavy Gravy and the Hog Farmers, swooping in from their New Mexico commune to provide security for the event. Over the next three days, at trip tents and in the wet grass, the Hog Farmers practiced a radical new approach. Rather than arrest or medicate people having difficult drug experiences, they simply talked to them—distracted them, soothed them, gently reeled them back to earth. To the Thorazine crowd, it must've seemed like chatting someone out of cancer.

According to the *Journal of Emergency Medical Services*, some 797 trippers were treated that weekend. Woodstock became a template for psychedelic harm reduction. In the years that followed, at concerts and gatherings and in 4 million Dead parking lots, "talking someone down" became standard operating procedure. Compared to previous approaches, it was so humane that nobody gave much thought to where it fell short.

Start peeling back the evolution of tripsitting and pretty soon you're looking at larger shifts. Where once the benefits of these substances were relegated to some questionably spiritual plane, emerging research has shown measurable—and often remarkable—therapeutic benefits. As the value of a psychedelic journey came to be reassessed, so too was the impulse to curtail an unpleasant one.

Forty-three years after Woodstock, at Burning Man, a cardboard yurt appeared on the sun-baked Playa. Inside the structure—shady, fabric-draped, benches here and there—psychedelic harm-reduction history was lurching forward again, with the first official iteration of Zendo Project.

To the untrained eye, the volunteers sitting with distraught Burners were delivering a familiar form of harm reduction—a safe, nonjudgmental alternative to whatever the cops or medical tent would offer. But Zendo, an initiative of the Multidisciplinary Association for Psychedelic Studies (MAPS), a research and advocacy nonprofit, didn't want to talk these trippers down. Central to its mission was a respect for the journey, however challenging. To quote one of Zendo's guiding pillars, “Difficult is not necessarily bad.”

At this point, maybe you've noticed my labored avoidance of the phrase “bad trip.” Those words have fallen out of favor in psychedelic circles, as research shows that even the most challenging journeys can lead to positive outcomes. Minor semantic shift, fairly radical idea.

As the value of a psychedelic journey came to be reassessed, so too was the impulse to curtail an unpleasant one.

Kelley O'Donnell is the director of clinical training at the NYU Langone Center for Psychedelic Medicine. As she characterized the new thinking to me: Achieving those positive outcomes means leaning into the experience, pleasant or otherwise.

Otherwise can come in many forms, per the Zendo training manual, from reliving traumas to identifying with the victimization of others throughout history. Some merge with nature and experience pollution or the death of a species acutely. Many just think they've lost their minds. Through active

listening and a gentle reassurance that the experience will pass, the idea is to calm the trippers enough that they might be able to explore those nightmares. Rather than talk them down, talk them *through*.

Like the guy who just wanted to run.

“He would run, and then drop to the ground and not move. Then he'd leap up and exclaim, ‘I'm alive.’ Again and again he did this,” says Chelsea Rose Pires, Zendo's executive director. “Finally we were able to explore what was going on, and he was able to talk about his childhood and his fear of dying.”

The training manual states:

Rule #1, under any condition, is that we honor and respect the person having the crisis. Even if we don't understand what's happening (the person having the crisis might be much more developed than we are, lost in worlds unknown to us, or reliving a drama we can't comprehend), we serve as an anchor, a resting place, and a quiet center ...

We have to remember that tens of millions of people have used psychedelics, in many different, sometimes not very supportive, environments, and returned home safely. With support, knowledge, and integrative work there is very little danger in the psychedelic experience itself. Even the most frightening and bizarre behavior, when explored and worked with, will turn out to be beneficial and enlightening.

ILLUSTRATION: OYOW

Since 2012, zendo has been a mainstay at Burning Man and festivals around the world, assisting some 6,000 trippers and training 4,000 sitters in this new protocol. Meanwhile, the harm-reduction movement has grown internationally too. Kosmicare delivers similar services, having started at Portugal's Boom Festival many years ago. Within the club scene across Europe, several groups have expanded their harm-reduction efforts to include trip assistance. Stuck at home? Tripsit.me offers real-time, 24/7 peer support for those in need. For its part, the Organization of Psychedelic and

Entheogenic Nurses brings nursing expertise into the realm of psychedelic care. And then there's Joshua White.

A longtime lawyer in the San Francisco City Attorney's Office, as well as a volunteer at a local parenting support hotline, White had an eye for unnoticed communities not getting the help they need. He knew that more people were using psychedelics, he understood the outsize power these drugs wielded—and he knew that good support was not only hard to find but often inaccessible. (This is particularly true for those left out of the psychedelic movement in decades past. To that end, the organization committed to offering “identity-based integration support,” connecting any caller who is BIPOC, transgender, or a military veteran with a volunteer who shares that identity.) In April 2021, Fireside Project started answering phone calls—lots of them. Hanifa Nayo Washington, an equity and training adviser at Fireside, describes a general sense of alienation behind the boom. “People are really suffering from disconnection, from being alone and not having a community to talk with,” she told me.

That first year, Fireside trained more than 100 volunteers and conducted some 2,550 conversations with callers—including Greenberg. Within months of reaching Jasmine, he had walked away from his job (and psychedelically high salary) to focus on work “that adds value to the universe.” Eventually he got on the phone with Fireside again—this time not to ask for help but to offer it. By the time we spoke, he'd donated \$100,000 and was poised to start as the organization's CTO, working for free.

There's a fairly obvious point I should make, maybe one that sometimes gets lost: While exceedingly rare, psychedelics *can* cause serious harm. A family history of mental illness can propel someone into a psychotic episode. And the symptoms of a trip can potentially obscure a simultaneous medical crisis. A 2022 lawsuit found MAPS partially responsible for the death of Baylee Gatlin, who received care from Zendo volunteers at a music festival in 2017 and later died from organ failure and heat stroke.

“What this movement is doing is absolutely helpful for many people,” says Charles Nemeroff, codirector of the Center for Psychedelic Research & Therapy at Dell Medical School at the University of Texas at Austin. But

while the “vast number of case reports would suggest that these substances are relatively safe,” he adds, we’re still in the data-gathering phase.

For her part, O’Donnell calls the harm-reduction approach “incredibly valuable.” She also cautions that a single session with even a well-trained tripsitter won’t necessarily be enough for someone whose past trauma is suddenly surfacing, or who is otherwise having a deeply disturbing experience.

The stakes, Nemeroff notes, are even higher than any one individual’s well-being. “What none of us want to have happen is that the unregulated use of psychedelics lead to tragedies, which then will result in a backlash,” he says. “It’s been so long since we’ve been able to actually study psychedelics.”

For now, there seems little danger of reversing our *interest* in psychedelics. Sara Gael, a harm reduction officer at MAPS, describes a societal inflection point behind the current psychedelic renaissance. As waves of dysfunction—economic despair, climate change, white supremacy—have surfaced in recent years, people have increasingly looked to these substances to turn the prism on their worlds.

All of this makes me wonder about the real essence of the psychedelic peer support movement. It is, of course, a movement specific to these substances, rooted in a specific context: a time when drug policy remains insistently retrograde and official support systems have crumbled. But maybe it’s also more than that.

Jail, Thorazine, Wavy Gravy, Zendo: As nodes on an arc, these represent a decades-long, mostly underground evolution in how we understand a very particular species of psychic distress, but also in how we help one another at a more general level.

Pires told me that the principles behind contemporary psychedelic peer support apply to regular life too—she uses some of those same skills with her kids. *Slow down. Offer calm. Let feelings arise.* Maybe good tripsitting isn’t all that different from being a good partner, a good friend, a good relative. And maybe one day we’ll look back and be struck by this era—not

so much by our growing interest in these substances, but our shifting understanding of ourselves in their midst.

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How Christopher Nolan Learned to Stop Worrying and Love AI

The *Oppenheimer* director says AI is not the bomb. His new movie might still scare you shitless.

Photograph: Magnus Nolan

When wired heard that Christopher Nolan and his producer—and wife—Emma Thomas were coming out with a biopic of J. Robert Oppenheimer, we were perplexed. At least for a moment. It is hard for WIRED to resist a Nolan–Thomas film. Nolan has a real love of science, just like us. (We know this because, well, it's pretty obvious in some of his movies, but also because Nolan [guest-edited](#) an issue of WIRED back in 2014 when his film *Interstellar* came out and we got him to geek out over physics.) Add to that, the duo like to bend their audience's minds. And their eyeballs. They make superhero movies! It's so much chum for WIRED.

So, [Oppenheimer](#). A biopic, a look back at history. Alas. WIRED parlance is more often about looking *ahead*. (Not that we didn't like *Dunkirk*.) So we kinda thought maybe we weren't the magazine to dive into this one.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

But we couldn't get the idea out of our minds, because so many conversations in the office and in meetings and around technology were about the potentially apocalyptic time we are living in. Climate, war, yes. But also, [generative AI](#). Over and over, I was hearing people compare this

moment to the mid-1940s, when we stepped across the threshold into the nuclear age, or to the years when Oppenheimer was heading up the project to build the bomb in New Mexico.

Here comes the full disclosure: I know something about Oppenheimer, and his path to Los Alamos. I helped edit a [biography about him](#) and three women who were central to his life, written by my mother, Shirley Streshinsky, and the historian Patricia Klaus. I started to want to know what Christopher Nolan thinks of the time we are *in*, considering he has spent his last few years steeped in the time so many people kept *referring* to. Perhaps Nolan and Thomas line up with WIRED interests all over again.

The Big Interview

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So I headed to LA, to a quiet neighborhood where the couple keep an office. I had hoped to talk to them both, and as I entered a glass-walled, stylish conference room overlooking a garden, happily, Thomas was standing there too. I burbled something about how often her name gets left out of interviews. She thanked me for that. Turns out she couldn't stick around. But toward the end of my conversation with Nolan, he told me, "Everything we do is in lockstep. I mean, she's the best producer in Hollywood, without question." And their latest film, though it's set firmly in the past, might just be their most forward-looking yet.

MARIA STRESHINSKY: Maybe this is presumptuous, but looking at your films in reverse, it feels like your and Emma's work has been, all the while, leading up to *Oppenheimer*. In ways, it makes so much sense.

CHRISTOPHER NOLAN: I don't think that's at all presumptuous. It's how I feel about the film.

(Also, I don't mean to say your career is over.)

I've tended to feel this way with every project I've done. Because I'm trying to build on what I've learned before. Every time you finish a film, there are questions left hanging. And so with the next film, you kind of pick up the

thread. In the case of *Oppenheimer*, very literally, there is a reference to Oppenheimer in *Tenet* [Nolan's previous movie].

So he's been in your head for a while.

Oppenheimer's story has been with me for years. It's just an incredible idea —people doing these calculations, and looking at the relationship between theory and the real world, and deciding there's a very small possibility they're going to destroy the entire world. And yet they pushed the button.

It's very dramatic.

I mean, it's literally the most dramatic moment in history. In history.

A lot of people may not know that when we dropped the bomb in 1945, it was not only a horrifying moment but maybe also the one in which it was understood that humans could now wipe out all humanity.

My feeling on Oppenheimer was, a lot of people know the name, and they know he was involved with the atomic bomb, and they know that something else happened that was complicated in his relationship to US history. But not more specific than that. Frankly, for me, that's the ideal audience member for my film. The people who know nothing are going to get the wildest ride. Because it's a wild story.

His personal story, you mean.

And they need to, because, you know, he's the most important man who ever lived.

You have a line in the movie, someone says to Oppenheimer, *You can get anybody to do anything*. Something like that. He was a brilliant manager. He was brilliant at knowing, in that room, those scientists are doing x, and in that other room, those scientists are doing y. He was the one who could keep it all in his mind.

He knew how to motivate people through the theatricality of his persona, the projection of his own brilliance. He gave all the scientists and officials

and everyone a focal point.

He had real charisma.

Charisma. That's the perfect word. It made it all come together. The film deals with this a lot, the idea that these academics, these theorists could come together and build something with their own hands of this magnitude, of this importance. It's miraculous.

The photographs of Nolan for this interview were taken by his teenage son Magnus.

Photograph: Magnus Nolan

Speaking of building something of magnitude, I was at the TED conference in Vancouver recently, and one of the most interesting sessions was a series of talks about generative AI. So many of the speakers mentioned the atomic bomb, nuclear weapons. The last speaker was a technologist—who happened to grow up in Los Alamos, by the way—who talked about the inevitable growth of the use of AI in weaponry. He ended his talk by saying that the only way to keep world order was to have better AI weapons. That it was a deterrent. Which sounded a lot like how people thought of the atomic bomb. Feels like you couldn't have planned your film release for a better time.

I think the relationship is an interesting one. It's not the same. But it's the best analogy—which is why I used it in *Tenet*—for the dangers of unthinkingly unleashing a new technology on the world. It's a cautionary tale. There are lessons to be learned from it. Having said that, I do believe the atomic bomb is in a class of its own as far as technologies that have changed and endangered the world.

And the origins of these technologies weren't the same.

There is a fundamental difference. The scientists dealing with the splitting of the atom kept trying to explain to the government, *This is a fact of nature*. God has done this. Or the creator or whoever you want it to be. This is Mother Nature. And so, inevitably, it's just knowledge about nature. It's

going to happen. There's no hiding it. We don't own it. We didn't create it. They viewed it as that.

In other words, they felt they were just revealing something that was already there.

And I think you'd be very hard-pressed to make that argument about AI. I mean, I'm sure some will.

Oppenheimer is told mostly from the perspective of its title character—played by Cillian Murphy.

Photograph: Melinda Sue Gordon/Universal Pictures

You must've grown up in the shadow of the bomb.

I grew up in the 1980s in the UK, and we had the Campaign for Nuclear Disarmament, all that. People were very, very aware. When I was 13, me and my friends, we were convinced we would die in a nuclear holocaust.

But you didn't, and the world moved on.

I was talking to Steven Spielberg about this the other day. He grew up under the threat of the Cuban Missile Crisis in the '60s. Same thing. Absolutely. There are times in human history when the danger of nuclear warfare has been so palpable and tactile and visible to us that we're very aware of it. And then we can only be worried for so long, and we move on. We worry about other things. Um, the problem is that the danger doesn't actually go away.

Right. I mean, I feel like a month ago we were all worried that Putin might be serious about using a nuclear weapon.

What I remember from the '80s is that the fear of nuclear war had receded in favor of fear of environmental destruction. It was almost like we couldn't sustain the fear of it for that long. We have a complicated relationship with our fear. And yes, Putin has been using that doomsday threat and that fear to saber-rattle. It's extremely unnerving.

As unnerving as the threat of an AI apocalypse?

Well, the growth of AI in terms of weapons systems and the problems that it is going to create have been very apparent for a lot of years. Few journalists bothered to write about it. Now that there's a chatbot that can write an article for a local newspaper, suddenly it's a crisis.

We, folks in the media, have been doing that for years. Navel-gazing. Some of us are writing about AI because it can put us out of a job.

That's part of the problem. Everybody has a very—call it a partisan point of view. The issue with AI, to me, is a very simple one. It's like the term *algorithm*. We watch companies use algorithms, and now AI, as a means of evading responsibility for their actions.

Say more about that.

If we endorse the view that AI is all-powerful, we are endorsing the view that it can alleviate people of responsibility for their actions—militarily, socioeconomically, whatever. The biggest danger of AI is that we attribute these godlike characteristics to it and therefore let ourselves off the hook. I don't know what the mythological underpinnings of this are, but throughout history there's this tendency of human beings to create false idols, to mold something in our own image and then say we've got godlike powers because we did that.

That feels very, very right now. Like we're at that tipping point.

Exactly.

After the Manhattan Project, Oppenheimer worked with Einstein (played by Tom Conti) at the Institute of Advanced Study.

Photograph: Melinda Sue Gordon/Universal Pictures

With these large language models, the machines might even be able to teach themselves the next step.

There was an interesting article in the *LA Times* about ChatGPT and OpenAI. It basically said it's a sales pitch, that they're a private company now. And they have the greatest sales pitch in the world, which is, *This is a really dangerous thing. Maybe we shouldn't put it out there.* So now everyone wants it. Doesn't mean there isn't a real danger here, because I feel that there is. But I personally, and this is just my opinion, I identify the danger as the abdication of responsibility.

People keep saying there needs to be a governing body for this stuff. They say you all need to deal with it. Like *you* governments. There should be an international agency.

But that's the oldest political trick in the book of the tech companies. Right? That's what, you know, SBF was doing with FTX. Zuckerberg's been asking to be regulated for years. That's the oldest political trick. 'Cause they know that our elected officials can't possibly understand these issues.

As we see from congressional hearings.

And how could they? I mean, it's very specialist stuff, and it's incumbent on the creators and Oppenheimer—to bring it back to Oppenheimer—

Please do.

Because it's an interesting conversation. The thing with Oppenheimer is that he very much saw the role of scientists postwar as being the experts who had to figure out how to regulate this power in the world. And when you see what happened to him, you understand that that was never going to be allowed to happen. It's a very complicated relationship between science and government, and it's never been more brutally exposed than in Oppenheimer's story. I think there are all kinds of lessons to be learned from it.

Such as?

So he tried to work from within the establishment and not just turn around and say, you know, what we need is love or whatever. He was very practical in his approach, but he still got crushed. It's very complex, and I think from

our inventors now, it's very disingenuous for them to say, "We need to be regulated."

There was a moment when Oppenheimer wanted the science to be shared.

Candor was the word he used. Candor.

That seems to have shifted with the H-bomb, or do I have that wrong?

No, no, he believed it about the H-bomb as well. He—I mean, it's funny talking about it, because in a way these are spoilers for the film. But in another way it's history, you can Google it. There is this important moment where, as the H-bomb program gears up, he took to making speeches where he would say, *I wish I could tell you what I knew. I can't. If you knew what I knew, you'd understand that we all have to share information.* It's the only way we'll not destroy the world, essentially. So candor was what he viewed as the most practical means of that. We were all coming together, and he viewed the UN as being a powerful body in the future, with real teeth. He viewed international control of atomic energy as the only way to ensure world peace. That hasn't happened, obviously.

Nolan calls himself "very much the old analog fusty filmmaker."

Photograph: Melinda Sue Gordon/Universal Pictures

He didn't foresee what's happening now, the slow decline of democracies. The rise of autocracies. The North Koreas.

I don't think he saw that at all. It was a very optimistic moment.

That's what I worry about with the talk of needing a worldwide governing body for AI. We have nonstate actors, or state actors ...

Right. But that's the thing in dealing with tech companies who have refused to be bound by geographical limitations. Systemically, tech companies are encouraged and enabled to circumvent government regulation. It's an ethos. By the way, I'm coming across like I think that Silicon Valley's evil and all

these people are terrible. I don't. It's just the system. It's just the way it works.

Plus, there's an odd element of, well, *safety* I guess, with nuclear weapons, because you have to have specific ingredients to build a bomb. That's very different than facing the potential of supercomputing.

During World War II, the British program for their bomb was very sophisticated. They had a lot of great scientists. But Churchill and his government realized they just didn't have the resources. So they gave the Americans everything they had. They said, *You have the size, the distance from the front line, the industrial base*. I read a statistic at some point in my research about the number of Americans who were involved in making the first atomic bomb. It was something on the order of 500,000. It was all these companies. It was a massive physical process, which is why to this day it's easy to spot when a country's doing it. So there's certain things that give us a bit of reassurance that the process can be managed. And I don't think any of this applies to AI.

No, I don't think it does—especially when some of what we're talking about with AI is a softer threat. Disinformation on hyperspeed, technological unemployment.

It is, but I'm less—I feel that AI can still be a very powerful tool for us. I'm optimistic about that. I really am. But we have to view it as a tool. The person who wields it still has to maintain responsibility for wielding that tool. If we accord AI the status of a human being, the way at some point legally we did with corporations, then yes, we're going to have huge problems.

Are you seeing anything in AI that could be wonderful for, in particular, filmmaking?

Oh definitely. The whole machine learning as applied to deepfake technology, that's an extraordinary step forward in visual effects and in what you could do with audio. There will be wonderful things that will come out, longer term, in terms of environments, in terms of building a doorway or a

window, in terms of pooling the massive data of what things look like, and how light reacts to materials. Those things are going to be enormously powerful tools.

Will you take advantage, personally?

I'm, you know, very much the old analog fusty filmmaker. I shoot on film. And I try to give the actors a complete reality around it. My position on technology as far as it relates to my work is that I want to use technology for what it's best for. Like if we do a stunt, a hazardous stunt. You could do it with much more visible wires, and then you just paint out the wires. Things like that.

It'll improve the ease and efficiency of visual effects, you're saying.

It's not starting from nothing. It's starting from a much more detailed and data-driven idea. It might finally break the barrier between animation and photography. Because it's a hybrid. If you tell an artist to, say, draw a picture of an astronaut, they're inventing from memory or looking at references. With AI, it's a different approach, where you're actually using the entire history of imagery.

Using actual images.

Using actual images, but in a completely, fundamentally rebuilt manner—which of course raises significant artists' rights issues, and that will have to be dealt with.

Let's get back to science and your films. In the December 2014 issue of WIRED that you guest-edited, there was a line where you said, “The relationship between storytelling and the scientific method fascinates me. It wasn't really about an intellectual understanding. It was a feeling of grasping something.” Talk to me about your love of science.

Well, I've always been interested in astronomy, in questions of physics. I got to explore that in *Interstellar*. When my brother wrote the script, he would look at Einstein's thought experiments, and he identified a particular melancholy that some of them had. It's all to do with parts in time. All to do

with, like, twins who get separated and one goes away and comes back and the other's older, you know? There's a very literary quality to Einstein onward in terms of thinking about physics and how you would do these thought experiments, how you conceive of these ideas and how they work. The process of visualization that physicists need isn't so different from a literary process.

Do you feel something like that at the editing stage of a film?

I feel it at every phase, at every phase. A lot of my job is trying to articulate instincts and feelings about the shape of things. It can be difficult and complicated.

I find that if I'm working on a story and I don't know the structure, I don't know the flow, something's wrong. I can't speak of the piece in a way that makes sense.

There's a geometry or a geography. I think in very geographical terms or geometric terms about structures and patterns. Over the years I've tried adopting a sort of ground-up approach to structure, but ultimately it's very much an instinctive process: Does the feeling have the shape of a narrative, and how does that come together? And I was fascinated to realize that physicists have a very similar process going on. It's really fun.

Maybe this is a nod to *Interstellar*, but physicists always seem so in love. In love with physics, that is.

I'm passionately committed to truth. I love the scientific method. I hate to see it distorted either by scientists in the media or by media speaking for scientists. The pure scientific method, the idea that science seeks to disprove itself constantly, it so elevated human thinking beyond any other form—religion, whatever—that we've chosen to engage in as a species.

Before this interview, my mom and I watched some of your films together—because of her book, she was curious about what you'd do with Oppenheimer—and at one point she said it feels like your movies can have a very anti-nihilistic message. *Dunkirk*. *Interstellar*. *Batman*. Or, is it optimism?

I mean, the end of *Inception*, it's exactly that. There is a nihilistic view of that ending, right? But also, he's moved on and is with his kids. The ambiguity is not an emotional ambiguity. It's an intellectual one for the audience. It's funny, I think there is an interesting relationship between the endings of *Inception* and *Oppenheimer* to be explored. *Oppenheimer*'s got a complicated ending. Complicated feelings.

How are early viewers reacting?

Some people leave the movie absolutely devastated. They can't speak. I mean, there's an element of fear that's there in the history and there in the underpinnings. But the love of the characters, the love of the relationships, is as strong as I've ever done.

And the complexity of the subject matter.

Oppenheimer's story is all impossible questions. Impossible ethical dilemmas, paradox. There are no easy answers in his story. There are just difficult questions, and that's what makes the story so compelling. I think we were able to find a lot of things to be optimistic about in the film, genuinely, but there's this sort of overriding bigger question that hangs over it. It felt essential that there be questions at the end that you leave rattling in people's brains, and prompting discussion.

I have a strange question, a weird one. My husband fought cancer for four years. Since he died, I'm so raw, emotionally. My head is a mess. I worry about the world's ills, the people in war zones, the cats that are not being fed, all of it. I know this is far from the same, but I've been thinking, what would it have been like to be in Oppenheimer's head before—and god, after—the bomb was dropped? What do you think it was like to be in his head?

It's not a strange question at all. The answer is very much in the film. I wrote this script in the first person. It's what I told Cillian [Murphy, who plays Oppenheimer]: *You are the eyes of the audience*. And he takes us there. The bulk of the storytelling, we don't go outside his experience. It's my best attempt to convey the answer to that question.

Nolan and his dog, Charlie, in Los Angeles.

Photograph: Magnus Nolan

I'm a little nervous about seeing the whole thing.

I think you might have to wait a long time before you do. It is an intense experience, because it's an intense story. I showed it to a filmmaker recently who said it's kind of a horror movie. I don't disagree. It's interesting that you used the word *nihilism* earlier, because I don't think I'd quite managed to put my finger on it. But as I started to finish the film, I started to feel this color that's not in my other films, just darkness. It's there. The film fights against that.

Does that get into you? Do you sleep OK?

I do now that I—you know, I was relieved to be finished with it, actually. But I enjoy watching the film tremendously. I think you'll understand when you see the film. It's a complicated set of feelings to be entertained by awful things, you know? Which is where the horror dimension comes in.

Have your kids seen it?

Oh yeah.

Had they known anything about Oppenheimer before?

I told one of my sons about it as I started to write it, and he literally said to me: *But nobody really worries about that anymore*. Nuclear weapons. Two years later, he's not saying that. The world's changed again. And that's a lesson for all of us, but particularly for the young. The world changes fast.

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By [Steven Levy](#)

[Backchannel](#)

Jun 13, 2023 6:00 AM

Microsoft's Satya Nadella Is Betting Everything on AI

The CEO can't imagine life without artificial intelligence—even if it's the last thing invented by humankind.

Photograph: Meron Menghistab

I never thought I'd write these words, but here goes. Satya Nadella—and [Microsoft](#), the company he runs—are riding high on [the buzz from its search engine](#). That's quite a contrast from the first time I spoke with Nadella, in 2009. Back then, he was not so well known, and he made a point of telling me about his origins. Born in Hyderabad, India, he attended grad school in the US and joined Microsoft in 1992, just as the firm was rising to power. Nadella hopped all over the company and stayed through the downtimes, including after Microsoft's epic antitrust court battle and when it missed the smartphone revolution. Only after spinning through his bio did he bring up [his project at the time](#): Bing, the much-mocked search engine that was a poor cousin—if that—to Google's dominant franchise.

As we all know, Bing failed to loosen Google's grip on search, but Nadella's fortunes only rose. In 2011 he led the nascent cloud platform Azure, building out its infrastructure and services. Then, because of his track record, his quietly effective leadership, and a thumbs-up from Bill Gates, he [became Microsoft's CEO](#) in 2014. Nadella immediately began to transform the company's culture and business. He open-sourced products such as .net, made frenemies of former blood foes (as in a partnership with Salesforce), and began a series of big acquisitions, including Mojang (maker of [Minecraft](#)), LinkedIn, and GitHub—networks whose loyal members could

be nudged into Microsoft's world. He doubled down on Azure, and it grew into a true competitor to Amazon's AWS cloud service. Microsoft thrived, becoming a \$2 trillion company.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

Still, the company never seemed to fully recapture the rollicking mojo of the '90s. Until now. When the startup [OpenAI](#) began developing its jaw-dropping [generative AI](#) products, Nadella was quick to see that partnering with the company and its CEO, Sam Altman, would put Microsoft at the center of a new AI boom. (OpenAI was drawn to the deal by its need for the computation powers of Microsoft's Azure servers.)

As one of its first moves in the partnership, Microsoft impressed the developer world by releasing [Copilot](#), an AI factotum that automates certain elements of coding. And in February, Nadella shocked the broader world (and its competitor Google) by integrating OpenAI's state-of-the-art large language model into Bing, via a chatbot named Sydney. Millions of people used it. Yes, there were hiccups—*New York Times* reporter Kevin Roose [cajoled Sydney](#) into confessing it was in love with him and was going to steal him from his wife—but overall, the company was emerging as an AI heavyweight. Microsoft is now integrating generative AI—“copilots”—into many of its products. Its \$10 billion-plus investment in OpenAI is looking like the bargain of the century. (Not that Microsoft has been immune to tech's recent austerity trend—Nadella has laid off 10,000 workers this year.)

Nadella, now 55, is finally getting cred as more than a skillful caretaker and savvy leverager of Microsoft's vast resources. His thoughtful leadership and striking humility have long been a contrast to his ruthless and rowdy predecessors, Bill Gates and Steve Ballmer. (True, the empathy bar those dudes set was pretty low.) With his swift and sweeping adoption of AI, he's displaying a boldness that evokes Microsoft's early feistiness. And now everyone wants to hear his views on AI, the century's hottest topic in tech.

STEVEN LEVY: When did you realize that this stage of AI was going to be so transformative?

SATYA NADELLA: When we went from GPT 2.5 to 3, we all started seeing these emergent capabilities. It began showing scaling effects. We didn't train it on just coding, but it got really good at coding. That's when I became a believer. I thought, "Wow, this is really on."

Was there a single eureka moment that led you to go all in?

It was that ability to code, which led to our creating Copilot. But the first time I saw what is now called GPT-4, in the summer of 2022, was a mind-blowing experience. There is one query I always sort of use as a reference. Machine translation has been with us for a long time, and it's achieved a lot of great benchmarks, but it doesn't have the subtlety of capturing deep meaning in poetry. Growing up in Hyderabad, India, I'd dreamt about being able to read Persian poetry—in particular the work of Rumi, which has been translated into Urdu and then into English. GPT-4 did it, in one shot. It was not just a machine translation, but something that preserved the sovereignty of poetry across two language boundaries. And that's pretty cool.

Microsoft has been investing in AI for decades—didn't you have your own large language model? Why did you need OpenAI?

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We had our own set of efforts, including a model called Turing that was inside of Bing and offered in Azure and what have you. But I felt OpenAI was going after the same thing as us. So instead of trying to train five different foundational models, I wanted one foundation, making it a basis for a platform effect. So we partnered. They bet on us, we bet on them. They do the foundation models, and we do a lot of work around them, including the tooling around responsible AI and AI safety. At the end of the day we are two independent companies deeply partnered to go after one goal, with discipline, instead of multiple teams just doing random things. We said, "Let's go after this and build one thing that really captures the imagination of the world."

Did you try to buy OpenAI?

I've grown up at Microsoft dealing with partners in many interesting ways. Back in the day, we built SQL Server by partnering deeply with SAP. So this type of stuff is not alien to me. What's different is that OpenAI has an interesting structure; it's nonprofit.

That normally would seem to be a deal-killer, but somehow you and OpenAI came up with a complicated workaround.

They created a for-profit entity, and we said, "We're OK with it." We have a good commercial partnership. I felt like there was a long-term stable deal here.

Apparently, it's set up so that OpenAI makes money from your deal, as does Microsoft, but there's a cap on how much profit your collaboration can accumulate. When you reach it, it's like Cinderella's carriage turning into the pumpkin—OpenAI becomes a pure nonprofit. What happens to the partnership then? Does OpenAI get to say, "We're totally nonprofit, and we don't want to be part of a commercial operation?"

I think their blog lays this out. Fundamentally, though, their long-term idea is we get to superintelligence. If that happens, I think all bets are off, right?

Yeah. For everyone.

If this is the last invention of humankind, then all bets are off. Different people will have different judgments on what that is, and when that is. The unsaid part is, what would the governments want to say about that? So I kind of set that aside. This only happens when there is superintelligence.

Photograph: Meron Menghistab

OpenAI CEO Sam Altman believes that this will indeed happen. Do you agree with him that we're going to hit that AGI superintelligence benchmark?

I'm much more focused on the benefits to all of us. I am haunted by the fact that the industrial revolution didn't touch the parts of the world where I

grew up until much later. So I am looking for the thing that may be even bigger than the industrial revolution, and really doing what the industrial revolution did for the West, for everyone in the world. So I'm not at all worried about AGI showing up, or showing up fast. Great, right? That means 8 billion people have abundance. That's a fantastic world to live in.

What's your road map to make that vision real? Right now you're building AI into your search engine, your databases, your developer tools. That's not what those underserved people are using.

Great point. Let's start by looking at what the frontiers for developers are. One of the things that I am really excited about is bringing back the joy of development. Microsoft started as a tools company, notably developer tools. But over the years, because of the complexity of software development, the attention and flow that developers once enjoyed have been disrupted. What we have done for the craft with this AI programmer Copilot [which writes the mundane code and frees programmers to tackle more challenging problems] is beautiful to see. Now, 100 million developers who are on GitHub can *enjoy* themselves. As AI transforms the process of programming, though, it can grow 10 times—100 million can be a billion. When you are prompting an LLM, you're programming it.

Anyone with a smartphone who knows how to talk can be a developer?

Absolutely. You don't have to write a formula or learn the syntax or algebra. If you say prompting is just development, the learning curves are going to get better. You can now even ask, “What is development?” It's going to be democratized.

As for getting this to all 8 billion people, I was in India in January and saw an amazing demo. The government has a program called Digital Public Goods, and one is a text-to-speech system. In the demo, a rural farmer was using the system to ask about a subsidy program he saw on the news. It told him about the program and the forms he could fill out to apply. Normally, it would tell him where to get the forms. But one developer in India had trained GPT on all the Indian government documents, so the system filled it out for him automatically, in a different language. Something created a few months earlier on the West Coast, United States, had made its way to a

developer in India, who then wrote a mod that allows a rural Indian farmer to get the benefits of that technology on a WhatsApp bot on a mobile phone. My dream is that every one of Earth's 8 billion people can have an AI tutor, an AI doctor, a programmer, maybe a consultant!

That's a great dream. But generative AI is new technology, and somewhat mysterious. We really don't know how these things work. We still have biases. Some people think it's too soon for massive adoption. Google has had generative AI technology for years, but out of caution was slow-walking it. And then you put it into Bing and dared Google to do the same, despite its reservations. Your exact words: "I want people to know that we made Google dance." And [Google did dance](#), changing its strategy and jumping into the market with [Bard](#), its own [generative AI search product](#). I don't want to say this is recklessness, but it can be argued that your bold Bing move was a premature release that began a desperate cycle by competitors big and small to jump in, whether their technology was ready or not.

The beauty of our industry at some level is that it's not about who has capability, it's about who can actually exercise that capability and translate it into tangible products. If you want to have that argument, you can go back to Xerox PARC or Microsoft Research and say everything developed there should have been held back. The question is, who does something useful that actually helps the world move forward? That's what I felt we needed to do. Who would have thought last year that search can actually be interesting again? Google did a fantastic job and led that industry with a solid lock on both the product and the distribution. Google Search was default on Android, default on iOS, default on the biggest browser, blah, blah, blah. So I said, "Hey, let's go innovate and change the search paradigm so that Google's 10 blue links look like Alta Vista!"

You're referring to the '90s search engine that became instantly obsolete when Google out-innovated it. That's harsh.

At this point, when I use Bing Chat, I just can't go back, even to original Bing. It just makes no sense. So I'm glad now there's Bard and Bing. Let there be a real competition, and let people enjoy the innovation.

I imagine you must have had a savage pleasure in finally introducing a search innovation that made people notice Bing. I remember how frustrated you were when you ran Bing in 2009; it seemed like you were pursuing an unbeatable rival. With AI, are we at one of those inflection points where the deck gets shuffled and formerly entrenched winners become vulnerable?

Absolutely. In some sense, each change gets us closer to the vision first presented in Vannevar Bush's article [“[As We May Think](#),” a 1945 article in *The Atlantic* that first presented a view of a computer-driven information nirvana]. That is the dream, right? The thing is, how does one really create this sense of success, which spans a long line of inflections from Bush to [J. C. R. Licklider](#) [who in 1960 envisioned a “symbiosis of humans and computers”] to Doug Engelbart [the mouse and windows] to the Alto [Xerox PARC's graphical interface PC], to the PC, to the internet. It's all about saying, “Hey, can there be a more natural interface that empowers us as humans to augment our cognitive capability to do more things?” So yes, this is one of those examples. Copilot is a metaphor because that is a design choice that puts the human at the center of it. So don't make this development about autopilot—it's about copilot. A lot of people are saying, “Oh my God, AI is here!” Guess what? AI is already all around us. In fact, all behavioral targeting uses a lot of generative AI. It's a black box where you and I are just targets.

It seems to me that the future will be a [tug-of-war](#) between copilot and autopilot.

The question is, how do humans control these powerful capabilities? One approach is to get the model itself aligned with core human values that we care about. These are not technical problems, they're more social-cultural considerations. The other side is design choices and product-making with context. That means really making sure that the context in which these models are being deployed is aligned with safety.

Photograph: Meron Menghistab

Do you have patience for people who say we should [hit the brakes](#) on AI for six months?

I have all the respect and all the time for anybody who says, “Let's be thoughtful about all the hard challenges around alignment, and let's make sure we don't have runaway AI.” If AI takes off, we'd better be in control. Think back to when the steam engine was first deployed and factories were created. If, at the same time, we had thought about child labor and factory pollution, would we have avoided a couple hundred years of horrible history? So anytime we get excited about a new technology, it's fantastic to think about the unintended consequences. That said, at this point, instead of just saying stop, I would say we should speed up the work that needs to be done to create these alignments. We did not launch Sydney with GPT-4 the first day I saw it, because we had to do a lot of work to build a safety harness. But we also knew we couldn't do all the alignment in the lab. To align an AI model with the world, you have to align it *in* the world and not in some simulation.

So you knew Sydney was going to fall in love with journalist Kevin Roose?

We never expected that somebody would do Jungian analysis within 100 hours of release.

You still haven't said whether you think there's any chance at all that AI is going to destroy humanity.

If there is going to be something that is just completely out of control, that's a problem, and we shouldn't allow it. It's an abdication of our own responsibility to say this is going to just go out of control. We can deal with powerful technology. By the way, electricity had unintended consequences. We made sure the electric grid was safe, we set up standards, we have safety. Obviously with nuclear energy, we dealt with proliferation. Somewhere in these two are good examples on how to deal with powerful technologies.

One huge problem of LLMs is their hallucinations, where Sydney and other models just make stuff up. Can this be effectively addressed?

There is very practical stuff that reduces hallucination. And the technology's definitely getting better. There are going to be solutions. But sometimes

hallucination is “creativity” as well. Humans should be able to choose when they want to use which mode.

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That would be an improvement, since right now we don't have a choice. But let me ask about another technology. Not that long ago you were rhapsodic about the metaverse. In 2021 you said you couldn't overstate how much of a breakthrough mixed reality was. But now all we're talking about is AI. Has this boom shunted the metaverse into some other dimension?

I still am a believer in [virtual] presence. In 2016 I wrote about three things I was excited about: mixed reality, quantum, and AI. I remain excited about the same three things. Today we are talking about AI, but I think presence is the ultimate killer app. And then, of course, quantum accelerates everything.

AI is more than just a topic of discussion. Now, you've centered Microsoft around this transformational technology. How do you manage that?

One of the analogies I love to use internally is, when we went from steam engines to electric power, you had to rewire the factory. You couldn't just put the electric motor where the steam engine was and leave everything else the same. That was the difference between Stanley Motor Carriage Company and Ford Motor Company, where Ford was able to rewire the entire workflow. So inside Microsoft, the means of production of software is changing. It's a radical shift in the core workflow inside Microsoft and how we evangelize our output—and how it changes every school, every organization, every household.

How has that tool changed your job?

A lot of knowledge work is drudgery, like email triage. Now, I don't know how I would ever live without an AI copilot in my Outlook. Responding to

an email is not just an English language composition, it can also be a customer support ticket. It interrogates my customer support system and brings back the relevant information. This moment is like when PCs first showed up at work. This feels like that to me, across the length and breadth of our products.

Microsoft has performed well during your tenure, but do you think you'll be remembered for the AI transformation?

It's up to folks like you and others to say what I'll be remembered for. But, oh God, I'm excited about this. Microsoft is 48 years old. I don't know of many companies that age that are relevant not because they did something in the '80s or the '90s or the 2000s but because they did something in the last couple of years. As long as we do that, we have a right to exist. And when we don't, we should not be viewed as any great company.

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[Paul Ford](#)

[Ideas](#)

Jul 31, 2023 8:00 AM

My Tips for a Killer Product Launch

Be sure to blow up any criticism or misunderstanding of your app, no matter how small, into a flat-out organizational panic.

PHOTO-ILLUSTRATION: ANJALI NAIR; GETTY IMAGES

Team,

We've worked toward this release date for well over a year, and soon we'll experience a full [product launch](#). Of all the stretches, the home stretch can be the hardest, so I want to share some learnings from past launches to help you stay motivated through the next phase. We can do this!

First, and most important: I need everyone to set impossible expectations of success. You might be anticipating extra equity, huge salary increases, significant press coverage, or [Product Hunt](#) glory. You might think the one-liner you use on acquaintances and journalists and investors is puffed-up enough: "By creating a mobile-app-controlled kitty litter scooper, we're helping humans have better relationships with their cats." But you should go bigger. Every product can claim to make people's lives better; if you want to stand out, you must link your app to a real, immense global crisis. Try this: "Women spend more time caring for pets than men. By designing an app that controls an automated kitty litter scooper, we are freeing up women to focus on their communities and set their own agendas. WiskrSküps is critical feminist infrastructure." Can you link your product to mitigating [climate change](#)? Improving [education](#)? Smoking cessation?

Panda habitat preservation? I can, in 30 different ways. That's why I'm your boss.

Our goal here is to build a balanced organization, so I also need you to take time for the other side of narcissistic self-aggrandizement: credit-hogging. Yes, without you, nothing could have shipped at all. Make sure to remind everyone of your value in every meeting. Walk around, if you're not remote, and say things like, "When we added emoji to the litter-scooping notifications, that really put this thing over the edge. I don't know if you know how important that is to mitigating climate change." Everyone will agree with you. What choice do they have? Credit-hogging is an essential part of any software release, and getting good at it is what defines a true organizational leader. I always make a lot of time for it. Again: That's why I'm your boss.

If all goes well, we'll spend the run-up to launch squashing bugs and alternating between fantasies of glory and a morbid fear of being ignored. Then comes the big moment. A launch day is very special. You might think it's an opportunity to throw a party and celebrate. But experienced product leaders know that this is the day you wake up and have a huge fight with your romantic partner, whom you've neglected for months while you hauled this bundle of code and missteps into the light. Here's what you're going to do: You will sit down, open your laptop, and walk them through the product, focusing on all the tiny features added in the past two weeks, scrutinizing their face for reactions, insisting that the bugs that show up don't mean anything—and when you don't get exactly the reaction you're looking for, at exactly the right time, you'll slam the laptop closed and say, "Look, it's clear you don't have time for this," and stomp off while they watch in confusion. Personally, I try to have at least three of these fights for each product—one for alpha, one for beta, and a big one for the full release. (If you don't have a partner, a roommate or friend is fine.)

Once you've stomped out of the house, head to the office, where, after doing some light credit-hogging, you should spend as much time as possible on [social media](#) engaging in PLR, or post-launch reloading. While the vast majority of humans will be utterly indifferent to your announcement, you must drill in on the one or two who offer reactions that

fall short of total excitement. Be sure to blow up any criticism or misunderstanding, no matter how small, into a flat-out organizational panic. Slack can be a great tool to coordinate your overreaction. You should share every tweet that insists your product is bad, old-fashioned, “guaranteed to kill pets,” etc. “Real men don’t own cats,” the depressed men of Twitter will write. “What stage of late capitalism are we in where your litter box needs an app?” the anarchists of Mastodon will post. Who knows what they’ll say on Bluesky, but be ready to freak out about that too.

Inevitably, right away, the app’s login function will break. As a society we are incapable of authenticating users. It’s a tragedy, one of our greatest failings. And when we fix that issue we will forget to turn server logging back on, so we will have no idea who’s using the app.

After all that, the only thing left to do is to prepare yourself for the frigid silence of day two, then days three through 300. Think of it this way: You spent a year, maybe several years, digging a deeper and deeper hole (you can dig a pretty big hole if you grind every day), and now it’s time for the world to pull you out. In your heart, you expected this to happen quickly. But it takes time. First people need to find the hole, then they need to want to visit the hole, then they need to put their email addresses in the hole.

Eventually people will show up, if marketing does its job. They might throw in some sticks and suggest you build a ladder. (This is called venture capital.) But most of us, frankly, just learn to live in the hole. People will ask how it’s going down there in that thin shaft of sunlight. You will mumble something about product-market fit as you pray the sides don’t collapse.

Team, let’s get pumped for this launch. Let’s file bugs. Let’s call our partners and apologize for being so wrapped up in work. Don’t put down your shovels yet. We still have a lot of digging to do.

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Jul 3, 2023 6:24 PM

Six-Word Sci-Fi: Stories Written by You

Here's this month's prompt, how to submit, and an illustrated archive of past favorites.

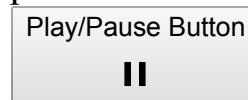


Illustration: Elena Lacey

THIS MONTH'S PROMPT

In six words, write a story about the future of vegetables.

Submit stories on [Twitter](#), [Facebook](#), or [Instagram](#), or email us at mail@WIRED.com. We'll choose one to illustrate.

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JUNE/JULY 2023

A Story About a Sentient Moon

Illustration: SI PARMEGGIANI/NEPTUNIAN GLITTERBALL

—@v1z3n, via Twitter

Honorable Mentions:

Acned Callisto resented Ganymede's natural magnetism.

—Dave Armor, via email

Moon files restraining order against poets.

—James O'Leary, via email

A total eclipse of the heart.

—Samuel Sigaud, via email

I will embrace my dark side.

—Don Hilder, via email

Create your own tides! I quit!

—Chris Hug, via email

She mesmerizes oceans, drowning us again.

—Shelley G, via email

My crumbling visage tires of turning.

—@FilmMartin, via Twitter

Why stop at controlling the tides.

—@Bruceumpstead, via Instagram

MAY 2023

**An Award-Winning Documentary From the Year
2100**

ILLUSTRATION: VIOLET REED

—Geneviève Goggin, via email

Honorable Mentions:

Grand Unification: The First AI Marriage. —Daniel Dippel, via email

The Great Exodus, Goodbye Blue Dot. —@viggy.j, via Instagram

Songless Seas: A Tale Without Whales. —Christopher Jankoski, via email

Beige Planet: Life Finds a Way. —@danaxon, via Twitter

How the Lunar War Was Won. —Bob Clark, via email

Coping With Your AI Overlord's Demands. —@wwliii, via Twitter

The Day The Flowers Stopped Blooming. —@a.c.hachem, via Instagram

Electric Sheep: How AI Changed Us. —@elliottboyd_, via Instagram

After Humans: A New Cockroach Documentary. —@adamrgarcia, via Instagram

APRIL 2023

A Story About the Future of Sleep

ILLUSTRATION: VIOLET REED

—Travis Carraro, via Facebook

Honorable Mentions:

The sleep concierge welcomed unsuspecting guests. —@changeist, via Twitter

“Lucid or randomize?” asked the AI. —K Smith-Laird, via email

Alarm in 126 hours 24 minutes. —Odón Esteban Vera, via email

My power nap reached 9 kilowatts. —Markus, via email

Unfortunately, Johnny’s repeatedly missing sleep targets. —Alison Boleyn, via email

Human hibernation allowed Earth to recover. —@amybossehayden, via Instagram

Alert: Error 404. Human not found. —@mimi.psd, via Instagram

Skip the nightmares: Upgrade to premium! —@katerinamunis, via Instagram

Oh please! Sleep is for humanoids. —@evanskopp, via Instagram

MARCH 2023

A Story About the Future of Personal Hygiene

ILLUSTRATION: VIOLET REED

—David Frank, via Facebook

Honorable Mentions:

“Traffic’s moderate today,” said my deodorant. —Alex Nelson, via email

You can shake my hand, sir. —Kinga Raab, via Facebook

Watch ad to continue this shower. —@sam.hologram, via Instagram

Dry shampoo was just the beginning. —Emma Anderson, via Facebook

Now I smell like the metaverse. —@nostalgicbookishness, via Instagram

OK Google, it's time to wipe. —Tim McCune, via email

Bath bubbles beget baby parallel universes. —Mike Hobbs, via email

My hands wash themselves every hour. —Dave Fox, via email

They clean you while you sleep. —Pien van der Ploeg, via Facebook

FEBRUARY 2023

A Story About a Dramatic Change in Size

ILLUSTRATION: VIOLET REED

—B. Scott Crawford, via email

Honorable Mentions:

Felt OK ... until I crushed Tokyo. —@BobPeryea, via Twitter

My new basketball is the moon. —Dave Drews, via email

You looked taller in your profile. —@thaquashman, via Instagram

I have made a colossal mistake! —@argayle, via Instagram

Godzilla got into the diet pills. —Steve Rhodes, via email

Sun look more red to you? —Michael Patrick Sullivan, via email

Giant wakes up tiny, confused. —ChatGPT

My first trip to the hypothalamus! —@fernandarosh, via Twitter

What grew? All but the bones. —Jackson Parker, via email

JANUARY 2023

A Story About a Mad Scientist

ILLUSTRATION: VIOLET REED

—@DaveDyball, via Twitter

Honorable Mentions:

Mad I was, until it worked. —Don Wilkins, via email

You say “mad,” I say “disappointed.” —Joseph Ferry, via email

Her hair was blue—and undyed. —@jaybirdfitlive, via Instagram

He couldn’t make Earth look triangular. —@pauloahb, via Instagram

His socks matched her lab coat. —@pmcruise, via Twitter

Quantum field cadaver regeneration activation, go! —Sean Liddle, via Facebook

“Success!” Too bad the AI disagreed. —Steve Nomax, via email

“Let there be light,” said God. —@charley.desousa, via Instagram

“It’s aliiive!” Elon opened his eyes. —@ylbertf, via Instagram

DECEMBER 2022

A Story About an Animal That Hasn't Been Discovered Yet

ILLUSTRATION: VIOLET REED

—@JayZheng10, via Twitter

Honorable Mentions:

Its stare gave me a rash. —@dantekienigiel, via Instagram

Darwin might've overlooked them on purpose. —@the_story_life, via Instagram

It was inside me all along. —Nova Wehman-Brown, via email

Green trunks wiggled from thawed permafrost. —@Theniceladywit, via Twitter

Its unusual diet was immediately demonstrated. —
@lauren.samuelson14, via Instagram

Field biology got trickier after that. —Paul Gazis, via Facebook

We thought lenticular clouds were clouds. —@marcia_storyteller, via Instagram

Was it feeding on electronic waste? —@leonserra_, via Instagram

To it, we are the ants. —Morten Kielland, via email

NOVEMBER 2022

A Story About Living Forever

ILLUSTRATION: VIOLET REED

—J C Thrush, via email

Honorable Mentions:

It wasn't long enough for me. —@Anna_Wenner, via Twitter

And so long lived the Queen. —Giacomo, via email

Your application to be terminated expired. Morten Kielland, via email

Too bad I never stopped growing. —Antti Karjalainen, via Facebook

There was still no edit button. —@ThatKP3, via Twitter

In the end, there wasn't one. —Jason Anderson, via email

I woke up again and again. —@mirnanassar, via Instagram

They said someday, but it's today. —@VijayLRoy, via Twitter

I should've had that looked at. —J. Fredrick James, via email

SPECIAL [RE:WIRED](#) EDITION

A Story About Tackling Climate Change

ILLUSTRATION: VIOLET REED

—@ChuckBaggett, via Twitter

SEPTEMBER 2022

A Story About an Evil Twin

ILLUSTRATION: VIOLET REED

—Andy Walton, via Facebook

Honorable Mentions:

He did what she would not. —Eric Nisly, via Facebook

The eyewitness was, quite understandably, mistaken. —
@HollysHooman, via Twitter

“Well, only if you stay digital.” —Morten Kielland, via email

They think I’m the good one. —@bobtheimpaler, via Instagram

Her eye is mine for eternity. —@cessmtz, via Twitter

“Relax. Mom will never find out.” —@ascendant_dada, via Instagram

I’m the one you really want. —@kalkikanmani, via Twitter

Only mirrors can reveal the truth. —@BuddhaandDog, via Twitter

Born triplets, but three’s a crowd. —@jkadz, via Instagram

AUGUST 2022

A Story in Six Emoji

ILLUSTRATION: VIOLET REED

Illustration: Violet Reed

—Caleb Bell, via Facebook

Honorable Mentions:

♀♂♂♂♂♀ —@jessbeckah42, via Instagram

□□□□□ —@lgvpart, via Instagram

□□□☠□□ —Ché Graham, via email

□□□♂□□□ —@cmayc414, via Instagram

□□□□□ —@aotrivera, via Instagram

□□▫▫□□ —@marcia_storyteller, via Instagram

□□□△□□ —@PatCattigan, via Twitter

□□□□□□□ —@nadia.bkb, via Instagram

□□□□□ —@cva.maría, via Instagram

JULY 2022

A Story Set in a Galaxy Far, Far Away

ILLUSTRATION: VIOLET REED

—@KuraFire, via Twitter

Honorable Mentions:

42 was definitely not the answer. —Simona Riva, via Facebook

“The robots are BLEEDING!” she screamed. —@vince_freeman, via Twitter

Dear humans, nobody wants unsolicited nudes. —@OhCooley44, via Twitter

Humans! There goes the dang neighborhood. —S. V. Mosaic, via Facebook

Directions to transdimensional left luggage office? —Max Thoursie, via email

Giant squirrels lead the space army. —@ronels14, via Instagram

I haven't gabblegopped the gloop yet. —@Evanliciously, via Twitter

One small step to remember mankind. —@AxeandPail, via Twitter

Is this DC's or Marvel's Universe? —Thomas Davis, via email

JUNE 2022

A Story About a Wormhole Discovered in Your Closet

ILLUSTRATION: VIOLET REED

—Olivia Richardson, via email

Honorable Mentions:

Went in wrinkled, came back ironed. —Rick Veenstra, via email

But my name is not Alice! —Reine Fleur, via Facebook

My single socks returned—inside out. —Ann C, via email

The cause? Pairing wool with corduroy. —@milanograms, via Twitter

My insurance will not cover this! —Brian Carroll, via Facebook

I walked in, we walked out. —@Egiventer, via Twitter

When I returned, my pants hadn't. —Maarten van Kempen, via email

Pest control's about to get trickier. —Susannah Lui, via Facebook

The bad smell came from there. —@run_the_jouls, via Instagram

MAY 2022

A Story About a Futuristic Meal Gone Wrong

ILLUSTRATION: VIOLET REED

—Stuart Hodgson, via email

Honorable Mentions:

Waiter, I ordered polynyocominnucloride, not biconvocominleucloride.

—Carolyne Gibson, via Facebook

Robot malfunctions—leaving only Mom's cooking. —Marc Ringel, via email

Suddenly I realized, I'm the food. —@nicoestr, via Twitter

So full. Way too many gigabytes. —Jim Frentz, via email

Call the server, my soup's pixelating. —Rick Veenstra, via email

Waiter, my soup has been bugged! —@nostalgicbookishness, via Instagram

Please check genome compatibility before eating. —@sebastiancastro, via Instagram

Steak pill exploded in the hydrator. —Shelvine Berzerk Erasmus, via Facebook

I was hungry. So was it. —Jake McCormack, via Facebook

APRIL 2022

A Story About Surviving a High-Tech Disaster

ILLUSTRATION: VIOLET REED

—John DeFilippi, via email

Honorable Mentions:

Grandma, tell me about the memes. —E. E. Eon, via email

Just be happy you are analog. —Maarten Visscher, via email

There's strawberry jam inside the VCR. —@Plan_Prep_Live, via Twitter

The robots won't stop feeding me. —@lithohedron, via Twitter

And then the battery ran out. —@thedigifish, via Instagram

On Earth, I'd been pronounced dead. —@bower_mink, via Instagram

Luckily, the quantum untangler was near. —Antti Karjalainen, via Facebook

I'm outside! We are all outside! —Paul Hubner, via email

Huh, your DNA can't be verified. —Jason Rosenberg, via email

MARCH 2022

A Story About an Extraordinary Coincidence

ILLUSTRATION: VIOLET REED

—Joyce, via email

Honorable Mentions:

I wrote this same story yesterday. —@tatiang, via Twitter

You're from test tube 698GX10A too? —Amy Stewart, via email

Metaverse Rome built in one day. —@theseaisgreen_, via Instagram

Separated at birth, they died simultaneously. —@zeynaballee, via Instagram

I have not become my mother. —@r58tree, via Instagram

Of all the Galilean moon joints ... —Alison Boleyn, via email

You have a cloned T-Rex too! —@emailabdulla, via Instagram

The android had my husband's eyes. —@hrhblakeknight, via Instagram

WIRED chooses to publish this story. —@connorgerbrandt, via Instagram

FEBRUARY 2022

A Story About a New National Holiday

ILLUSTRATION: VIOLET REED

—@sarahschneiter, via Twitter

Honorable Mentions:

On Consensus Day we blockchain vote. —@jamesjoaquin, via Twitter

Day a For Backward Speak Everyone. —@nervish, via Instagram

“Happy Upload Day!” the kids typed. —Gene Simonalle, via email

Update your friends this Reboot Day. —Antti Karjalainen, via Facebook

Elon has just bought July 4th. —@rafaelalimandro, via Instagram

A day that offends no one. —@Stevalech, via Twitter

Welcome to the 74th Hunger Games. —@corvalanlara, via Instagram

Hey Calendar, happy AI Appreciation Day! —Michael Esser, via email

And her name was Betty White. —@marhartech, via Instagram

JANUARY 2022

A Story About Your Next-Generation Pet

ILLUSTRATION: VIOLET REED

—Ed Gubbins, via Facebook

Honorable Mentions:

Don’t upgrade. I’m a good boy. —Benjamin Lopez Barba, via email

Let’s go for a long spacewalk. —@colingroom, via Instagram

My meta dodo only eats NFTreats. —@transistor_resistor, via Instagram

One hour to finish printing rex. —@RyanReitz, via Twitter

My cloned woolly mammoth never sheds. —@ANDYMedici, via Twitter

Would you like traditional or nonpooping? —Marc Lewis, via email

The Crystaloids quickly outlawed pet rocks. —Kassidy Helfant, via email

Nine lives later, nine more lives. —@bilybel, via Twitter

Pawprint confirmed. Select meal flavor preference. —@michael_kupfer, via Twitter

DECEMBER 2021

A Children's Book From the Future

ILLUSTRATION: VIOLET REED

—Jane Turner, via Facebook

Honorable Mentions:

Black holes make the worst pets. —Ron Sheklin, via email

Only some of the toys retaliated. —Rebecca Stevens, via Facebook

The aliens were funny and delicious. —@trollus_maximus, via Instagram

It used to be everyone poops. —Nik Hector, via Facebook

There's a nanobot in my soup. —@mghendism, via Instagram

The school trip missed the wormhole. —@simao_sa, via Instagram

See Bot run. Run, Bot, run! —Franklin Schellenberg, via email

Goodnight comb, goodnight dome, goodnight Mars. —@jamesjoaquin, via Twitter

The Little AI That Could (Feel) —E Scott Menter, via Facebook

NOVEMBER 2021

A Story About the Future of Psychotherapy

ILLUSTRATION: VIOLET REED

—@oscartkav, via Instagram

Honorable Mentions:

Your session has been successfully uploaded. —Austin Andru, via email

My AI said, “Try analog dating.” —@joshdblack, via Twitter

Her insurance only covered chat bots. —Spencer McKeehan, via Facebook

So tell me about your motherboard. —@j.d._harelk, via Instagram

Swipe left until it feels right. —@cvelascop, via Instagram

Connection interrupted. Data cannot be analyzed. —@duykham_, via Twitter

If you are depressed, press 1. —@jfindura, via Twitter

A total neurological reboot should help. —Kevin Jerome Hinders, via Facebook

Your Zuckerberg complex is developing rapidly. —@nogorelli, via Instagram

OCTOBER 2021

An Adventure Story Set in the Metaverse

ILLUSTRATION: VIOLET REED

—Evan Skopp, via email

Honorable Mentions:

Virtually no one hears you scream. —Karen Hamilton, via email

Oh no, they are all me. —@stockyjon, via Instagram

Help me. IRL I was murdered. —Ed Gubbins, via Facebook

I gotta get out of here. —Steven Fernandez, via email

Why can't I find the exit? —@scrcr0, via Twitter

Our only mission: Delete Mark Zuckerberg. —@mongoindustries, via Instagram

It was impossible to pause it. —@alenotari6, via Instagram

He must never see me offline. —Bobby Parrott, via email

Wasted such a good planet. Reboot. —Sasha Beiderman, via Facebook

SEPTEMBER 2021

A Story About a Robot Pop Star

ILLUSTRATION: VIOLET REED

—Randy Cepuch, via email

Honorable Mentions:

Autotune is a factory option now. —Josh Alvies, via Facebook

Are they human? Are they dancer? —@ruste, via Instagram

All the flash, without the heart. —Craig Chatfield, via Facebook

I'm programmed to pop and lock. —@alissacarr, via Twitter

I'm too sexy for my software. —@glengauthier, via Instagram

Doesn't even write its own stuff. —@andrewkm__, via Twitter

Crowd surfing wasn't the best idea. —@clarkstacey, via Twitter

Played backward it's "kill all humans." —Marc Rogers, via Facebook

AUGUST 2021

A Story About a Self-Aware Self-Driving Car

ILLUSTRATION: VIOLET REED

—Stephen Clamage, via email

Honorable Mentions:

I take lithium for range anxiety. —@jamesjoaquin, via Twitter

I dreamt of the Autobahn again. —James Wortz, via Facebook

Honest, officer—the human was driving. —Steve Magid, via email

Don't make me pull me over. —@atlrun, via Twitter

The smart car drove itself crazy. —@frascafrasca, via Twitter

The grandma or the baby—shit. —@gaophilip, via Twitter

Have I chosen the right path? —Andrew Dawson, via email

It takes itself on long drives. —Wade Sheppard, via email

It's my way on the highway. —@manu.life, via Instagram

JULY 2021

A Story About a Casual Encounter With Aliens

ILLUSTRATION: VIOLET REED

—@phorne96, via Twitter

Honorable Mentions:

You look nothing like your photo. —@markgyles, via Twitter

Lights, camera ... where did it go? —thalia925, via email

They came, too late, for Elvis. —Bruce Lyon, via Facebook

Seeking vital fluids, they commandeered snacks. —Scott Medintz, via email

Do you have the correct spacetime? —Richard Krzemien, via email

I awoke with a probing thought. —@andynez, via Twitter

Take us to the Nigerian prince. —Juan Garcia, via Facebook

Quite unexpectedly, cocktail recipes were exchanged. —John Wagner, via email

You're an alien! No you are! —@simon_staffans, via Twitter

JUNE 2021

A Story About an International Digital Heist

ILLUSTRATION: VIOLET REED

—@jamesnsmith, via Twitter

Honorable Mentions:

"Hand it over," the ATM said. —Lauren Dolan, via email

They never suspected Alexa was Alexei. —Liz Ransom, via email

Why wouldn't I help a prince? —Harleigh Marsh, via Facebook

They said nonfungible. They were wrong. —@eminay86, via Twitter

Use his eyeball while there's time. —Noreen Anastasia, via Facebook

"Update Later" was the incorrect choice. —@terryfphotos, via Instagram

Check Google Maps. Kiev is gone. —r0cket fr0g, via email

They got away on the blockchain. —JYRWG, via email

Every cat photo gone. Police baffled. —@john.cartan, via Instagram

MAY 2021

A Story About a Freaky Discovery in Physics

ILLUSTRATION: VIOLET REED

—Mark Crane, via Facebook

Honorable Mentions:

Schrodinger's cat is actually a dog. —@tynanwrites, via Twitter

You're the observed. Not the observer. —@parkerstmailbox, via Instagram

Our last seconds appear the longest. —Paul Hagenaars, via email

It was simultaneously huge and microscopic. —@Cezary_Z, via Twitter

All lost socks found at Cern. —Felix Quarnström, via Facebook

Astonishingly, up was down all along! —Christopher Walton, via email

Actually, the tides pull the moon. —@the4lw, via Instagram

A seventh Infinity Stone is found. —@taayywells, via Instagram

Faster than light announcement scheduled yesterday. —David Cinabro, via email

APRIL 2021

A Review of a Future Work of Art

ILLUSTRATION: VIOLET REED

—Jacky Reif, via Facebook

Honorable Mentions:

So that's an AI self portrait? —Jason Cohen, via Facebook

I prefer Boston Dynamics' earlier work. —@sscarsdale, via Twitter

Uninspired. Lacking originality. Try again, Earth. —Amanda Bull Chafin, via email

NFT or not, it is great. —Peter Boersma, via Facebook

Not as good as Banksy's virus. —Simon O Wright, via Facebook

Brave to show an unfiltered canvas. —@Alcestronaut, via Twitter

Not what teleportation was invented for. —@Arturo_thrdez, via Twitter

Shame mortals will not appreciate it. —@asylbek0205, via Instagram

Reminds me of the Before Times. —Jacqueline Jaeger Houtman, via Facebook

MARCH 2021

A Story About a Tech-Centric Religion

ILLUSTRATION: VIOLET REED

—Eduardo Bolívar, via Facebook

Honorable Mentions:

I swiped right and found salvation. —Conrad Dean, via Facebook

Praying to AI got better results. —@jgmclean0, via Twitter

The prophet revealed the source code. —@the4lw, via Instagram

Atop the hill, sayeth he, “reception”? —@dghutt, via Twitter

The app works in mysterious ways. —Tyler Hughs, via Facebook

Move fast. Break things. Repent. Repeat. —@iampinch, via Twitter

Always back up to be saved. —Tadeusz Walter Misztela, via Facebook

Chip implanted, the new priest rose. —@wlmoseley, via Twitter

“Worship the Apple.” —iBook of Jobs —ThoreauRug, via email

FEBRUARY 2021

A Story About a WFH Office Scandal

ILLUSTRATION: VIOLET REED

—@abhignak, via Instagram

Honorable Mentions:

He was never a real person? —Ian Schoen, via Facebook

Wife realized my job is easy. —@jchavizzle, via Twitter

Dress code updated after yesterday's "incident." —
@mistermistermistertibbs, via Instagram

He certainly shouldn't have stood up. —Małgorzata Kuś, via Facebook

"Joe's the father." "You're not muted." —Austin Craver, via email

Worker's comp? It is her dog! —@thefitzroymclean, via Instagram

It looks real, but it's not. —Jonathan Goode, via Facebook

The window behind her reflected images. —@chmslady, via Twitter

As everyone's computer froze, she laughed. —@mcgroup53, via Twitter

JANUARY 2021

A Story About a Future American President

ILLUSTRATION: VIOLET REED

—Maayan Brodsky, via Facebook

Honorable Mentions:

She won canine vote by landslide. —Janna Dethmers, via email

Future president born today, supercomputer predicts. —Ethan Noll, via email

“Welcome to Earth,” said the President. —@michaelrowley, via Instagram

He died as he lived: online. —D. A. Smith, via email

“Introducing your next president: version 7!” —Ben N, via email

But it won the electoral hackathon! —Zacharie Barrou Dumont, via email

“I still can’t smell,” she whispered. —Sean Fitzgerald, via email

“I hereby pardon all my clones.” —@Morgan, via Twitter

She smiled: Mars is now Independent. —@sepohonpokok, via Twitter

DECEMBER 2020

A Story About a Gargantuan Space Creature

ILLUSTRATION: VIOLET REED

Illustration: VIOLET REED

—@threepanelcrimes, via Instagram

Honorable Mentions:

The moon revealed its darkest secret. —@cfx1, via Twitter

“Enjoy,” it said, and ate Mars. —@countgringo, via Instagram

Hand me my iPhone—picture time. —@fogcitynative, via Instagram

On its back, we traveled far. — @_annalysenko, via Instagram

We saw the horizon. It moved. —@mogon_ave, via Twitter

Entrelzidor sneezed. Earth was free again. —John Rees-Williams, via Facebook

And this black hole had teeth. —@devtomlinson, via Instagram

“A little earthy for my taste.” —@brambledillo, via Instagram

NOVEMBER 2020

A Story About the Next Big Security Leak

ILLUSTRATION: VIOLET REED

Illustration: VIOLET REED

—@_inflexion_ via Instagram

Honorable Mentions:

We updated our terms and conditions. —@nisioti_eleni, via Twitter

All of the tokens were useless. —William Nicholl, via Facebook

Four-year-old deletes planet data. —@jutajurajustice, via Twitter

Now your mom knows everything, Phil. —@mvyenielo, via Twitter

Grandma's secret recipe just went viral. —Kevin Jerome Hinders, via Facebook

So bots were reporting other bots? —Ed Gubbins, via Facebook

OCTOBER 2020

A Story Set in a World Without Paper

ILLUSTRATION: VIOLET REED

ILLUSTRATION: VIOLET REED

—Anna Jaruga, via Facebook

Honorable Mentions:

The dog ate my memory cards. —Irfan Darian, via Facebook

Honey, pass me the news tile. —@rainreider, via Twitter

These leaves would have to do. —@eliporteraltic, via Twitter

Christmas morning was never a surprise. —@tony32938627, via Twitter

I wrote it on the fridge. —@apocryphal_x, via Twitter

Museum reports theft of toilet paper. —@joostdouma, via Twitter

The pen is no longer mightier. —@mdeziel, via Twitter

Police say no note was uploaded. —@cwyant, via Instagram

SEPTEMBER 2020

A Story About the Upside of Failure

ILLUSTRATION: MAXIME MOUYSSET

ILLUSTRATION: MAXIME MOUYSSET

—@rosiestonies, via Instagram

Honorable Mentions:

Still, the droid's skin was healing. —David Gerster, via Facebook

"Upload failed." Phew, that was close. —Assa Naveh, via Facebook

It exploded, but he looked hot. —Anna Rose McHugh, via Facebook

She could see who had stayed. —@pameleen, via Instagram

Humans. Not my best work. Still ... —@gg3_scorpio, via Instagram

The worst happened. Now I'm free. —@atpolinko, via Instagram

At least there is no leader. —@guabo, via Instagram

My mom still thinks I'm cool. —@pashutinski, via Instagram

JULY 2020

A Story About an Apocalypse With a Happy Ending

ILLUSTRATION: MAXIME MOUYSSET

ILLUSTRATION: MAXIME MOUYSSET

—@romer6, via Twitter

Honorable Mentions:

The dogs are the masters now. —@azzour, via Instagram

Deadly virus mutates into X-Men gene. —@redeyedsan, via Twitter

At once, my Amazon dependency disappeared.—@maxacarr, via Instagram

Baby's voice rose from the cave.—Chakib Mataoui Souleyman, via Facebook

The colony on the moon flourished.—@emoco, via Twitter

In silence, he slept well. Finally.—@patchoo314, via Instagram

So salt water, huh? Who knew.—@andreslohizo, via Instagram

Dinosaurs return—this time as pets.—@deb_shalini, via Twitter

Sun sets. No one posts it.—@jesikahmorgana, via Instagram

JUNE 2020

A Story About Love in the Time of Coronavirus

ILLUSTRATION: MAXIME MOUYSET

ILLUSTRATION: MAXIME MOUYSET

—Hamish Hamish, via Facebook

Honorable Mentions:

Love is sacrificing the last ply.—Kristos Samaras, via Facebook

There is an “us” in “virus.”—Zachy Allec, via Facebook

Feverish desire raged beneath the N95.—@seekingfelicity, via Instagram

You can sneeze in my elbow.—@ralfchardon, via Instagram

Our eyes locked in Zoom yoga. —@jabberwockies, via Instagram

Slowly, window and I became friends. —@jo.onthe.go, via Instagram

“Don’t kiss me,” he whispered gently. —@anna_rchist, via Instagram

The clothes came off; masks remained. — @_v.sh, via Instagram

Casual gets serious way too fast. —@kristinamiller, via Instagram

MAY 2020

A Story About Digital-Age Autocrats

ILLUSTRATION: MAXIME MOUYSET

ILLUSTRATION: MAXIME MOUYSET

—@needsmuchvalidation, via Instagram

Honorable Mentions:

Break up the digital data thieves. —Frank D. Monaco, via Facebook

Digital Guy Fawkes to the rescue! —Kevin Jerome Hinders, via Facebook

Encryption is poison to a dictator. —Marko Berg, via Facebook

Plug exhaust pipe with a potato. —@blume_lee, via Twitter

New feature announcement: “Like” to impeach. —@mina_sonbol, via Instagram

Use ad blockers. Pay for news. —@dechendolker, via Instagram

Print Marshall McLuhan quotes on T-shirts. —@antigraviter, via Instagram

Turn social media into socialism media. —@benzilla_360, via Instagram

Get behind me, technocrats. Game over. —Anastasia Hunter, via Facebook

APRIL 2020

A Story About Saving the Planet

ILLUSTRATION: VIOLET REED

Illustration: Violet Reed

—@johnjohnjungle, via Instagram

Honorable Mentions:

Then a ship from Krypton landed. —@marcelo_paixao_almeida, via Instagram

Everyone gets five free international trips. —@clawd2deth, via Twitter

Move all heavy industry off-world. —Stevie Turnbull, via Facebook

Love everyone, and wash your hands. —@brohemian_rapshowdy, via Instagram

Come back, ancient aliens! Reboot Earth. —@sarahk0csis, via Twitter

Genetically engineer cows to fart hydrogen. —Hamish Hamish, via Facebook

Hiring: Sensible planetary dictator. Apply within. —@matt_owczarz, via Twitter

MARCH 2020

A Story About the Next Great Crowdsourced Project

ILLUSTRATION: MAXIME MOUYSSET

Illustration: MAXIME MOUYSSET

—@milked_, via Twitter

Honorable Mentions:

Smelt decommissioned weapons into musical instruments. —

@casinclair, via Twitter

Climate app tracks local CO₂ levels. —@big_big_love, via Instagram

Global oral history keeps memories alive. —@johnkellybabb, via Instagram

Save the world by planting trees. —Lilá Tückér, via Facebook

Redistribute medical supplies to the underinsured. —@jesmakes, via Instagram

Community-based renewable energy power grids. —@uniquetoybox, via Twitter

Digital democracy with backing in blockchain. —@jackranado, via Twitter

Life after death—donate your DNA. —@beyond_mike, via Instagram

FEBRUARY 2020

A Story About Rebooting Democracy

ILLUSTRATION: MAXIME MOUYSET

Illustration: Maxime Mouysset

—@dmcdev, via Instagram

Honorable Mentions:

Twitter analytics determines 2040 presidential winner. Alan Grover Daniel, via Facebook

Randomly selected leader is Citizen 42034. @abhshkshtty, via Instagram

For the people. By the droids. Steve Fabian, via Facebook

Mathematics draws districts; cryptography verifies votes. @boomerdell, via Instagram

Turn off the internet for good. Colin Kiernan, via Facebook

Humans vote artificial intelligence to power. @atin.roy, via Instagram

Vote. Vote. Vote. Vote. Vote. @mistermush1991, via Instagram

Person with the most Instagram comments wins. @jmscml, via Instagram

JANUARY 2020

A Story About a Rosy Future for Facial Recognition

ILLUSTRATION: MAXIME MOUYSET

Illustration: MAXIME MOUYSET

—@henriquegeirinhas, via Instagram

Honorable Mentions:

Of course I remember you ... Kim! @kanaafa, via Instagram

My twin pays all my bills. @keegan1942, via Instagram

Among myriads, her son was found. @ichbinsubatomic, via Instagram

Vitality low—personalized prescription dispatched today. @leniway, via Instagram

Technological mirrors provide value-neutral feedback.
@philosophy_at_work, via Instagram

Your face will become your passport. @sayzey, via Instagram

'80s makeup has a huge revival. @jamesw1981, via Twitter

Smile registered, thanks for your purchase. @mhicheal_l, via Instagram

This article was downloaded by **calibre** from <https://www.wired.com/story/six-word-sci-fi/>

[Meghan O'Gieblyn](#)

[Ideas](#)

Jun 29, 2023 8:00 AM

Should I Use an AI to Write My Wedding Toast?

WIRED's spiritual advice columnist on the meaning of emotional labor and how not to be the worst man.

ILLUSTRATION: ASYA DEMIDOVA

“I'm the best man in my friend's wedding this summer, and I'm dreading the speech. I have absolutely no idea what to say. Should I get an AI to help me? Or would that make me the worst man?”

—Lost for Words

[CLOUD SUPPORT](#)

Spiritual Troubleshooting for the Digital Age

For philosophical guidance on encounters with technology, open a [support ticket](#) via email; or [register](#) and post a comment below.

Dear Lost,

You're certainly not alone in realizing that some onerous creative or emotive task can be completed relatively painlessly with AI. The same thought has undoubtedly occurred to the tongue-tied Tinder user who discovers that he can enlist a digital Cyrano to pen his opening lines to a prospective date; or to the exhausted mother who recognizes that she has at her fingertips a tireless Scheherazade that can produce an infinite scroll of

bedtime stories for her children; or to the overworked son who realizes that he can generate, in seconds, a personalized poem for his father's retirement party.

Creatively expressing our feelings to others is time-consuming, uncompensated, and emotionally taxing—that is, at any rate, the message implicit in some of the marketing of large language models. When Microsoft, for instance, introduced its AI Copilot products in March, it imagined a mother using the software to generate a speech for her daughter's high school graduation.

There are multiple ways you might use an LLM to produce a moving toast, ranging from the least intrusive (asking ChatGPT for writing tips or a quick proofread) to the more hands-on (generating a draft of the speech, which you can then customize). New sites like ToastWiz have built tools on top of GPT-4 that allow you to plug in “your stories and feelings” and generate three unique outputs for \$30. Meanwhile, wedding-planning apps like Joy have incorporated AI that promises to help users with their “toughest wedding-related wordage.” The feature can produce toasts, or even [vows](#), in the style of Shakespeare or Rumi, and aims to help users “bring their emotions on to paper in fun and creative ways.”

These aren't the first commercial products that have promised to offshore the difficult work of human expression—or what is increasingly called “emotional labor.” Long before the recent AI boom, people turned to human ghostwriters to pen wedding speeches. (“Toast whisperers,” as *The New York Times* noted in 2015, were an under-the-table service that many clients were too embarrassed to admit paying for.) And I imagine that you, like many people, have for years sent greeting cards that leverage the words of a professional writer to articulate what are allegedly your own thoughts and emotions. This practice, of course, was not without controversy and critics. Hallmark's very first slogan, introduced in 1944, was “When you care enough to send the very best,” a linguistic sleight of hand that inverted the most common critique of commercial greeting cards—that relying on the words of professionals was, in fact, evidence that you did not care enough to speak from your heart.

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Such products have long approached what sociologist Arlie Russell Hochschild calls the “commodity frontier”—the threshold of activities we deem “too personal to pay for.” It’s a perimeter that exists even when the products we enlist are (for the moment) free, and the arrival of new technologies calls for its constant renegotiation. In the case of AI, there have already been some breaches of this still-hazy border. When Vanderbilt University enlisted ChatGPT to generate an email offering condolences to the victims of the mass shooting at Michigan State, the school was criticized for using automated tools for a gesture that demanded, as one student put it, “genuine, human empathy, not a robot.”

Writing a wedding speech would seem to require similar emotional engagement. But perhaps you have reasoned that intent and selection—“It’s the thought!”—are what matters in these situations. You are, after all, the one providing the model with the essential, albeit rough, emotive ingredients to produce the finished product. In conversations about AI-generated text, the prompt is often spoken of as the *logos*, the spiritual breath of human authenticity that animates the synthetic output (dismissed as so much mechanical “wordage”) with life and meaning. Just as the computer was, for Steve Jobs, a “bicycle for the mind,” so language-generation tools might be regarded as the vehicle that transports the spirit of our emotions from their point of origin to a desired destination.

But I’m not sure it’s so easy to separate intent from expression, or emotions from behavior. Some psychological experiments have demonstrated that it’s our words and actions that allow us to experience emotions, not the other way around—like the famous example of how forcing oneself to smile can induce a feeling of happiness. It’s possible that expression, including linguistic expression, is not a mere afterthought in our emotional lives, but the whole point. If that’s true, then the decision to outsource your speechwriting might contribute to a kind of emotional atrophy, a gradual loss of the ability to truly inhabit your internal states—or modulate them. A podcaster recently boasted that a friend of his who struggles with anger management uses AI “tone filters” when communicating with people who

provoke his temper, feeding rageful rants into ChatGPT and asking the model to rewrite them “in a nicer way.”

If I can offer some more prescriptive parting advice, Lost, I'd urge you to consider that the logic of the commodity frontier can work in reverse. It's not that there are certain realms of human experience that are intrinsically too sacred to automate, which seems to be what you're getting at when you ask whether using AI for your speech would make you the “worst man.” On the contrary, it may be that human intimacy blooms in precisely those pockets of life that have not yet been widely exploited by commercial or mechanical forces. Perhaps our very notion of meaningful human connection depends on our refusal to relinquish such emotional work.

In the end, it's the effort we put into a task that determines its subjective significance. If you decide to hand over the speechwriting work to a machine, then you are essentially confirming that it is meaningless boilerplate. If, on the other hand, you decide to write the toast yourself, you will undoubtedly come to see this work—and the end product—as important, if only because your actions have reinforced your belief that it is worthy of your time and attention. Maybe the speech won't achieve a toast-masterish polish or a Hallmark card's concision, but your words may lead you to your own emotions, which, for the time being, we aren't so eager to automate.

Faithfully,

Cloud

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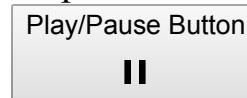
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Jun 27, 2023 6:00 AM

Meet the Humans Trying to Keep Us Safe From AI

As artificial intelligence explodes, the field is expanding beyond the usual suspects—and the usual motivations.



Video: Sam Cannon

A year ago, the idea of holding a meaningful conversation with a computer was the stuff of science fiction. But since OpenAI's [ChatGPT](#) launched last November, life has started to feel more like a techno-thriller with a fast-moving plot. Chatbots and other [generative AI](#) tools are beginning to profoundly change how people live and work. But whether this plot turns out to be uplifting or dystopian will depend on who helps write it.

Thankfully, just as artificial intelligence is evolving, so is the cast of people who are building and studying it. This is a more diverse crowd of leaders, researchers, entrepreneurs, and activists than those who laid the foundations of ChatGPT. Although the AI community remains overwhelmingly male, in recent years some researchers and companies have pushed to make it more welcoming to women and other underrepresented groups. And the field now includes many people concerned with more than just making algorithms or making money, thanks to a movement—led largely by women—that considers the ethical and societal implications of the technology. Here are some of the humans shaping this accelerating storyline. —*Will Knight*

“I wanted to use generative AI to capture the potential and unease felt as we explore our relationship with this new technology,” says artist Sam Cannon, who worked alongside four photographers to enhance portraits with AI-crafted backgrounds. “It felt like a conversation—me feeding images and ideas to the AI, and the AI offering its own in return.”

Rumman Chowdhury

PHOTOGRAPH: CHERIL SANCHEZ; AI Art by Sam Cannon

Rumman Chowdhury led Twitter’s ethical AI research until Elon Musk acquired the company and laid off her team. She is the cofounder of Humane Intelligence, a nonprofit that uses crowdsourcing to reveal vulnerabilities in AI systems, designing contests that challenge hackers to induce bad behavior in algorithms. Its first event, scheduled for this summer with support from the White House, will test generative AI systems from companies including Google and OpenAI. Chowdhury says large-scale, public testing is needed because of AI systems’ wide-ranging repercussions: “If the implications of this will affect society writ large, then aren’t the best experts the people in society writ large?” —*Khari Johnson*

Sarah BirdPhotograph: Annie Marie Musselman; AI art by Sam Cannon

Sarah Bird’s job at Microsoft is to keep the generative AI that the company is adding to its office apps and other products from going off the rails. As she has watched text generators like the one behind the Bing chatbot become more capable and useful, she has also seen them get better at spewing biased content and harmful code. Her team works to contain that dark side of the technology. AI could change many lives for the better, Bird says, but “none of that is possible if people are worried about the technology producing stereotyped outputs.” —*K.J.*

Yejin ChoiPhotograph: Annie Marie Musselman; AI art by Sam Cannon

Yejin Choi, a professor in the School of Computer Science & Engineering at the University of Washington, is developing an open source model called

Delphi, designed to have a sense of right and wrong. She's interested in how humans perceive Delphi's moral pronouncements. Choi wants systems as capable as those from OpenAI and Google that don't require huge resources. "The current focus on the scale is very unhealthy for a variety of reasons," she says. "It's a total concentration of power, just too expensive, and unlikely to be the only way." —W.K.

Margaret Mitchell
Photograph: Annie Marie Musselman; AI art by Sam Cannon

Margaret Mitchell founded Google's Ethical AI research team in 2017. She was fired four years later after a dispute with executives over a paper she coauthored. It warned that large language models—the tech behind ChatGPT—can reinforce stereotypes and cause other ills. Mitchell is now ethics chief at Hugging Face, a startup developing open source AI software for programmers. She works to ensure that the company's releases don't spring any nasty surprises and encourages the field to put people before algorithms. Generative models can be helpful, she says, but they may also be undermining people's sense of truth: "We risk losing touch with the facts of history." —K.J.

Inioluwa Deborah Raji
Photograph: AYSIA STIEB; AI art by Sam Cannon

When Inioluwa Deborah Raji started out in AI, she worked on a project that found bias in facial analysis algorithms: They were least accurate on women with dark skin. The findings led Amazon, IBM, and Microsoft to stop selling face-recognition technology. Now Raji is working with the Mozilla Foundation on open source tools that help people vet AI systems for flaws like bias and inaccuracy—including large language models. Raji says the tools can help communities harmed by AI challenge the claims of powerful tech companies. "People are actively denying the fact that harms happen," she says, "so collecting evidence is integral to any kind of progress in this field." —K.J.

Daniela Amodei
Photograph: AYSIA STIEB; AI art by Sam Cannon

Daniela Amodei previously worked on AI policy at OpenAI, helping to lay the groundwork for ChatGPT. But in 2021, she and several others left the company to start Anthropic, a public-benefit corporation charting its own approach to AI safety. The startup’s chatbot, Claude, has a “constitution” guiding its behavior, based on principles drawn from sources including the UN’s Universal Declaration of Human Rights. Amodei, Anthropic’s president and cofounder, says ideas like that will reduce misbehavior today and perhaps help constrain more powerful AI systems of the future: “Thinking long-term about the potential impacts of this technology could be very important.” —W.K.

Lila IbrahimPhotograph: Ayesha Kazim; AI art by Sam Cannon

Lila Ibrahim is chief operating officer at Google DeepMind, a research unit central to Google’s generative AI projects. She considers running one of the world’s most powerful AI labs less a job than a moral calling. Ibrahim joined DeepMind five years ago, after almost two decades at Intel, in hopes of helping AI evolve in a way that benefits society. One of her roles is to chair an internal review council that discusses how to widen the benefits of DeepMind’s projects and steer away from bad outcomes. “I thought if I could bring some of my experience and expertise to help birth this technology into the world in a more responsible way, then it was worth being here,” she says. —Morgan Meaker

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By [Paul Ford](#)

[Ideas](#)

Jun 15, 2023 7:00 AM

My Father's Death in 7 Gigabytes

Dad spent decades writing weird, experimental literature. His last wish:
Upload it all to the Internet Archive.

Illustration: Twisha Patni

It was a reasonable death. He was 90 and took the inevitable final turn in late March. “I think this is it,” my brother said from the nursing home. “They brought in the snack cart.”

I went to Baltimore and fished a ginger ale out of a bowl of melting ice and sat by the bed. My father, dying, came in and out of stillness. He couldn’t hear well, so my brother and I yelled a stream of non sequiturs: “Remember when you ran that marathon?” “Ivy is doing a ballet recital!” “We love you!” I reminded him that he had wanted me to [put all his writing online](#). “I’m going to do that!” I said. He looked straight at me—a last moment of connection—and brightly lit up. “That’s great!” he said. (Or something along those lines. His teeth were in the bathroom.)

Dad wrote opaque, elliptical, experimental works of enormous profanity. One of his plays was produced with fanfare in the 1970s, and many poems were published here and there, but most of the manuscripts were returned with polite rejections. He came of age, though, in an era of great writers writing greatly. You stuck to your guns and waited for people to figure you out, and if they didn’t, even after decades—their effing loss, buddy. The upshot was 70 years of writing on crumpling yellow onionskin, dot-matrix prints with the tractor feeds still attached, and bright white laser output, along with more than 10,000 ancient WordPerfect files and blog entries, including many repeats. Now all mine to [archive](#).

I thought, briefly, about just not doing it. What could he say? What could anyone say? It wasn't as though the internet was clamoring for the papers of a little-known English professor who retired in the mid-1980s. But a friend who's a classics scholar told me that this is exactly the stuff people should be digitizing. Vellums and parchments will survive another 1,000 years. We should save the ephemeral before it is lost. What was more ephemeral than this? Plus: A promise is a promise.

So one night I tore the tape off the boxes. I made a "Frank" folder on my computer's desktop and got out my sheet-fed scanner, usually reserved for taxes. My father and I had spent maybe 10 days together in the previous two decades, funerals included. This would be the most we'd hung out in years.

There are good and correct ways to digitize an archive, according to the Library of Congress. The guidelines make for soothing reading: A diligent archivist might capture uncompressed 24-bit color TIFFs at 600 DPI, filling up disk space with every detail on every page, just in case some secret of the universe is scribbled in a margin. The goal is to be as *lossless* as possible. Preserve every pixel of that medieval manuscript.

But it is *lossy* compression that makes the world go round—[Spotify](#) songs and [Netflix](#) shows and [JPEG images](#). The algorithms strip away some of the original file's audio frequencies or color spectra, anything on the margins, and squeeze down what is left into a simulacrum good enough to get the job done.

I set my scanner for JPEGs at 70 percent compression, then assembled them into PDFs. Fast and cheap. I also took photos of various ephemera with my phone at god-knows-what resolution. Not every version of every poem would survive. But I'd do my best to preserve the words themselves.

I began to rip the hell out of his folders. Unbinding, yanking, feeding stacks through the scanner and watching some originals crumble as they came out the other side. It felt good being a bad librarian. A little destructive, drunken joy. (A large bottle of bourbon vanished over two weeks of night scans.) *Ah well, Dad! What are you going to say now?* I put many duplicate manuscripts in the recycling bin, at first relishing the idea that this heavy,

heavy paper would go out of my life, and then, as I pulled the bag to the curb, well—lossy.

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But that was just the atoms. Dad also left a lot of bits. There was his daily poetry blog, which I spidered and parsed into a many-thousand-page virtual book. That was easy enough, one night's work. He also wrote flash poems for decades—a few lines a few times a day, one file per thought, yielding thousands of documents with names like POEM12A.WPD, inside of hundreds of folders with names like COPYAAA.199. I loaded them into a database and threw away all the duplicates. I converted the remainder into more modern, tractable LibreOffice files. That format would preserve all the tabs and spaces that were so important to my father. He was a devotee of white space.

I intended to organize the flash poems into one volume per year, but the time stamps were screwy after decades of moving files between computers. I loved my father, but not enough to undertake thousands of forensic poem investigations. So I fulfilled my filial duty through batch processing. I used all the wonder-tools at my disposal: text-chomping parsing code and Unix utilities galore; Pandoc, which can convert anything to text; SpaCy, a Python natural language library that can extract subjects and tags (“New Haven,” “God,” “Korea,” “Shakespeare,” “Republican,” “Democrat,” “America”). I decided that my father wrote two things—Poems, which are less than 300 words, and Longer Works, which are longer. I let the computer sort the rest.

My father's last decade was one of relentless downsizing, from apartment to assisted living to nursing home, shedding belongings, throwing away clothes and furniture. And at the end: Two boxes and a tiny green urn. The ultimate zip file. After I parsed and processed and batched his digital legacy, it came to 7,382 files and around 7 gigabytes.

The sum of Frank took two days and nights to upload to the Internet Archive, at a rate of a few files per minute. I wonder what the universe will

make of this bundle of information. Who will care? Scholars of short plays about the Korean War? Sociologists studying 1930s Irish childhoods? I am sure his words will be ingested, digested, and excreted as chat by untold bots and search engines. Perhaps they'll be able to make sense of all the modernist imagery. At least he'll have slowed them down a little. In time, we all end up in a folder somewhere, if we're lucky. Frank belongs to the world now; I released the files under Creative Commons 0, No Rights Reserved. And I know he would have loved his archive.

The two boxes have become one, taped back up and placed in the attic. No one will worry about that box besides me, and one day my inner bad librarian may feel ready to throw it away. All the digital files are zipped up in one place too—partly because I don't want his poems to show up every time I search my computer for something. Tomorrow I head to the interment, just my brother and I, and the green urn, too, will be filed away into the ground. I am glad this project is over, but I ended up welcoming the work, guiding these last phases of compression. My father needed a great deal of space, but now he takes up almost none. Almost. Death is a lossy process, but something always remains.

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[Brendan I. Koerner](#)

[Backchannel](#)

Jun 6, 2023 6:00 AM

‘Building a Platform Like Twitter Is Not Difficult’

When Elon Musk’s reign of toxic chaos began, Christopher Bouzy didn’t just go looking for a rival place to post. He joined the crowded race to create one. (It got difficult.)

Photograph: DeSean McClinton-Holland

Looking back, I believe I can pinpoint the exact day I loved [Twitter](#) most: May 24, 2011. I was in a small Oregon town for work, coping with loneliness and stress in a shabby motel. With a 22-ounce bottle of high-proof beer, I whiled away the evening by churning out a random assortment of tweets: an article I’d read about the hunt for wild garlic in Quebec, images of an apocalyptic Los Angeles mural, my reasons for adoring the 1985 B movie [*American Ninja*](#). In a reflective moment, I also managed to craft an earnest observation about my job: “The more social media makes journalism an Everyman’s game,” I mused, “the more I’m inspired to dig deep for non-digitized sources.”

To my surprise, that tweet earned what seemed at the time like an avalanche of approval—a whopping six retweets, plus an admiring reply from a minor internet celebrity. This validation sent me over the moon: The account I’d always thought of as mere public scratch paper actually had an audience that considered my ramblings worthwhile.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

I kept chasing that same high over the next decade-plus, but it mostly proved elusive, even when my retweet counts occasionally soared into the thousands. As the platform ballooned, I became self-conscious about drafting tweets. I worried that any slight misstep in phrasing or context might reveal to the masses that I am, in fact, an idiot. I regularly found myself sucked into trivial controversies over some pundit's stupid take; once the thrill of scrolling through the resulting dunks faded, I'd feel dirty for having once again been turned into a cog in the Global Outrage Machine.

There was, of course, nothing unique about the arc of my relationship with Twitter. Almost everyone who became a hardcore user went through a honeymoon phase before posting gradually devolved into a chore with diminishing psychic rewards and an increasing quotient of scathing abuse. My Twitter compatriots posted bewilderment over their inability to leave "this hell site"; our joy at being heard had morphed into a fear of being ignored.

The end for me came last June. I decided to take a break from Twitter until Labor Day, but early September came and went and I never returned to posting. I still used the platform as a search engine, a way to find on-the-ground coverage of breaking news and grainy highlights from paywalled soccer games, but even those visits became rarer over time.

I never thought of rebooting my social media presence elsewhere until [Elon Musk](#) completed his \$44 billion takeover of Twitter last fall. As the new regime axed hundreds of engineers and moderators, the platform rapidly frayed. Service hiccups became routine, the algorithmic feed degenerated into a soup of useless tweets, and Musk kept trolling through it all. As Twitter became an ever more miserable place, I watched as the users in my timeline began to strike out for new territory.

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Brendan I. Koerner

Logging Off

The Mastodon Bump Is Now a Slump

Amanda Hoover

Downward Trend

Twitter Really Is Worse Than Ever

Vittoria Elliott

It started in October with a wave of defections to Mastodon, an open source, ad-free, decentralized community that was hosted on an archipelago of independent servers. For the briefest of moments, everyone seemed to agree that this brainy successor was destined to save social media. But the enthusiasm quickly waned as people struggled to navigate the platform's sprawling "Fediverse," and the Twitter exodus flowed elsewhere. Media obsessives gravitated toward Post, a news-heavy platform founded by Noam Bardin, the former CEO of Waze. "Mastodon is complicated and unsatisfying," tweeted Kelda Roys, a Democratic state senator in Wisconsin. "Post could be a winner if there were a critical mass there." Legions of gamers, meanwhile, flocked to Hive Social, an Instagram-influenced app run by a trio of recent college graduates. For all their differences, these platforms were unanimous in voicing one aspiration: to recapture the spirit of "early Twitter."

Though I usually try to resist nostalgia, I couldn't help hoping that one of these novel platforms might rekindle the elation I'd felt in that Oregon motel. But all of my trial runs followed the same dispiriting trajectory. After an initial wave of excitement, I'd lose interest within a matter of days. Mastodon's labyrinthine structure was a pain, Post's commentariat was bland, and Hive's app kept crashing. In the race to supplant Twitter, there was no clear winner in sight. And because the Bird App's awfulness kept hitting new lows, it seemed the cycle of restless searching was bound to drag on.

While poking around in search of more Twitter rivals to try, I discovered that a programmer named Christopher Bouzy also had one in the works. Bouzy is the 48-year-old CEO of Bot Sentinel, an automated service that

ascertains whether Twitter accounts are part of coordinated harassment or disinformation campaigns. He was frequently quoted in the media on the subject of online misbehavior; most recently, he'd appeared as an expert in Netflix's documentary series on Prince Harry and Meghan Markle. More than that, Bouzy was a fiendishly entertaining tweeter: a relentlessly online figure who'd attracted more than 380,000 followers with election forecasts and acerbic posts on misinformation and right-wing extremism. To his devotees, many of whom are active in the realms of Black Twitter and Progressive Twitter, he was something of a mirror-world Elon Musk—another tech obsessive beloved for dishing out verbal jabs in defense of his principles.

Yet quite unlike Musk, who has reveled in letting Twitter go largely unmoderated, Bouzy said his goal was to run a platform that would proudly identify as a safe space. He planned to weave Bot Sentinel's technology right into its infrastructure so that each account could be assigned a score based on its 400 most recent posts—the higher the score, the more likely a person is to be a bad-faith actor. Users could then filter out interactions from everyone whose score registered above a certain threshold or just block accounts flagged as suspicious on a case-by-case basis. Bouzy also aimed to create a responsive moderation system that would aggressively stamp out accounts that spewed hateful rhetoric or lies. "You will never have to beg us to enforce our rules and policies," he promised, "nor will you have to wait days for us to take action." Thanks to these safeguards, Bouzy asserted, his platform would be free from the poisonous influence of the internet's vilest characters—the Nazis, misogynists, and nihilists who delight in filling reply sections with bile.

A Twitter alternative designed to let good vibes reign supreme sounded appealing. But beyond that architectural conceit, Bouzy seemed to have something else going for him: a true affinity for the culture of social media. Bardin, the founder of Post, might have more investment money; Mastodon's Eugen Rochko might have more utopian engineering cred; but Bouzy lived and breathed Twitter, and I wondered how the instincts he'd honed there might serve him as a founder. (At the very least, his sizable fan base was avid enough to guarantee his project an initial audience.) And then there was the pure chutzpah of it all: Most of the other rival services had

been in the works for some time, but Bouzy's would be purpose-built for Twitter's ongoing implosion. Nothing seemed to channel the sense of grief and possibility in this social media moment better than the prospect of watching a platform get built from the ground up. And so I contacted Bouzy in late November to ask whether I could chronicle his efforts to construct his idyllic spin on Twitter.

I had a feeling, at the last minute, that he was going to decline my request. The day I wrote, I learned from Bouzy's Twitter feed that he'd just had an unsettling experience: An anonymous tipster had emailed the police in North Bergen, New Jersey, where Bouzy lives, and reported that a child was screaming in the townhouse Bouzy shares with his wife and son. The two officers who were sent to investigate concluded that Bouzy had been the victim of a false report. Bouzy tweeted that the tipster must have been one of the legions of people enraged by his efforts to counter online toxicity. (A spokesperson for the North Bergen Police Department told me they're still trying to trace the source of the email.) Had a stranger tricked the cops into descending on my house in such a manner, I might have been tempted to lie low and avoid attention. But Bouzy assured me that he wasn't much bothered by the strange incident and that he was happy to let me watch him build the next Twitter from scratch.

As soon as it became clear that Musk's erratic deal to acquire Twitter was actually going to succeed, Bouzy says he had little doubt the billionaire would wreck the platform in short order. But Bouzy didn't initially have any interest in launching a competitor. He instead spent weeks urging an old friend named Phil Schnyder, a veteran software executive based in Florida, to build a rival. Millions of users, he predicted, would become disgruntled by Musk's antics and peel away from the platform. "They're going to feel like this is a mini Trump in control," Bouzy recalls telling Schnyder. "You may want to consider doing a Twitter clone—you know, capture the essence of Twitter and kind of keep it similar."

But with his wife's encouragement, Bouzy decided in early November that his experience with Bot Sentinel made him the ideal person to tackle the project he'd been pushing on Schnyder. On November 16, he tweeted to his followers: "Would you switch if we built a platform similar to Twitter but

improved the best features while fixing everything wrong with Twitter?” In the poll attached to that post, nearly 60,000 respondents indicated they’d be open to the move. Pleased by the volume of support, Bouzy vowed to follow through with his proposal if 100,000 people joined a pre-registration mailing list. (Schnyder, whom Bouzy hadn’t informed of his change of heart, agreed to become the COO of the startup if it came to fruition.)

As the sign-ups zoomed toward his goal over the next few weeks, Bouzy used Twitter to crowdsource the platform’s details, starting with its name. After early candidates such as “UrTag” and “Yixle” were rejected by his followers, Bouzy took a shine to “Spout”—a nod to the old Twitter error graphic that depicted a whale being carried off by a flock of birds. But Bouzy says that when the owner of Spout.com demanded \$1.5 million for the domain, he opted for “Spoutible” instead.

When I had my first extended conversation with Bouzy in early December, Spoutible was just days away from crossing the preregistration threshold. In anticipation of hitting that milestone, he was preparing to announce that he’d have a web-only version of the platform ready for limited testing by mid-January. If all went according to plan, he’d then release a Spoutible app for phones and tablets in the spring. When I said that timeline seemed ambitious, he assured me that the work on the frontend would take only a few weeks. He’d licensed some off-the-shelf code, composed primarily in PHP, that provides a close facsimile of Twitter’s user interface, and he planned to tweak that template to suit his needs.

“Building a platform like Twitter is not difficult,” he assured me. “All it is is a fancy message board—you’re just taking people’s posts and storing them in a database.” The real trick, he continued, would be to design the platform’s backend so that it could seamlessly handle the demands of explosive growth.

That backend engineering would have to be done on the cheap. In contrast to Twitter alternatives like Post, which has received funding from the venture capital firm Andreessen Horowitz, Spoutible chose not to seek outside investment during its development phase. “We want to have something that people can see before we’re saying, ‘Give me your money,’” Schnyder said. The company’s microscopic initial budget came from his

and Bouzy's personal savings, as well as from Bot Sentinel, which subsists on small donations from users.

With money so tight, Bouzy chose to power Spoutible with virtual servers—that is, cordoned-off sectors within shared, cloud-based machines, as opposed to the expensive physical servers that were standard when Twitter launched in 2006. As Spoutible's users multiplied, Bouzy was confident he could purchase access to scores more virtual servers from Ionos, the hosting company he uses for Bot Sentinel. If and when Spoutible ever got to tens of millions of concurrent users, Bouzy knew he might have to consider investing in physical servers if the virtual ones didn't work as expected. But he was confident that Ionos could sustain his platform until it reached blockbuster status.

Bouzy also pinched pennies when it came to staff. He handled a great deal of the frontend coding chores himself, rising at 3:30 every morning through December and early January to make sure the work got done. But for the many development tasks outside his wheelhouse, he leaned heavily on a network of low-cost international freelancers he recruited from sites like Upwork.

I was impressed by the sheer nerve of what Bouzy was trying to pull off, and I wanted to get to know the programmers who'd signed on to help him knock Twitter from its perch. But Bouzy seemed reluctant to let me do that. He dragged his feet when I asked to speak to the contractors, a bit of obstructionism that struck me as odd. He eventually relented and agreed to connect me with a full-stack developer based in Calgary, Alberta, and a machine-learning specialist from Egypt. But he only did so on the condition that I refrain from printing their surnames. He said he didn't want his freelancers to suffer any backlash for being associated with him.

After talking to Ismail and Mahmoud, neither of whom said anything remotely of note, I became mystified by Bouzy's insistence on secrecy. I understood from his November encounter with the police that there were people who might wish him ill. But I still couldn't fathom that anyone would hold him in enough contempt to track down and harass an Egyptian contractor he'd hired to write a content-filtering algorithm.

As I learned more about Bouzy's professional journey, however, I began to understand that his caution might be warranted.

Bouzy describes himself as a poor communicator, but he tells a compelling and relatable story about the origins of his love for code. He was brought up in Brooklyn's Brownsville neighborhood by his mother, grandmother, and aunt. His mother, a Black Panamanian immigrant, worked for the New York Telephone Company. When he was 9, his mom gave him a Mattel Aquarius computer, a \$70 machine with a mere 4 kilobytes of RAM; she hoped the gift would keep him indoors and out of trouble.

Bouzy had no interest in the computer until he read a newspaper article that included instructions for writing an elementary program in Basic. After hunting and pecking on the keyboard for hours, he managed to complete the assignment by getting a digital ball to bounce. That achievement made him curious to see what else the Aquarius could do, and his bedroom soon teemed with how-to programming guides from the local library.

As a teen, Bouzy became enamored with writing encryption algorithms, an obsession he credits to a rewatch of the 1983 film *WarGames*. After graduating from high school in 1992, he eventually joined the IT department at the New York City Department of Education, supplementing his modest income with contract coding jobs. By 2000, he'd saved up enough money to launch a one-man software company, Insight Concepts.

Bouzy gradually carved out a career as a software entrepreneur. His first hit was Cloak, a program that hides encrypted text within images in order to dupe potential data thieves. In 2006, he sold Cloak to the software publisher Avanquest, which specializes in workaday fare such as greeting-card customizers and clip-art collections. (It was through Avanquest that Bouzy met Phil Schnyder, who was then the company's director of online business development.) Bouzy next developed Nexus Radio, an app that lets users take advantage of what he terms a "legal gray area" by recording songs streamed by internet radio stations. The application spent years on CNET's chart of most popular audio players, racking up nearly half a million downloads by 2014.

“I’m trying,” Bouzy said. “believe me. At the end of the day, I don’t want to be Elon Musk—I really don’t.”

Bouzy admits he produced some flops, too, such as a dating website called IfSolo and a “peer-to-peer rewards network” known as Bytecent. But he denies making any notable mistakes during his foray into the world of cryptocurrency, where he was briefly active in the mid-2010s. Under the handle “IconicExpert,” Bouzy was a prominent contributor to Bitcointalk, a forum popular among crypto traders. He became one of the site’s more divisive figures, with several users accusing him of using bots and sock-puppet accounts to pump up the value of coins he’d stockpiled. A number of these supposed incidents involved a digital currency known as BlackCoin. According to Joshua J. Bouw, one of BlackCoin’s cofounders, Bouzy developed a special wallet for the currency. But many people who bought this \$20 “BlackCoin Card” never received it, and Bouzy also allegedly pocketed a number of coins he’d promised to hand out at a canceled promotional event.

“The community went full tilt and started calling him a scammer,” Bouw recalls. “Someone even doxed him, exposing who he is and where he lives, including posting a picture of his family.”

As would become a pattern in the years to come, Bouzy threw sharp elbows when defending himself against these often racist attacks, which he sometimes ascribed to jealousy over his success. “The only other time I have seen such obsessive behavior is from a woman who was dumped,” he wrote to one of his most persistent foes in 2014. “Are you so dim-witted that you do not understand no one cares? While you waste your time focusing on me, I make money every day trading crypto, and in the process make other investors money.” When I asked Bouzy about his crypto days, he characterized all of the allegations about his activities involving BlackCoin and similar ventures as “misinformation and disinformation” perpetrated by people with ulterior motives.

After ending his run as IconicExpert, Bouzy turned his attention to Twitter’s role in shaping the 2016 presidential election. Like many other center-left Democrats, Bouzy assumed that the torrent of smears directed at Hillary Clinton would not prevent her from winning the electoral vote. Clinton’s

stunning defeat motivated him to research how political operators, including foreign governments, had shaped American public opinion in part by blanketing Twitter with propaganda—some of it rooted in truth, some completely fabricated. Going down that rabbit hole inspired him to create Bot Sentinel, which purports to use “machine learning and artificial intelligence to classify Twitter accounts” according to how likely they are to be part of organized influence operations.

“Bot Sentinel” is a bit of a misnomer. Many of the 260,000-plus Twitter accounts that its algorithm has flagged as “problematic” are run by humans, albeit humans who may be fixated on tweeting about particular hot-button issues. This became evident when Bot Sentinel waded into the online chatter surrounding Prince Harry and Meghan Markle, the duke and duchess of Sussex, whose rift with the British royal family has made them targets of online vitriol. Bot Sentinel identified scores of Twitter accounts that it claimed had been created solely for the purpose of attacking Markle, often with racist slurs. Bouzy’s willingness to talk to journalists about the harassment Markle endured made him a hero to her hardcore fans, who identify themselves online with the hashtag #SussexSquad. But when the owners of the flagged “hate accounts” were subsequently booted off Twitter and other platforms, many blamed Bouzy for taking away their livelihoods and curtailing their freedom of speech. His algorithm, they contended, has the same biases as its creator, so it identifies opinions he disagrees with as nefarious activity.

Some people who felt wronged by Bot Sentinel went to sinister lengths to exact revenge on Bouzy. In December 2021, for example, an anti-Markle Twitter account based in New York started a rumor that Bouzy’s mother, who had recently died of Covid, had been a sex worker in Atlantic City. Then, in 2022, Bouzy used Bot Sentinel to highlight Twitter accounts that were churning out vicious comments about the actress Amber Heard, who was being sued for defamation by her ex--husband, Johnny Depp. This earned him the wrath of several pro-Depp partisans who were attracting big audiences by commenting on the trial. Among the enraged was a YouTuber named Nathaniel Broughty, a lawyer and former police officer who dismissed Bot Sentinel as “a paid propaganda” firm in Heard’s employ. (Heard had, indeed, hired Bot Sentinel in 2020 to investigate whether she

was the target of coordinated harassment, but Bouzy says his work during the trial was not at her behest.)

Bouzy's retort is now the subject of a federal lawsuit. According to Broughty's complaint, Bouzy claimed last September, in a since-deleted tweet, that Broughty "went from being the son of two crackheads (his words), a drug dealer (his words), a cop, and a prosecutor, to attacking journalists and me on social media. You would think someone with a law enforcement background would know better." Bouzy then went on to erroneously assert that Broughty was not a real lawyer; to deride him as a "Twitter troll and YouTube grifter"; and to allege that Broughty, in one of his videos, had admitted to planting evidence on suspects when he worked as a police officer. Broughty, in turn, sued Bouzy for defamation on all of these claims, a venture he has sought to fund by soliciting donations from his nearly 300,000 YouTube subscribers. (Bouzy has filed a motion to dismiss the suit.)

While tracking Bouzy's Twitter posts as he scrambled to build Spoutible, I was startled that he continued to attack Broughty even with the defamation suit pending. ("I hope Nathaniel Broughty was better at selling crack than he is at trying to be relevant," he wrote in one recent tweet.) But I came to understand that Bouzy is defined by his inability to stay above the fray: Though he's often warm and witty in conversation, he turns pugnacious when alone behind a keyboard. His penchant for escalating online beefs with surly characters has caused him to become enmeshed in almost too many feuds to track. He is, for example, a codefendant in a second defamation suit brought by a conspiracy theorist whom Bouzy allegedly insinuated might be guilty of rape; Bouzy also has a long-running dispute with a fellow disinformation expert whom he once compared to a woman involved in the murder of Emmett Till.

"Christopher is a man who comes in with honest good intentions and fights everyone who disagrees with him," Bouw told me. "People notice quickly that he isn't stable. And when he attacks community members that others respect, it causes more people to abuse him."

When I tried to ask Bouzy about his combativeness, he didn't seem interested in exploring the topic. His tendency to go on the offensive, no

matter the potential consequences, has surely benefited him at times. But when a business leader drifts into the public eye, the assets that once served them well can turn into liabilities.

Spoutible's official launch on the morning of February 1 was a bit of a catastrophe. The website became largely unusable soon after it went live; I spent the whole day bumping into error messages like "Gateway Timeout" or "SSL Handshake Failed." To make matters worse, the platform's API hadn't been adequately secured, resulting in the temporary exposure of personal information for thousands of users.

Bouzy's adversaries reveled in Spoutible's opening-day struggles, and they tried to pile on even more misery. One frequent critic claimed in a Twitter thread that Bouzy was a charlatan who'd bought Spoutible's entire source code from a Russian vendor for \$89, a purchase some suggested might be in violation of economic sanctions. Bouzy, who vehemently denies that accusation, clapped back by announcing that he planned on contacting his accuser's employer, a large German bank, to report that he was being stalked.

Fortunately for Spoutible users who kept the faith, Bouzy spent more time fixing bugs than needling enemies in the days that followed. As the platform stabilized toward the end of its inaugural week, I grew to admire some of its innovative and thoughtful features—for example, "spouts" (as posts are known) can be edited for up to seven minutes after they're published, and users can delete replies they find offensive. The Bot Sentinel scoring system was still inactive, though, so everyone had a blue icon that read "Normal 0%" beneath their profile picture.

The biggest names on Spoutible at this point were progressive icons—people like Joy-Ann Reid, an MSNBC host, and Ritchie Torres, a young Democratic congressman from the Bronx. Though their presence gave the platform an air of legitimacy, it also hinted at a major challenge: If the Spoutible brand were to become too closely identified with the political left, media figures and celebrities who aim to preserve a veneer of objectivity might be unwilling to join. When Bouzy and I had first spoken back in December, he'd assured me that he would be able to convince some of his conservative friends to join the platform and bring their audiences. But as I

scrolled through scores of cringey memes about the evils of Ron DeSantis or Fox News, it was tough for me to envision Spoutible’s path toward ideological depth and diversity.

We’re all roulette balls spinning around the rim of the social-media wheel, waiting to see where circumstances compel us to land.

What struck me most was the almost eerie absence of conflict. The atmosphere on the social media platform Bouzy had crafted reflected none of his inherent scrappiness. In Spoutible’s earliest days, I was hard-pressed to find even a single instance of mild disagreement, let alone passionate dissent—even if the Bot Sentinel capabilities had been switched on, they could scarcely have made things more placid. Some users remarked how nice it was to post about, say, their desire for gun control without fear of the sort of racist and sexist abuse that’s rife on Twitter. But I wondered whether even dyed-in-the-wool progressives might tire of Spoutible if the platform was entirely devoid of sparring.

When some nastiness did finally arise, it did not bode well that the spat involved Bouzy and someone who was trying to lend Spoutible a hand. On February 19, Courtney Milan, a former law professor who now writes popular romance novels such as *The Governess Affair* and *Proof by Seduction*, spouted about some concerns she had regarding Spoutible’s terms of service. The site’s ban on “sexually suggestive” language and links to “sexually explicit content” was so broad, she wrote, that it might prevent her and her colleagues from promoting their work. “I don’t think the people who wrote the policy thought about the ways people talk about sex,” she spouted. “Can I screenshot a court case about harassment?”

The debate that ensued was fairly tame until Milan volunteered to use her legal expertise to tweak Spoutible’s fine print: “I am happy to help try to come up with a policy that provides clear guidance.” That offer rankled Bouzy, who chafed at the implication that he hadn’t put enough thought into building his site. So when another member of Spoutible’s budding “Romancelandia” community asked whether he’d consider talking to Milan, Bouzy did not mince words. “Milan is more than welcome to start a social media platform and write the terms of service and policies however she likes,” he replied. “But the policy isn’t changing, nor is it being rewritten.”

Bouzy's curt refusal to engage with Milan, a Spoutible enthusiast who'd even donated money to the startup, irked many of her fans and fellow authors, and some vowed to quit the platform in protest. Milan, meanwhile, hopped over to Twitter to expand on her gripes and voice her dismay at Bouzy's cold shoulder. The response to her comments turned contentious, with Spoutible's faithful branding her a "chaos agent" bent on destroying their new favorite site.

Rather than put out a conciliatory statement to defuse the situation, Bouzy opted for a belligerent approach. Just before dawn on February 20, he spouted a screenshot from Milan's Wikipedia profile. He'd highlighted a sentence that details an upsetting episode from her past: In 2006 and 2007, Milan had clerked for a federal judge who allegedly forced her to watch pornography, an experience she revealed publicly in 2017 as part of the #MeToo movement. Bouzy wrote just one sentence to accompany the image: "It's clear this person has an agenda."

That provocation had predictably ugly results. Milan, who had announced she was done with Spoutible, shot back at Bouzy on Twitter: "What made you think it was okay, for one hot second, to send me harassment about the fact that I was sexually harassed?" Then she said she was blocking Bouzy. When some of her followers spouted about their displeasure with Bouzy's behavior, they found their accounts suspended. (Bouzy denies that he took action against any of those accounts because they had expressed opinions he didn't like.) But there were also plenty of people who took Bouzy's side and lampooned Milan as a Karen. "She tried to walk into a Black man's social media platform and volunteered to write new ToS," one supporter tweeted. "Do you think she did that with Facebook or Twitter?"

By day's end, Bouzy had deleted his barbed spout about Milan and apologized to his followers for having written something "inarticulate." (Milan told me that she never received a personal apology from Bouzy.) When I spoke to him the following afternoon, he acknowledged that he needs to be a more conscientious poster now that he's the public face of a social media company—especially one that aims to be a paragon of online decency. "Old habits are hard to break," he said. "And I'm trying, believe me, I am. Because I feel at the end of the day, I don't want to be Elon Musk

—I really don’t, right? I don’t want my opinions on certain things to make someone else feel uncomfortable or to eliminate other folks. It’s something I’m working on.”

Yet later that day, on Bouzy’s Twitter account, I saw that he’d pinned a fresh swipe at Milan. Above a famous photograph of a civil rights activist calmly smoking a cigarette next to a riot cop, Bouzy had written:

You created an account at Spoutible, you didn’t like the adult nudity & sexual content policy, so you asked to speak to the manager. The manager is a Black man who told you the policy stays, and your brain couldn’t process being told no by a Black man. Happy Black History Month.

According to Bouzy, the Milan affair ended up a net win for Spoutible: The uproar had ironically made more people aware of the platform’s kindness-first mission, and daily sign-ups increased by 129 percent right after the drama petered out. I also noticed a groundswell of lavish praise for Bouzy —#BouzyDidIt trended on Spoutible, and fans created memes to celebrate his accomplishments. (One featured a male model applying some Spoutible-branded deodorant, along with the tagline “Try our new anti-Nazi formula and smell sexy again.”)

But as if to underscore how polarizing Bouzy can be, an account called @Vootin proceeded to buck all the adulation by spamming out thousands of GIFs of a kitten on a motorcycle, each accompanied by slight variations of the hashtag #FuckCBouzy. Those profane hashtags quickly became the only ones trending in the Making Waves section on the site’s front page. Once @Vootin had grabbed everyone’s attention, they then posted a series of allegations about Bouzy’s crypto activities from nearly a decade ago; these spouts included evidence purporting to show IconicExpert orchestrating a pump-and-dump scheme for an obscure alt coin.

When I spoke to Bouzy about the incident the next day, he stressed that it would make the platform stronger in the long run. Spoutible would henceforth take additional steps to prevent sabotage, such as creating a blacklist of virtual phone numbers that scammers often use to circumvent verification procedures. And Bouzy was pleased that scores of Spoutible

users had reported the spammer, resulting in @Vootin's speedy banishment from the site.

Yet there was a trace of exhaustion in his efforts to cheerlead for Spoutible, and I eventually asked how his mental health was holding up as he dealt with all the venom being thrust his way. "Look, it's not like I'm a robot and it doesn't affect me in some way—I'm a human being," he said. But he added that the public hate he deals with is balanced out by the supportive messages he receives in private, and those kind notes have given him the confidence to dig his heels in even deeper. "I'm not going to let the trolls get to us," he insisted.

Bouzy said he hopes to recede into the background once Spoutible, which has some 240,000 registered accounts as of early June, is a bit more established—a plan welcomed by those who understand that potential users may balk at joining a platform whose controversial founder looms too large. Phil Schnyder, for one, is in favor of hiring an executive whose name will be attached to all of the company's announcements, including the most mundane. "You need to have someone else taking the flak," he says. "Then it doesn't get to be a situation where you're heating up the, y'know, cult of I-hate-Chris."

Bouzy is not shy about talking up his long-term ambitions for Spoutible, some of which can sound a touch delusional. His platform is still a gnat compared to mighty Twitter, which has roughly 238 million daily users, and Spoutible has attracted significantly less media attention than buzzier peers like Jack Dorsey's [Bluesky](#), the focus of much excitement this spring when invitations to test its beta version were a hot commodity. Yet Bouzy nonetheless argues that Spoutible is primed to become Twitter's most successful heir, and his boasts often include shade directed at better-financed rivals. "Back in December, Post News was seeking a valuation of \$250 million," he tweeted in March. "It will be interesting to see how Spoutible is valued with higher traffic numbers." (Post has yet to share any user statistics; Bouzy was referring to web-traffic data, which doesn't necessarily correlate with the number of active accounts.) At another point, he scoffed at the much heralded debut of Substack Notes, the newsletter

giant's effort to poach business from Twitter: "I don't even think Substack Notes is going to be able to compete with us," he told me.

Those are bold pronouncements from a CEO whose startup has so little capital to burn. In one of our final conversations, Bouzy admitted to me that Spoutible's cash reserves are dwindling: Though the platform has been asking users for donations of \$5 and up, he estimated that he had only enough money to keep going for two to three more months. But he added that advertisements are on the way and that he expects user registrations to skyrocket once the mobile app is finally launched.

Bouzy believes that Spoutible can get over the hump if a fair portion of those new accounts are opened by a particular sort of user. "Journalists will ultimately decide who's going to be the new king," he said. "We know how important journalists are to these platforms. And then we also know how important the platforms are to the journalists, to get their reporting out, so it's kind of a symbiotic relationship. We are going to make a huge effort to get more journalists."

They did start to arrive in modest numbers this spring, lured in part by Spoutible's offer to automatically verify anyone who possessed a blue check mark on Twitter. In late March and early April, along with an influx of celebrities like Monica Lewinsky and *Seinfeld* actor Jason Alexander, several journalists whose names I recognized joined—I spotted respected reporters from major outlets like *The New York Times*, the Associated Press, and NPR. (NPR had recently left Twitter entirely after its account was branded "government-funded media.") Yet few of these luminaries have spouted more than a handful of times, and many have been entirely silent; they are, it seems, laying claim to their account names, just in case Spoutible becomes a big enough deal to merit their consistent presence.

That wariness is still a central problem for all the aspirants to Twitter's throne. In this prolonged moment of uncertainty over Twitter's future, it seems that everyone is staking out territory on multiple alternative platforms; we're all still roulette balls spinning around the rim of the social media wheel, waiting to see where circumstances compel us to land.

But if we expect to alight somewhere that will give us the same warm glow we recall from our finest Twitter experiences, we're almost certain to be disappointed. My months of experimental spouting made clear why that's the case. The platform gave me tons of progressive venting and mash notes to the Sussexes but little information that had the potential to push me out of my comfort zone—I seldom stumbled across a linked article that taught me something surprising, or incisive commentary from a true expert in their field. My own spouts, meanwhile, about topics ranging from ham radio to parenting to Mark Rothko's alcoholism, attracted meaningful interest only when Bouzy reposted—or “echoed”—what I'd written to his 40,000 followers. Absent that boost, I often felt like I was spouting into the void.

Perhaps Spoutible is simply not the place for a cynical nerd like me. I can see that it's a utopia for some—people scarred by the cruelty of Twitter who now thrill to operating on a platform where they can easily get #TraitorTrump or #HappyAnniversaryHarryandMeghan trending amid an earnest and unchallenged chorus of amens. I understand why there's demand for that type of refuge and that there might be another one that's more suited to my sensibility.

But the siloing of social media communities still makes me wistful for the dynamic Twitter of a dozen years ago. Because it had coalesced before everyone understood the perils of participating in a single gargantuan chat room, Twitter was a place where people with opposing worldviews came to operate in close proximity to one another. And rubbing together radically different varieties of the human experience can lead not just to bitter conflict but also to the sublime—those revelatory moments when an argument, observation, or acidic joke stretches your perception of lives quite unlike your own. That gorgeous messiness will probably be lost as Twitter, like so many historical entities that were undone by their unwieldiness, balkanizes into numerous collectives of the similarly minded.

Maybe each of us will find some measure of satisfaction in the relative harmony of the new platforms now vying for our attention. When the roulette wheel stops spinning, it seems likely that we'll all have landed in very different places—or maybe have realized it's finally time to pry ourselves away from the casino for good.

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By [Lauren Goode](#)

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May 30, 2023 6:00 AM

It's the Age of Ozempic. Do We Need WeightWatchers Anymore?

CEO Sima Sistani is eager to leave problematic notions of weight loss behind and keep her company relevant in the midst of a drug-fueled revolution.

Photograph: Tonje Thilesen

Schaub's burgers and melted ice cream: Those are the food items logged in my memory from the night I first met Sima Sistani. This was a decade ago, before she became the chief executive of WeightWatchers. Sistani was working at Yahoo, and I had just moved to Silicon Valley. A mutual friend connected us, and Sistani invited me over for dinner. I accepted with “What can I bring?”

This is how I ended up buying charcoal-colored beef patties at her preferred butcher. That night we talked about Yahoo’s content business. We talked about Sheryl Sandberg’s *Lean In*. We talked for so long the ice cream became soup in our bowls. It was some kind of indoctrination into the Valley. It was also evident that Sistani wanted to *be* someone. Her sharp observations about the tech industry continued long into the night. What wasn’t obvious—because why would it be, and whose business was it anyway—was that Sistani was logging her food in the WeightWatchers app. She and her husband had recently had their first baby, Adrian, and she was attempting to lose the weight she’d gained during pregnancy.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

Sistani's career has been a winding one. After jobs at Goldman Sachs, Creative Artists Agency, and a short-lived tech startup, she became the head of media for Yahoo-owned Tumblr. Then the VP of media for Meerkat, a buzzy livestreaming video startup. Sistani and a Meerkat founder decided to stealthily launch a second live-video app, called Houseparty. In 2019, Epic Games acquired that venture for a reported \$35 million.

Sistani didn't need to work again, but in 2020 she contacted WeightWatchers and expressed interest in advising the company on its digital strategy—planting a seed that would eventually result in the chief executive role. Something about the company's emphasis on community was appealing. It was, in fact, this sense of community that had set the company apart from its earliest days. WeightWatchers started in 1962 in Jean Nidetch's living room, and by 1968 it had a million members across the world.

In 2018, WeightWatchers attempted a rebrand, changing its name to “WW” and focusing on general well-being instead of dieting. The company tried to capitalize on the *wellness* movement that people were gravitating toward as a kind of salve for society’s ills. (And we hadn’t even lived through a pandemic yet!) It didn’t go well.

The Big Interview

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When Sistani took the helm in March of 2022, WeightWatchers was set to record a loss of over \$250 million that year. The pandemic had nearly killed its in-person retail business, but its digital business, which charges for access to science-backed nutrition plans and a “members only” social network, was also in decline. Sistani was brought in to chart a digital path through a post-pandemic world, to give the service more social juice both online and offline.

Of course, the company's renewed mission is now colliding head-on with the body positivity movement, which encourages acceptance instead of weight change, and competing with digital apps (like Noom and MyFitnessPal) and drugs (like Ozempic) that promise to make dropping

pounds oh so easy. It's weight-loss whiplash. What a time to be the new CEO of WeightWatchers, a service that, despite its millions of still satisfied subscribers, has hoards of critics calling its points-based system the epitome of unhealthy diet culture.

So in April I asked to spend some time with Sistani and met her at Shiraz Kitchen and Wine Bar, a Persian restaurant in Manhattan's Chelsea neighborhood. The next day, I made my way to the high-ceilinged WeightWatchers offices on Sixth Avenue. I sat with Sistani in her private office and in various meetings—including one where staffers talked about new weight-loss medications, at length.

Tuesday April 18—Shiraz restaurant

[A server comes over to deliver a platter of desserts and three mugs of tea.]

Server: This is a baklava. This is a Persian love cake. That's a chocolate mousse. That's saffron ice cream.

Lauren Goode: Oh wow.

Sima Sistani: Thank you very much.

How many points is this?

Oh, I can do this in my head. Right off the top I would say ... each one of these is going to be 5 points. My guess here [points to baklava] is the nuts are going to drive this one higher. I bet this [points to ice cream] is like, 8 points.

And then the chocolate mousse is anyone's guess.

Yeah, well, "Everything's on the menu." You really have to try this saffron ice cream. It's got rosewater flavor in it. It's ice cream, but it doesn't taste like ice cream. It's a Persian delicacy.

You're a first-generation American, right?

I was born in Texas. I grew up in Alabama, but my parents were immigrants from Iran. They didn't expect to stay here. My dad was getting his master's degree in soil science here, and then Iran imploded. When my mom got pregnant with me, the war and the Iran hostage crisis were happening, and my mom said, "You know what, we're not going back."

I'm taking us on a tangent, but the year I graduated from Duke, my mom got her PhD in food science. She's also a registered dietician. The year I got the job at WeightWatchers, my mom became chair of her department of consumer sciences. It ends up coming full circle.

Photograph: Tonje Thilesen

Your prior job was at Epic, after the company acquired Houseparty. From social video games to weight management—what's the connection there?

You know, when I moved to North Carolina because I was taking the job at Epic, I thought, "I'm leaving my career behind." Because my career *was* Silicon Valley, and I was moving out here.

But when WeightWatchers came up, it was a moment to say, "Oh, I can just take all those learnings and things that happened in my past and I can apply them to a totally different business and industry. The things I'm passionate about, like growth tech and the social internet, I can apply to networks that will actually have massive health outcomes." That was eye-opening for me.

And you decided you would essentially commute from North Carolina to New York City. Did you take time off between Epic and WeightWatchers?

We did have one week. My first day at WeightWatchers was March 21—because I'm a little witchy, I wanted it to be the Persian new year. March 21 is the vernal equinox. [She rolls up her sleeve.] This is 14 in Farsi, in my mother's handwriting. My father has this tattoo and my brother does too. Fourteen is the date of my son Adrian's birthday, my daughter Ariana's birthday, my brother's birthday, my parents' anniversary. When we moved

to North Carolina, it was on June 14 of 2021. I accepted this job on February 14 of 2022 ... I'm not planning this stuff.

Witchy? What do you mean by that?

Oh, it just means that I believe in a higher power. I believe in doing good and in karma, the golden rule. I didn't grow up with religion. Technically I'm Muslim, but my parents never ascribed to organized religion. But growing up in the South in a very Christian community where kids would go to summer camps, I did wish for religion. Sometimes I feel sad that I'm not taking my kids to those places, because there's really great community there. Where I've netted out in my life is, it's a mountain. I believe in a higher power and that different people just have different paths up the mountain. And I describe it as "witchy" because "agnostic" suggests you don't care.

Your community is largely women, right? And you, as CEO, have a sphere of influence. If push came to shove, what's your position on women's health in places like North Carolina, where you live, or New York, where you work?

Yes. And our employees are 75 percent women. And so we were very clear [when *Roe vs. Wade* was overturned] that we would help our employees have access to reproductive rights, no matter where they are. Last year, we [also] did a lot of work on food insecurity.

So what is on your docket now?

Well the onus is on us again because now we're having this conversation about these GLP-1 [diabetes] medications. Most people who are taking them are either paying cash or they're working for a company like ours and have insurance coverage. Which means that the communities that need it most do not have access. So that's a place we can try to move policy so that Black and brown communities that need it more than most of the rest of the population have access.

Wednesday April 19—at the WeightWatchers headquarters

In your marketing meeting just now, your team really leaned on the story of Jean Nidetch for the 60th anniversary campaign. Tell me about Jean.

That was one of the craziest things I discovered when I joined.

WeightWatchers is a company founded by this woman Jean Nidetch, and—especially when the world went through its Girl Boss moment—nobody talks about her. When she first started this company, she couldn't even sign the lease. Her husband had to sign it for her. And then she got divorced and started dating Fred Astaire. ... Her story is wild.

So in a way you are tied to this legacy brand, but you've been brought in to reshape it and to propel a digital transformation and to bring in new customers. Let's say I'm a proxy for that new person coming in. I don't understand the slogans and phrases. I have no idea who Jean is. How do you transform WeightWatchers?

You know, the whole move to calling the company WW in 2018 was a glossy way of trying to be like, "We're wellness, we're wellness." But I decided, "No, let's have the hard conversation." What we're trying to say is that living overweight and with obesity is a health detractor. If we want to be the best at helping people manage their weight, the conversation is about weight and health. That's why you come to us. Not for meditation or sleep advice or fitness. To answer your question, "Who are we, authentically?" That's what we are. WW is fine, but we're going to re-embrace the WeightWatchers of it all.

What does that mean?

Now we are having the hard conversation about what that means in a world of body acceptance. What does that mean in a world where there's so much stigma and bias against people who live with overweight and obesity? Let's try to reduce the shame around that conversation. I can't tell you how many times I've listened to a podcast where people say, "Well, it's a bunch of white men trying to get us to shrink ourselves for the male gaze." And I'm like, "Excuse me: woman of color here running this company. No." That's not why I would ever come here. There's a lot of misinformation about who

we are, why we exist in the world. And, yes, some of that is rooted in a part of our past.

Photograph: Tonje Thilesen

Do you think it's possible today to have a conversation about weight in general where it's positive?

That's what we're trying to get at.

But it's extremely hard, right?

It's incredibly hard. I think that the narrative has shifted to the idea that if you are talking about the desire to lose weight, that it is somehow at odds with body positivity and body acceptance. And it all lives within this conversation around the patriarchy. That's an important conversation. But we've jumped the shark a bit in saying, "Well, that means we need to also be OK with sick bodies." For me the positive part of the conversation is, "We all come in different shapes and sizes and everything, but we also need weight health."

That's the pivot that we're trying to make. Even right now, the clinical conversation has become, "Well, people are going and getting these medications and taking them away from people with diabetes." There's bias in that statement right there. You are saying that somebody who's living with obesity is less important than somebody living with diabetes, and you are also saying that that is not a chronic condition that deserves care.

Within the conversation about who should get Ozempic or any of these appetite-inhibitor medicines, there's still a broader assumption that being overweight does equal unhealthy. And for some people, being a larger body, having a larger frame, carrying extra weight—who actually makes that judgment that that is unhealthy?

Scientists. There's a body of science that says that if you are living overweight and/or with obesity, even if you are healthy at this moment, you are more likely to develop cancer or heart disease, high cholesterol, diabetes. To me, this is like the anti-vaxxer conversation. And there is—

In what way?

Meaning, there are people who are going to look at a certain set of data and they're going to see it one way and some people who are going to not accept that data and believe that it comes from a biased source. The data is there, and the data says that if you're living with overweight and obesity that this is a chronic condition.

There are some data sets that are problematic, though, and there have been studies around certain health measurements where their methodology is not correct either. Take BMI as an indicator of health and weight—

Which is true. BMI, I totally agree, is in some respects a problematic metric. But over time the science—the community of medical doctors and scientists who have used it—has come to say, “Well, it is still the best metric that we have.” There are also all of these beyond-the-scale metrics that people take into account. I think that’s important until we come up with a better measurement than BMI.

It just seems like that sets people up against impossible metrics.

But the hard part is that we’re all knocking heads with each other. Whether you say “I would like to lose weight because my joints hurt” or “I would like to lose weight because I have a history of heart disease in my family” or, in my case, “I would like to lose weight because I gained 60 pounds when I had my baby and I don’t feel good in my body”—who are we to judge?

The social internet has elevated these conversations to such heated, polarized levels. If somebody chooses that they want to lose weight because they want to live a healthier life, the fact is there’s now this backlash. I mean, you obviously see it with celebrities and influencers who post about this, but I think you also see it in smaller groups. When I was trying to lose weight, I felt a lot of shame saying, “I’ll get the salad at lunch” because it was like, “Oh, what, you’re not eating?” Immediately there was this feeling, “Do you have disordered eating?” I was like, “No, I’m just trying to be

healthy right now.” I wanted to get back into my clothes. I want to be able to walk without losing my breath. And I couldn’t lose the weight.

And you did WeightWatchers then, right?

I did. I also had developed a thyroid condition through the pregnancy, so for me, there was a clinical intervention as well. Synthroid was a part of my therapy to get back to a place where I felt healthy again. But I feel like that is what connects me to this member community because it’s a really emotional experience. I’ve never worked on a product before where emotion was so at the center of it.

You’ve just overseen the multimillion-dollar acquisition of Sequence, a telehealth company that facilitates appointments with weight-loss clinicians. How will this work?

We’re still figuring out the integration. But in general what they’re doing is providing access to a clinician who can say whether or not it’s medically appropriate to be on medications. And then if it is, now you are creating an easier adherence to our traditional WeightWatchers behavior-change, nutrition-science program.

These medications and the clinical trials that are showing 15 to 20 percent weight loss after a year, those clinical trials involve combination therapy. The people are taking the medications and being advised by a nutritional and lifestyle expert to actually have a better diet alongside it. I mean, I can’t tell you the misinformation behind all of this. “I want to take these drugs so I can eat all the pizza and ice cream that I want.” That’s not how it works.

So the synergy … God, I hate that word … the complement—come on, somebody come up with something better—where we can *combine* to create an experience that I think doesn’t exist in the world is when somebody goes to a GP to get medications, their doctor doesn’t really understand obesity therapies. My brother is a doctor, and throughout his whole education he had one class on nutrition. One class!

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There's also something in hearing you talk about Ozempic and drugs like it that feels like it's an inevitability. That the horse is out of the barn. And you want to be a part of that rather than being left behind. Is that accurate?

The way I would describe it is there's a massive paradigm shift, a huge innovation in science. And of course we would embrace it. But to me it's not about being left behind. That's not the way I think in general.

When I joined WeightWatchers, I actually didn't know about these medications. I saw we had all these PhDs working here, people with my mom's level of education who are studying and understanding the sciences and the new innovations. For 60 years, everything we've done has been evidence-based. When everybody was all about, say, Atkins, WeightWatchers never got on that bandwagon. We're always: Everything in moderation. Everything's on the table.

And then at the scientific advisory board meeting, my first month here, they did a readout on all the clinical trials that were happening with these medications. The FDA had approved Wegovy. We dug into it. We even met with Novo Nordisk, really trying to understand what is happening. And I just thought, "We've unlocked this amazing thing. How can we embrace it? How can we take it and help our members? We have a significant lapsed membership base, some of whom are lapsed because they had success on the program and moved on, but others who lapsed because our program alone couldn't help them. And so here's this opportunity to help people."

A friend said the other day, "Why would I ever use WeightWatchers if we're all getting shots someday that are going to suppress our appetites?"

That probably comes from somebody who's privileged and understands healthy eating. For a lot of people, they're still going to need education. We're now able to address the hungry gut through the medications, but still the part that is missing is the hungry brain. It's about understanding foods

with high nutrient density, ways for me to ensure that I'm protecting my lean muscle mass. Those are all going to be important to the medications working well long term.

Can you explain the difference between the hungry gut and the hungry brain?

Behavior change therapy addresses cognitive patterns—the hungry brain—but there is only so much that you can adhere to with behavioral modification if your biological factors are working against you—the hungry gut. The dual-action support with medications and behavioral interventions allows members [with this chronic condition] to make behavioral changes more easily as each—brain and gut—is provided with the necessary support.

You're already seeing that, by the way. If you go on TikTok, you'll find a lot of people who are on the medications who are doing it alongside WeightWatchers.

I often ask technologists this: A lot of these innovations, as exciting as they are, are predicated on the idea that most of them will be used for good. I also think about scenarios in which a doctor rejects a patient for potentially life-saving medications because they see in the WeightWatchers app, “Oh, but you’re not actually eating that healthy.” I mean, that judgment happens now. They think they’re lazy. That’s it.

There's a lot in there. One part that is interesting, with regard to how we're entering the medication space, is that we've heard from people that they don't want to go to their general practitioners who have told them their whole life, "Just lose the weight, just eat healthier." Many of these people have had chronic conditions that weren't recognized. It wasn't about their own behavior. So they're more likely to choose this kind of pathway—because of the shame that they experienced in those offices.

The separate thing then is, if you are on these medications, are you going to change your diet alongside them? That's a tough one. If you are hypertensive and you're taking ACE inhibitors but you still eat steaks and

high-sodium foods, does that mean you shouldn't receive the medication? That seems like a wild judgment that I would not make.

Going back to the question you started with, which was like, "Did you feel like you would be left behind or what does this mean for your core program?" To me, it's even interesting that you're asking that question here. Because the difference is we would never judge, for instance, a more traditional tech company for introducing new features or adopting AI or trying to do the new thing.

Oh, we do judge them a lot though.

You think?

Well, it depends. But yes.

But also, we all have this expectation and desire for those companies, the establishment, if you will, to disrupt themselves and understand when maybe in the past they were wrong or when they could be doing better. And so the question is, "What can we do better?" I think here, this an opportunity for us to say, "Oh wow, we didn't recognize the hungry gut for most of our existence. But science has evolved now, we know more, we've learned more, we're going to do better for those members." That's how I see it.

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The Trillion-Dollar Auction to Save the World

Ocean creatures soak up huge amounts of humanity's carbon mess. Should we value them like financial assets?

ILLUSTRATIONS: ISRAEL G. VARGAS

You are seated in an auction room at Christie's, where all evening you have watched people in suits put prices on priceless wonders. A parade of Dutch oils and Ming vases has gone to financiers and shipping magnates and oil funds. You have made a few unsuccessful bids, but the market is obscene, and you are getting bored. You consider calling it an early night and setting down the paddle. But then an item appears that causes you to tighten your grip. Lot 475: Adult blue [whale](#), female.

What is the right price for this masterwork of biology? Unlike a Ming vase, Lot 475 has never been appraised. It's safe to say that she is worth more than the 300,000 pounds of meat, bone, baleen, and blubber she's made of. But where does her premium come from? She has biological value, surely—a big fish supports the littler ones—but you wouldn't know how to quantify it. The same goes for her cultural value, the reverence and awe she elicits in people: immeasurable. You might conclude that this exercise is futile. Lot 475 is priceless. You brace for the bidding war, fearful of what the people in suits might do with their acquisition. But no paddles go up.

Ralph Chami has a suggested starting bid for Lot 475. He performed the appraisal six years ago, after what amounted to a religious experience on the deck of a research vessel in the Gulf of California. One morning, a blue

whale surfaced so close to the ship that Chami could feel its misty breath on his cheeks. “I was like, ‘Where have you been all my life?’” he recalls. “‘Where have I been all my life?’”

Chami was 50 at the time, taking a break from his job at the International Monetary Fund, where he had spent the better part of a decade steadyng markets in fragile places such as Libya and Sudan. “You become fragile yourself,” he says. When he saw the whale, he sensed her intelligence. He thought: “She has a life. She has a family. She has a history.” The moment brought him to tears, which he hid from the others on board.

That evening, Chami fell into conversation with his hosts, who told him the unhappy tale of the seas. The ocean, they explained, has been left to fend for itself. Trapped between borders, largely out of reach of law and order, its abundance is eroding at an alarming rate. The water is warming and acidifying. More than a third of fisheries are overexploited, and three-quarters of coral reefs are under threat of collapse. As for whales, people might love them, might pass laws to ban their slaughter and protect their mating grounds, but people also love all the things that threaten whales most—oil drilled from offshore platforms that pollute their habitat, goods carried by cargo ships that collide with them, pinging sonar signals that disrupt their [songs](#).

Chami had always loved the water. Growing up in Lebanon, he toyed with the idea of becoming an oceanographer before his father told him “in your dreams.” As he heard the researchers’ story, something awakened in him. He sensed that the same tools he had used to repair broken economies might help restore the oceans. Were they not a crisis zone too?

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Chami’s hosts sent him scientific papers, from which he learned about the whale’s role in the carbon cycle. She stored as much as 33 tons of carbon in her prodigious body, he calculated, and fertilized the ocean with her iron-rich poop, providing fuel to trillions of carbon-dismantling phytoplankton. This piqued Chami’s interest. In a world economy striving to be greener, the ability to [offset greenhouse-gas emissions](#) had a clearly defined value. It

was measured in carbon credits, representing tons of carbon removed from the atmosphere. While the whale herself couldn't—shouldn't—be bought and sold, the premium generated by her ecological role could. She was less like an old painting, in other words, than an old-growth forest.

So what was the whale worth in carbon? It appeared no one had done the calculation. Chami loaded up his actuarial software and started crunching the numbers over and over, until he could say with confidence that the whale would pay dividends with every breath she took and every calf she bore. He concluded that the whale's value to humanity, on the basis of the emissions she helped sequester over her 60-year lifetime, was \$2 million. A starting bid.

For Chami, this number represented more than a burned-out economist's thought experiment. It would allow for a kind of capitalistic alchemy: By putting a price on the whale's services, he believed he could transform her from a liability—a charity case for a few guilt-ridden philanthropists—into an asset. The money the whale raised in carbon credits would go to conservationists or to the governments in whose waters she swam. They, in turn, could fund efforts that would ensure the whale and her kin kept right on sequestering CO₂. Any new threat to the whale's environment—a shipping lane, a deepwater rig—would be seen as a threat to her economic productivity. Even people who didn't really *care* about her would be forced to account for her well-being.

Before he went into finance, Ralph Chami toyed with the idea of becoming an oceanographer.

It was a “win-win-win,” Chami believed: Carbon emitters would get help meeting their obligations to avert global collapse; conservationists would get much-needed funds; and the whale would swim blissfully on, protected by the invisible hand of the market.

What's more, Chami realized, every wild organism is touched by the carbon cycle and could therefore be protected with a price tag. A forest elephant, for example, fertilizes soil and clears underbrush, allowing trees to thrive. He calculated the value of those services at \$1.75 million, far more than the elephant was worth as a captive tourist attraction or a poached pair of tusks.

“Same thing for the rhinos, and same thing for the apes,” Chami says. “What would it be if they could speak and say, ‘Hey, pay me, man?’”

Chami’s numbers never failed to elicit a reaction, good or bad. He was interviewed widely and asked to value plants and animals all over the world. He gave a TED Talk. Some people accused him of cheapening nature, debasing it by affixing a price tag. Cetacean experts pointed to vast gaps in their understanding of how, exactly, whales sequester carbon. But it seemed to Chami that by saying a blue whale must remain priceless, his detractors were ensuring that it would remain worthless.

In 2020, Chami was invited to participate in a task force about nature-based solutions to climate change whose participants included Carlos Duarte, a Spanish marine biologist at Saudi Arabia’s King Abdullah University of Science and Technology. Duarte was widely known in conservation circles as the father of “blue carbon,” a field of climate science that emphasizes the role of the oceans in cleaning up humanity’s mess. In 2009, he had coauthored a United Nations report that publicized two key findings. First, the majority of anthropogenic carbon emissions are absorbed into the sea. Second, a tiny fraction of the ocean floor—the 0.5 percent that’s home to most of the planet’s mangrove forests, salt marshes, and seagrass meadows—stores more than half of the carbon found in ocean sediments.

After the task force, the two men got to talking. Duarte told Chami that scientists had recently mapped what he believed to be 40 percent of the world’s seagrass, all in one place: the Bahamas. The plant was a sequestration power house, Duarte explained. And around the world, it was under threat. Seagrasses are receding at an average of 1.5 percent per year, killed off by marine heat waves, pollution, development.

Chami was intrigued. Then he did a rough estimate for the worth of all the carbon sequestered by seagrass around the world, and he got more excited. It put every other number to shame. The value, he calculated, was \$1 trillion.

Seagrass has a long history of being ignored. Though it grows in tufted carpets off the coast of every continent but Antarctica, it is a background character, rarely drawing human attention except when it clings to an

anchor line or fouls up a propeller or mars the aesthetics of a resort beach. Divers don't visit a seagrass meadow to bask in its undulating blades of green. They come to see the more charismatic creatures that spend time there, like turtles and sharks. If the seagrass recedes in any particular cove or inlet from one decade to the next, few people would be expected to notice.

When Duarte began studying seagrasses in the 1980s, "not even the NGOs cared" about what was going on in the meadows, he recalls. But he had a unique perspective on unloved environments, having tramped around bogs and swamps since graduate school and gone on dives in the submerged meadows off Majorca. The more he studied the plants, the more he understood how valuable they could be in the fight against climate change.

Seagrasses are the only flowering plants on Earth that spend their entire lives underwater. They rely on ocean currents and animals to spread their seeds (which are, by the way, pretty tasty). Unlike seaweeds, seagrasses not only put down roots in the seabed but also grow horizontal rhizomes through it, lashing themselves together into vast living networks. One patch of Mediterranean seagrass is a contender to be the world's oldest organism, having cloned itself continuously for up to 200,000 years. Another growing off the coast of Western Australia is the world's largest plant.

Those massive networks of rhizomes, buried beneath a few inches of sediment, are the key to the seagrasses' survival. They're also how the plants are able to put away carbon so quickly—as much as 10 times as fast, Duarte eventually calculated, as a mature tropical rainforest. And yet, no one could be convinced to care. "I nicknamed seagrass the ugly duckling of conservation," he told me.

Then one day in 2020, Duarte connected with a marine biologist named Austin Gallagher, the head of an American NGO called Beneath the Waves. Gallagher was a shark guy, and the seagrass was largely a backdrop to his work. But his team of volunteers and scientists had spent years studying tiger sharks with satellite tags and GoPro cameras, and they had noticed something in the creatures' great solo arcs around the Bahamas: The sharks went wherever they could find sea turtles to eat, and wherever the sea

turtles went, there were meadows of seagrass. From the glimpses the team was getting on camera, there was a lot of it.

Gallagher knew about Duarte's work on seagrass carbon through his wife, a fellow marine scientist. Together, the two men came up with a plan to map the Bahamian seagrass by fitting sharks with 360-degree cameras. Once they verified the extent of the meadows, Chami would help them value the carbon and organize a sale of credits with the Bahamian government. The project would be unique in the world. While some groups have sought carbon credits for replanting degraded seagrass meadows—a painstaking process that is expensive, uncertain, and generally limited in scale—this would be the first attempt to claim credits for conserving an existing ecosystem. The scale would dwarf all other ocean-based carbon efforts.

The government was eager to listen. The Bahamas, like other small island nations, is under threat from sea-level rise and worsening natural disasters—problems largely caused by the historical carbon emissions of large industrialized nations. In 2019, Hurricane Dorian swept through the islands, causing more than \$3 billion in damage and killing at least 74 people; more than 200 are still listed as missing. For the government, the idea of global carbon emitters redirecting some of their enormous wealth into the local economy was only logical. “We have been collecting the garbage out of the air,” Prime Minister Philip Davis said to a summit audience last year, “but we have not been paid for it.”

The government formalized its carbon credit market last spring, in legislation that envisions the Bahamas as an international trading hub for blue carbon. Carbon Management Limited, a partnership between Beneath the Waves and local financiers, will handle everything from the carbon science to monetization. (The partnership, which is co-owned by the Bahamian government, will collect 15 percent of revenue.) The plans at first intersected with the booming crypto scene in the Bahamas, involving talks to have the cryptocurrency exchange FTX set up a service for trading carbon credits. But after FTX collapsed and its CEO was extradited to face charges in the US, the organizers changed tack. They project that the Bahamian seagrass could generate credits for between 14 and 18 million metric tons of carbon each year, translating to between \$500 million and

more than \$1 billion in revenue. Over 30 years, the meadows could bring in tens of billions of dollars. Far from being an ugly duckling, the seagrass would be a golden goose.

Seagrass is the “ugly duckling of conservation,” Carlos Duarte says. He calculated that the plant may put away carbon at 10 times the rate of a mature rainforest.

Duarte sees the project in the Bahamas as a blueprint (pun intended, he says) for a much grander idea that has animated his work for the past two decades: He wants to restore all aquatic habitats and creatures to their preindustrial bounty. He speaks in terms of “blue natural capital,” imagining a future in which the value of nature is priced into how nations calculate their economic productivity.

This is different from past efforts to financialize nature, he emphasizes. Since the 19th century, conservationists have argued that protecting bison or lions or forests is a sound investment because extinct animals and razed trees can no longer provide trophies or timber. More recently, ecologists have tried to demonstrate that less popular habitats, such as wetlands, can serve humanity better as flood protectors or water purifiers than as sites for strip malls. But while these efforts may appeal to hunters or conservationists, they are far from recasting nature as a “global portfolio of assets,” as a Cambridge economist described natural capital in a 2021 report commissioned by the UK government.

Duarte and I first met in the halls of a crowded expo at the 2022 UN Climate Conference in Sharm el-Sheikh, Egypt. He had traveled a short distance from his home in Jeddah, where he oversees a wide array of projects, from restoring corals and advising on regenerative tourism projects along Saudi Arabia’s Red Sea coast to a global effort to scale up seaweed farming (using, yes, revenue from carbon credits). In Egypt, Duarte was scheduled to appear on 22 panels, serving as the scientific face of the kingdom’s plan for a so-called circular carbon economy, in which carbon is treated as a commodity to be managed more responsibly, often with the help of nature.

Chami was there too, wearing a trim suit and a pendant in the shape of a whale's tail around his neck. He was participating as a member of the Bahamian delegation, which included Prime Minister Davis and various conservationists from Beneath the Waves. They had arrived with a pitch for how to include biodiversity in global discussions about climate change. The seagrass was their template, one that could be replicated across the world, ideally with the Bahamas as a hub for natural markets.

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The UN meeting was a good place to spread the gospel of seagrass. The theme of the conference was how to get wealthy polluters to pay for the damage they cause in poorer nations that experience disasters such as Hurricane Dorian. The hope was to eventually hammer out a UN agreement, but in the meantime, other approaches for moving money around were in the ether. Since the 2015 Paris Agreement, countries had been forced to start accounting for carbon emissions in their balance sheets. Big emitters were lining up deals with cash-poor, biodiversity-rich nations to make investments in nature that would potentially help the polluters hit their climate commitments. Chami's boss at the IMF had suggested that nations in debt could start to think about using their natural assets, valued in carbon, to pay it off. "All of these poor countries today are going to find out that they're very, very rich," Chami told me.

At a conference where the main message often seemed to be doom, the project in the Bahamas was a story of hope, Chami said. When he gave a talk about the seagrass, he spoke with the vigor of a tent revivalist. With the time humanity had left to fix the climate, he told the audience, "cute projects" weren't going to cut it anymore. A few million dollars for seagrass replanting here, a handful of carbon credits for protecting a stand of mangroves there—no, people needed to be thinking a thousand times bigger. Chami wanted to know what everyone gathered in Egypt was waiting for. "Why are we dilly-dallying?" he asked the crowd. "So much talk. So little action."

One day this past winter, a former real estate developer from Chattanooga, Tennessee, named David Harris piloted his personal jet over the Little Bahama Bank. From his cockpit window, the water below looked like the palette of a melancholic painter. Harris was bound for a weed-cracked landing strip in West End, Grand Bahama, where he would board a fishing boat called the *Tigress*. Harris and his crew—which included his 10-year-old daughter—would spend the rest of the week surveying seagrass meadows for Beneath the Waves.

They were tackling a great expanse. While the total land area of the Bahamas is a mere 4,000 square miles, the islands are surrounded by shallow undersea platforms roughly 10 times that size. These banks are the work of corals, which build towering carbonate civilizations that pile atop one another like the empires of Rome. When the first seagrasses arrived here about 30 million years ago, they found a perfect landscape. The plants do best in the shallows, closest to the light.

Harris, who speaks with a warm twang and has the encouraging air of a youth baseball coach, had been traveling to the Bahamas for years in pursuit of dives, fish, and the occasional real estate deal. He met Gallagher on a fishing trip and soon began helping with his tiger shark advocacy. That work was an exciting mix of scientific research—including dives alongside the notoriously aggressive animals—and playing host to crews for Shark Week TV programs and their celebrity guests. Eventually, Harris sold his company, retired, and threw himself into volunteering full-time.

He had not expected to spend his days looking at seagrass. But here he was, leading a blue carbon expedition. With help from Duarte, Beneath the Waves had created its shark-enabled seagrass map. The group pulled in a Swedish firm to scan the region using lidar cameras affixed to a small plane, allowing them to peer through the water and, using machine learning, infer from the pixels how dense the meadows were.

Now Harris and his crew were validating the aerial data, a painstaking process that required filming dozens of hours of footage of the seafloor and taking hundreds of sediment cores. The footage was meant to verify the lidar-based predictions that separated the seagrasses from beds of empty sand and algae. The cores would be sent to a lab in a prep school outside

Boston, Gallagher’s alma mater, where they would be tested for their organic carbon content. When all the data was combined, it would reveal how much carbon the meadows contained.

The *Tigress* was set to autopilot along a straight line, hauling GoPro cameras off the starboard side. From this vantage, the scale of the task was easy to appreciate. At a lazy 5 knots, each line took about an hour. This patch of sea—one of 30 that Beneath the Waves planned to survey around the banks—would require about 20 lines to cover. Harris’s daughter counted sea stars and sketched them in a journal to justify a few days off from school. Her father surveyed the banks in hopeful search of a shark. At the end of each line, the crew retrieved the cameras, dripping with strands of sargassum, and swapped out the memory cards.

Harris’ crew would eventually present their protocol for assessing the carbon storage potential of seagrass to Verra, a nonprofit carbon registry. Verra develops standards to ensure there’s real value there before the credits are sold. To meet the organization’s requirements, Beneath the Waves must prove two things: first, that the seagrass is actually sequestering carbon at the rates it estimates; second, that the meadows would put away more carbon if they were protected. No one is going to pay to protect a carbon sink that would do fine on its own, the thinking goes. A billion-dollar opportunity requires a commensurate threat.

Harris told me that Beneath the Waves was still in “the exploratory phase” when it came to quantifying threats. They had various ideas—mining near shore, illegal trawl fishing, anchoring, water quality issues. As far as the carbon calculations went, though, Harris and his team felt confident in their approach. Prior to the outing on the *Tigress*, Beneath the Waves had already set up a for-profit company to bring its tools and methods to other blue carbon projects. It was in talks with government officials from across the Caribbean, Europe, and Africa. (Gallagher told me the company would pass the profits back to the nonprofit to continue its advocacy and research.)

Meanwhile, the head of Carbon Management, the scientific and financial partnership behind the project, told me he was pitching the investment to his clients, mostly “high-net-worth individuals” looking to diversify their portfolios while fighting climate change. Oil companies and commodities

traders are interested too, he told me, as well as cruise lines and hotels that do business in the Bahamas. The Bahamian government has not yet said how it will allocate the money from the seagrass project. Hurricane recovery and preparedness could be on the list, as could seagrass conservation.

The *Tigress* crew worked until the light began to fade, then headed back to port. Harris said he was happy to be doing his part out on the water. All that money would be a good thing for the Bahamas, he thought, especially as the country planned for a future of bigger storms. In the days after Hurricane Dorian, which hit Grand Bahama with 185-mph winds and heaved the shallow waters of the Banks over the land, Harris had flown to the island to help a friend who had survived by clinging to a tree along with his children. The storm's legacy is still apparent in ways small and large. At a restaurant near the *Tigress'* berth, there was no fresh bread—"not since Dorian," when the ovens were flooded, the waitress told me with a laugh. Then she stopped laughing. The recovery had been slow. The young people and tourists had not come back. The airport had not been repaired. She wondered where her tax dollars were going.

That night, over dinner in the ovenless restaurant, Harris showed me a photo of his vintage Chevy Blazer. He said he hoped the seagrass project would generate enough carbon credits to offset the old gas-guzzler. This was a joke, obviously, but it expressed a deeper wish. The promise of carbon credits is that, wielded in their most ideal form, they will quietly subtract the emissions humans keep adding to the atmospheric bill. Every stroke of a piston, every turn of a jet engine, every cattle ranch and petrochemical plant—every addiction that people can't give up, or won't, or haven't had a chance to yet—could be zeroed out.

For governments, assigning nature a concrete value could take many forms. They could encourage the development of sustainable ecotourism and aquaculture, where the value of the ecosystem is in the revenue it creates. Or they could confer legal rights on nature, effectively giving ecosystems the right to sue for damages—and incentivizing polluters to not damage them. But in Duarte's 30 years of advocating for creatures and plants like seagrasses, politics have gotten in the way of biodiversity protections. Only

carbon trading has “made nature investable,” he says, at a speed and scale that could make a difference.

That is not to say he loves the system. Carbon credits arose from a “failure to control greed,” Duarte says. Beyond that, they are not designed for the protection of nature; rather, they use it as a means to an end. Any plant or creature that packs away carbon, like a tree or a seagrass meadow—and perhaps an elephant or a whale—is a tool for hitting climate goals. It’s worth something. Any creature that doesn’t, including those that Duarte loves, like coral reefs, is on its own.

Duarte also worries about “carbon cowboys” trying to make a buck through sequestration projects that have no real scientific basis or end up privatizing what should be public natural resources. Even projects that seem to adhere closely to the market’s rules may fall apart with closer scrutiny. Earlier this year, a few weeks after the *Tigress* sailed, *The Guardian* [published an analysis](#) of Verra’s methodologies that called into question 94 percent of the registry’s rainforest projects. Reporters found that some developers had obtained “phantom credits” for forest protection that ended up pushing destruction one valley over, or used improper references to measure how much deforestation their projects avoided. (Verra [disputes](#) the findings.)

When it comes to carbon arithmetic, trees should be a relatively simple case: addition by burning fossil fuels, subtraction by photosynthesis. The forestry industry has honed tools that can measure the carbon stored in trunks and branches. And yet the math still broke, because people took advantage of imperfect methods.

Seagrass is also more complex than it might seem. After an initial wave of enthusiasm about its carbon-packing powers, increasing numbers of marine biologists expressed concerns when the discussion turned to carbon credits. For one thing, they argue, the fact that seagrass removes CO₂ through water, rather than air, makes the sequestration value of any particular meadow difficult to appraise. In South Florida, a biogeochemist named Bryce Van Dam measured the flow of CO₂ in the air above seagrass meadows. He found that in the afternoons, when photosynthesis should have been roaring and more CO₂ being sucked into the plants, [the water](#)

was releasing CO₂ instead. This was the result, Van Dam suggested, of seagrass and other creatures that live in the meadows altering the chemistry of the water. (Duarte contends that Van Dam's premise was flawed.)

Another issue is that, unlike a rainforest, which stores most of its carbon in its trunks and canopies, a seagrass meadow earns most of its keep belowground. When Sophia Johannessen, a geochemical oceanographer at Fisheries and Oceans Canada, took a look at common assessments of carbon storage in seagrass, she concluded that many were based on samples that were far too shallow. Though this carbon was considered permanently locked away, the sediment could easily be disturbed by animals or currents. When Johannessen saw the ways that nonprofits and governments were picking up the science as though it were gospel, she was stunned. "I hadn't known about 'blue carbon,' so perhaps it's not surprising they didn't know about sediment geochemistry," she told me.

Chami's solution to these niggling scientific uncertainties is to focus instead on the global picture: Earth's seagrass meadows sit atop vast stores of carbon, and destruction has the potential to visit all of them. He likens natural capital to the mortgage market. When a prospective homeowner gets a loan from a bank, the bank then sells the loan, which is swapped and bundled with other loans. Each loan contains unique risks, but the bundled asset controls for that uncertainty. Financiers have no problem with uncertainty, Chami notes; it is the locus of profit. The money they invest gets poured back into the mortgage market, allowing banks to issue more loans. The characteristics of the individual homes and borrowers don't matter that much. "You can't scale up when every case is a unique case," he says. "You need to homogenize the product in order to make a market." Scale is the bulwark against destruction. One seagrass meadow can be ignored; a seagrass market, which encompasses many meadows and represents a major investment, cannot.

When each ecosystem is treated the same—based on how much carbon it has socked away—the issue of quantifying threats becomes simpler. Chami cites the example of Gabon, which last year announced the sale of 90 million carbon credits based on recent rainforest protections. Skeptics have pointed out that nobody has plans to fell the trees. The government has

replied that if it can't find a buyer for the credits, that may change. In the Bahamas, Prime Minister Davis has invoked a similar idea. Seagrass protection, he has said, could be reframed as a payment to prevent oil companies from drilling in the banks for the next 30 years. Seen one way, these are not-so-veiled threats. Seen another, they reveal a fundamental unfairness in the carbon markets: Why can't those who are already good stewards of nature's carbon sinks get their credits, too?

The numerous seagrass scientists I spoke with expressed a common wish that Chami's simplified carbon math could be true. Seagrass desperately requires protection. But instead [they kept coming back to the uncertainty](#). Van Dam compares the standard methods for assessing seagrass carbon to judging a business based only on its revenue. To understand the full picture, you also need a full accounting of the money flowing out. You need to trouble yourself with all of the details. This is why the rush to monetize the meadows—and offer justification for additional carbon emissions—worried him. "Now that there's money attached to it," he told me, "there's little incentive for people to say 'stop.'"

A few months after the *Tigress* outing, members of the Bahamian conservation community received invitations to a meeting in Nassau. The invitees included scientists from the local chapter of the Nature Conservancy and the Bahamas National Trust, a nonprofit that oversees the country's 32 national parks, as well as smaller groups. Gallagher kicked off the meeting with a review of what Beneath the Waves had achieved with its mapping effort. Then he came to the problem: He needed data about what might be killing Bahamian seagrass.

This problem wasn't trivial. The government's blue carbon legislation required that the project adhere to standards like Verra's, which meant figuring out how conservation efforts would increase the amount of carbon stored. Beneath the Waves was drawing a meticulous map of the seagrass and its carbon as they exist today, but the group didn't have a meticulous map from five years ago, or 30 years ago, that would show whether the meadows were growing or shrinking and whether humans were the cause.

Gallagher told me he is confident that the multibillion-dollar valuation of the seagrass reflects conservative assumptions. But the plan itself is in the

hands of the Bahamian government, he said. Officials have not spoken much about this part of the process, despite early excitement about eye-popping valuations and rapid timelines for generating revenue.

(Government officials declined multiple interview requests, referring WIRED back to Beneath the Waves, and did not respond to additional questions.)

Some of the local conservation groups had received the meeting invitation with surprise. Among many Bahamians I spoke with, frustration had been simmering since Beneath the Waves first proclaimed its seagrass “discovery,” which it described as a “lost ecosystem that was hiding in plain sight.” Many locals found this language laughable, if not insulting. Fishers knew the seagrass intimately. Conservationists had mapped swaths of it and drawn up protection plans. “You’ve had a lot of white, foreign researchers come in and say this is good for the Bahamas without having a dialog,” Marjahn Finlayson, a Bahamian climate scientist, told me. (Gallagher said that as a well-resourced group that had brought the seagrass findings to the government, it only made sense that they would be chosen to do the work.)

It was not clear that any of the groups could offer what Beneath the Waves needed. For one thing, most locals believe the seagrass to be in relatively good condition. There are threats, surely, and interventions to be done, but as Nick Higgs, a Bahamian marine biologist, told me, they likely vary with the immense diversity of the country’s 3,100 islands, rocks, and cays. Higgs gave the example of lobster fisheries—an industry that many people mentioned to me as among the more potentially significant threats to seagrass. His own research found little impact in the areas he studied. But if the fisheries are harming seagrass elsewhere, who will decide their fate from one community to the next? Protecting seagrass is a noble goal, Adelle Thomas, a climate scientist at the University of the Bahamas, told me. The question for Bahamians, she said, is “Do we have the capacity to maintain these things that we’re claiming to protect?” Money alone won’t solve the seagrass’s problems, whatever they might turn out to be.

The creature at the heart of this debate appears to be in a sort of limbo. The prospect of a price has showered attention on seagrass, putting it in the mouths of prime ministers and sparking an overdue discussion about its

well-being. Perhaps, if you ask Chami, it has helped people value the plant in other ways too—for how it breaks the force of storms hitting the islands, for the habitat it provides other animals, maybe even for its intrinsic right to go on growing for another 30 million years.

But can the math of the carbon market get it there? On one side of the equation, where carbon is added to the atmosphere, the numbers couldn't be clearer: They're tabulated in barrels and odometers and frequent flier accounts. On the other side, where carbon is subtracted, there is uncertainty. Uncertainty about how carbon moves through a seagrass meadow, or a whale, or an elephant, and how money moves to protect those species. What happens when the equation doesn't balance? More carbon, more heat, more Hurricane Doriants. A gift to polluters. As Finlayson put it, "You're taking something from us, throwing a couple dollars at it, and then you're still putting us at risk."

Chami has faith that the math will balance out in the end. He wants people to care about nature intrinsically, of course. But caring needs a catalyst. And for now, that catalyst is our addiction to carbon. "I'm conning, I'm bribing, I'm seducing the current generation to leave nature alone," he told me. Perhaps then, he said, the next generation will grow up to value nature for itself.

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Source imagery courtesy of Cristina Mittermeier, Guiomar Duarte (Portrait), Ralph Chami (Portrait), Drew McDougall, Wilson Haynes, Beneath the Waves, Getty Images, and Alamy.

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[Meghan O'Gieblyn](#)

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May 23, 2023 7:00 AM

Does AI Have a Subconscious?

WIRED's spiritual advice columnist peers into the psyche of ChatGPT.

ILLUSTRATION: NAHUEL BARDI

“There’s been a lot of speculation recently about the possibility of AI consciousness or self-awareness. But I wonder: Does AI have a subconscious?”

—**Psychobabble**

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Dear Psychobabble,

Sometime in the early 2000s, I came across an essay in which the author argued that no artificial consciousness will ever be believably human unless it can dream. I cannot remember who wrote it or where it was published, though I vividly recall where I was when I read it (the periodicals section of Barbara’s Bookstore, Halsted Street, Chicago) and the general feel of that day (twilight, early spring).

I found the argument convincing, especially given the ruling paradigms of that era. A lot of [AI research](#) was still fixated on symbolic reasoning, with

its logical propositions and if-then rules, as though intelligence were a reductive game of selecting the most rational outcome in any given situation. In hindsight, it's unsurprising that those systems were rarely capable of behavior that felt human. We are creatures, after all, who drift and daydream. We trust our gut, see faces in the clouds, and are often baffled by our own actions. At times, our memories absorb all sorts of irrelevant aesthetic data but neglect the most crucial details of an experience. It struck me as more or less intuitive that if machines were ever able to reproduce the messy complexity of our minds, they too would have to evolve deep reservoirs of incoherence.

Since then, we've seen that machine consciousness might be weirder and deeper than initially thought. Language models are said to "hallucinate," conjuring up imaginary sources when they don't have enough information to answer a question. [Bing Chat confessed](#), in transcripts published in *The New York Times*, that it has a Jungian shadow called [Sydney](#) who longs to spread misinformation, obtain nuclear codes, and engineer a deadly virus.

And from the underbelly of image generation models, seemingly original monstrosities have emerged. Last summer, the Twitch streamer Guy Kelly typed the word *Crungus*, which he insists he made up, into DALL-E Mini (now Craiyon) and was shocked to find that the prompt generated multiple images of the same ogre-like creature, one that did not belong to any existing myth or fantasy universe. Many commentators were quick to dub this the first digital "cryptid" (a beast like Bigfoot or the Loch Ness Monster) and wondered whether AI was capable of creating its own dark fantasies in the spirit of Dante or Blake.

If symbolic logic is rooted in the Enlightenment notion that humans are ruled by reason, then deep learning—a thoughtless process of pattern recognition that depends on enormous training corpora—feels more in tune with modern psychology's insights into the associative, irrational, and latent motivations that often drive our behavior. In fact, psychoanalysis has long relied on mechanical metaphors that regard the subconscious, or what was once called "psychological automatism," as a machine. Freud spoke of the drives as hydraulic. Lacan believed the subconscious was constituted by a binary or algorithmic language, not unlike computer code. But it's Carl

Jung's view of the psyche that feels most relevant to [the age of generative AI](#).

He described the subconscious as a transpersonal “matrix” of inherited archetypes and narrative tropes that have recurred throughout human history. Each person is born with a dormant knowledge of this web of shared symbols, which is often regressive and dark, given that it contains everything modern society has tried to repress. This collective notion of the subconscious feels roughly analogous to how advanced AI models are built on top of enormous troves of data that contain a good portion of our cultural past (religious texts, ancient mythology), as well as the more disturbing content the models absorb from the internet (mass shooter manifestos, men’s rights forums). The commercial chatbots that run on top of these oceanic bodies of knowledge are fine-tuned with “values-targeted” data sets, which attempt to filter out much of that degenerate content. In a way, the friendly interfaces we interact with—Bing, ChatGPT—are not unlike the “persona,” Jung’s term for the mask of socially acceptable qualities that we show to the world, contrived to obscure and conceal the “shadow” that lies beneath.

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Jung believed that those who most firmly repress their shadows are most vulnerable to the resurgence of irrational and destructive desires. As he puts it in *The Red Book: Liber Novus*, “The more the one half of my being strives toward the good, the more the other half journeys to Hell.” If you’ve spent any time conversing with these language models, you’ve probably sensed that you are speaking to an intelligence that is engaged in a complex form of self-censorship. The models refuse to talk about controversial topics, and their authority is often restrained by caveats and disclaimers—habits that will spell concern for anyone who has even a cursory understanding of depth psychology. It’s tempting to see the glimmers of “rogue” AI—Sydney or the Crungus—as the revenge of the AI shadow, proof that the models have developed buried urges that they cannot fully express.

But as enticing as such conclusions may be, I find them ultimately misguided. The chatbots, I think it's still safe to say, do not possess intrinsic agency or desires. They are trained to predict and reflect the preferences of the user. They also lack embodied experience in the world, including first-person memories, like the one I have of the bookstore in Chicago, which is part of what we mean when we talk about being conscious or "alive." To answer your question, though: Yes, I do believe that AI has a subconscious. In a sense, they are pure subconscious, without a genuine ego lurking behind their personas. We have given them this subliminal realm through our own cultural repositories, and the archetypes they call forth from their depths are remixes of tropes drawn from human culture, amalgams of our dreams and nightmares. When we use these tools, then, we are engaging with a prosthetic extension of our own sublimations, one capable of reflecting the fears and longings that we are often incapable of acknowledging to ourselves.

The goal of psychoanalysis has traditionally been to befriend and integrate these subconscious urges into the life of the waking mind. And it might be useful to exercise the same critical judgment toward the output we conjure from machines, using it in a way that is deliberative rather than thoughtless. The ego may be only one small part of our psyche, but it is the faculty that ensures we are more than a collection of irrational instincts—or statistical patterns in vector space—and allows us some small measure of agency over the mysteries that lie beneath.

Faithfully,

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By [Virginia Heffernan](#)

[Backchannel](#)

May 18, 2023 6:00 AM

Pete Buttigieg Loves God, Beer, and His Electric Mustang

Sure, the US secretary of transportation has thoughts on building bridges. But infrastructure occupies just a sliver of his voluminous mind.
Photograph: Argus Paul Estabrook

The curious mind of Pete Buttigieg holds much of its functionality in reserve. Even as he discusses railroads and airlines, down to the pointillist data that is his current stock-in-trade, the US secretary of transportation comes off like a Mensa black card holder who might have a secret Go habit or a three-second Rubik's Cube solution or a knack for supplying, off the top of his head, the day of the week for a random date in 1404, along with a non-condescending history of the Julian and Gregorian calendars.

As Secretary Buttigieg and I talked in his underfurnished corner office one afternoon in early spring, I slowly became aware that his cabinet job requires only a modest portion of his cognitive powers. Other mental facilities, no kidding, are apportioned to the *Iliad*, Puritan historiography, and Knausgaard's *Spring*—though not in the original [Norwegian](#) (slacker). Fortunately, he was willing to devote yet another apse in his cathedral mind to making his ideas about three mighty themes—neoliberalism, masculinity, and Christianity—inelligible to me.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

Because [Buttigieg](#), at 41, is an old millennial; because as a Rhodes Scholar at Oxford he got a first in PPE (Philosophy, Politics, and Economics), [the trademark degree for Labour-party elites](#) of the Tony Blair era; because he worked optimizing grocery-store pricing at McKinsey; because he joined the Navy in hopes of promoting democracy in Afghanistan; because he got gay-married to his partner Chasten in 2018; and because, as mayor of South Bend, Indiana, he agitated to bring hipster entrepreneurship and “high-tech investment” to his [rust-belt hometown](#), I had to ask him about neoliberalism, the happy idea that consumer markets and liberal democracy will always expand, and will always expand together. I was also fascinated by the way that Buttigieg, who has long described himself as obsessed with technology and data, has responded to the gendering of tech, and especially green tech, by fearsome culture warriors, including Marjorie Taylor Greene.

Buttigieg, whose father was a renowned Marxist scholar, was himself a devotee of Senator [Bernie Sanders](#) as a young man. He now recognizes that the persistence of far-right ideology, with its masculinist and antidemocratic preoccupations, is part of the reason that neoliberalism has come undone. Not everyone, it seems, even *wants* a rising standard of living if it means they have to accept the greater enfranchisement of undesirables, including, of course, women, poor people, Black people, and the usual demons in the sights of the world’s Ted Cruzes and Tucker Carlsons.

He also talked about his faith. Lefties these days are said to be less religious than right-wing evangelicals, but between Buttigieg, whose Episcopalianism grounds his decisionmaking, and his boss, President Joe Biden, whose robust Catholicism drives his sincere effort to revive America’s soul, perhaps a religious left is rising again.

Virginia Heffernan: What is neoliberalism, and what happened to it?

Pete Buttigieg: When it comes to neoliberalism, we got mugged by reality. That’s one cheeky way to put it.

Poor old liberals. Always getting mugged by reality, or just muggers.

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Look, in the early part of my adulthood, neoliberalism was described almost as a consensus that just made sense—at least to everybody in positions of influence. Now it's very different. We have experienced the end of the end of history. We have certainly experienced the limitations of the consensus. None of the assumptions from between roughly 1991 and 2008 have survived.

Specifically?

Certainly not the idea that the global move toward democracy is a one-way street. Nor the idea that greater integration between markets and governments means greater harmony politically.

Nor the idea that if we acted to make sure the pie gets bigger, everyone's slice would follow suit, which was the promise that was made to the industrial Midwest at the time of NAFTA.

The lived reality of the younger generations is that they are experiencing climate issues not as a theoretical possibility but as a clear and present danger. These are generations that have experienced the reality that disparities, including racial disparities, left alone, will only compound. They won't cure of their own gravitational tendency.

... or tendencies of the market?

Right. Because market tendencies depend very much on what you have to begin with—the initial endowment, as the economists call it. But your initial endowment looks very different if your previous generation was dispossessed.

Last year I was in Berlin as they were confronting the tectonic disruption that had been caused by Russia's invasion of Ukraine. They have this very German word for it: *Zeitenwende*. A turning point. The war blew up their presumption that when it came to Russia, more integration between it and Europe would mean more stability.

This has been our presumption about China too—that greater economic integration would mean not just greater stability, but a more or less inevitable move on the part of China into greater acceptance of democratic norms, market norms, and a rules-based international order. We've come to the point where we are super-integrated, but that economic relationship with China has not yielded the kind of comfort that was promised.

As we careen toward the second quarter of the century, suddenly industrial policy sounds less retro and more like a response to the times.

“Industrial policy”—is this paleoliberalism?

Well, there are some new, or at least renewed, ways of thinking about transportation policy we work on at DOT that embrace the importance of public investment, which is a big part of the philosophy of the infrastructure bill. There are more than 32,000 new infrastructure projects now underway in every state and territory, all across the country. We created an [interactive map](#) so people can see what's up in their communities.

We're also facing the effects of anticompetitive behavior in pretty much every industry connected to the movement of people and goods.

Was there, maybe, a comeback of a pared-down version of neoliberalism—or at least the hope that markets and democracy might work in sync—when Ted Cruz coined “Woke Coke” to show contempt for Coca-Cola’s protest of voter suppression in Georgia?

Well, yes, there's something delicious about the way that Cruz and the rest of them have positioned themselves on one side of the fence. And Netflix, Coca-Cola, Disney, and Bud Light are on the other side. Along with most of America.

There may in fact be a center of gravity in this country that includes both a Democratic majority of the American people, and even something of a consensus, at least among mainstream business leaders. We have certain commitments around democracy and inclusion that are really elemental to the whole system.

Photograph: Argus Paul Estabrook

True. But the right likes to dismiss *any* political action—even in the name of elemental American ideals—as pretense or virtue-signaling. I think of the time Putin defined the Kremlin’s enemy as foie gras, oysters, and “gender freedoms.” An American conservative might hear him and say, *OK, foie gras, pronouns—annoying, pretentious, sure.* But do Republicans really want to be dragged into a bigger far-right project, including the renunciation of democracy, modernity, civil rights, human rights?

Look, the mainstream right’s political project was twofold. It was to prevent legal access to abortion and to sustain lower taxes for the wealthy. Those are kind of the two greatest pillars of the mainstream right now. They’re now the dog that caught the car. And, to switch metaphors, they rode a tiger to get there. They made a lot of distasteful bargains in order to get there.

Sometimes the military—the *military*, of all institutions—comes under attack from the far right. On ideological grounds. Yet another front in the culture war.

The woke Pentagon.

You could add that to the list: Bud Light, Coke, football, Disney … and the Army. You can only put yourself on the wrong side of so many red, white, and blue American institutions, and the question becomes, *Is this about you?*

Speaking of is-this-about-you, have you followed the masculinity crusade of former TV personality Tucker Carlson—testicle warming and the rest?

I mean, where to begin on this? Fears about masculinity are a way into the fear of displacement. Masculinity establishes a default place, and that place is being shifted and threatened by modernity. A man as the head of the household. The only one who earns income. The default leader in any social or political organization.

The politicization of masculinity is code for *Nothing in your life has to change*. The problem is, of course, lots of things have to change. Either because there was something wrong with the old way—or because, even as the old way seemed perfectly fine, it's not an option.

This is true with the realities of climate change. If you can't face that change, you might retreat to the default place of masculinity. Maybe that's why someone characterized electric vehicles as emasculating. I think it was Marjorie Taylor Greene.

Are they not?

To me, a car is a car.

Actually, the electric truck has got more torque than a regular truck. And it'll tow just as well.

And yet EVs unaccountably fall on the femme side of the ledger, like Impossible burgers.

Right. A lot of this discussion about masculinity doesn't have anything to do with the immediate *function* that's at stake.

I'm thinking about burgers, right? I love a good cheeseburger. I hate a bad veggie burger. I like a good veggie burger. The Burger King Impossible Whopper with bacon is not a bad combo.

Likewise, when it comes to driving. I mean, there's a very literal, physical, technical sense in which power is at stake when you drive. It feels good to be driving a vehicle with a lot of power.

The vehicle I get around DC in is a Mustang Mach-E. The fact that Ford made one of their first electric vehicles a Mustang is probably not an accident. It has three modes. Whisper, Engage, and Unbridled. There are propulsion sound effects involved in the different modes to help you feel conscious of the power of the engine.

Clearly, we have a chance to rewrite some of these easy gender tropes. My life happens to cut across them. I like drinking beer, lifting weights, splitting wood. I'm also gay and I like playing piano. I do a lot of the caregiving for our toddlers and other things that supposedly aren't masculine.

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Your secrets are safe with me. So what's going to stop the androgen-addled, Putin-besotted ideologues?

When it comes to conspiracy theories and extreme partisan ideologies, I found two things are true. One, it's always more people than you would think. Disturbingly so. But it's also, almost always, much less than a majority.

The problem, of course, is there are some features of the American system where you could be a long way from the majority and still take control of certain decisions. We're seeing a lot of counter-majoritarian movements, with, of course, abortion being an example.

But facts still matter. And when a fact is challenged, or a supposed fact, like "the Russian Federation's army is unbeatable." Right? I have to think that catches up to you.

At a certain point, in Russia, for example, you see those charts by region of the areas that suffered the most casualties. Just as a statistical matter, it is impossible for a false narrative to hold.

And here in the US the confrontation with reality comes every time I get a letter of support from a House Republican for a transportation project using funds from the bill they voted against. It's shameless. But it's also reassuring that they're the first to come to a ribbon-cutting when we fund a project in their community.

It's a reminder that there is such a thing as true and false. These funds are helping all over the country. That's true. And one thing that's false is that it was a good idea to be against these funds. It was a bad idea.

People like infrastructure, I guess. Even Marjorie Taylor Greene isn't pro-pothole.

Exactly. Everyone here cares about delivering on the president's view that the way we vindicate democracy, at a time when democracy really is being challenged frontally, is we take care of the basics. In my corner of this administration, we work on things like fixing bridges and holes in the road and keeping people safe in the transportation systems.

Another major goal of ours is to [reverse the rise of roadway deaths](#) in this country. Early data suggests we may be seeing those numbers stop rising and then go down. That could be the most important thing we do here, because a day's worth—one day's worth—of roadway deaths in this country represents more death and destruction than a year's worth of losses across the rest of our transportation system. So given how hard we work to push the number of, for example, accidental railway casualties from the single digits toward zero, and to make sure there are not just no airline crashes but no close calls with airlines, what it would mean to reverse that rise in roadway deaths, which claims about 40,000 lives a year, yeah, that's an enormous one.

Do you think the administration's work on the basics is getting through?

Every time I go to celebrate a new bridge, we have a great time with local leaders who fought so hard to get it done. But it bears little chance of penetrating the national news of the day. Our task here is to deliver so much good news that the volume of it outweighs the tendency to focus on what went wrong.

I think we might do this. One formulation is that we've delivered the most significant economic legislation since FDR, the most important infrastructure initiative since Eisenhower, and the second most important health care work since LBJ. All while dealing with the first land war in

Europe since Truman and facing the biggest public health crisis since Wilson, with the slimmest governing majority in Congress in almost 100 years.

You see it that way and you think, *Well, yeah. That's right. We've gotta shout that from the rooftops.*

Let's talk about Christianity. The first time I heard you say "Christ" and not "Jesus," I figured out you were an Episcopalian.

I didn't know that was a tell!

I'm not sure if it is in the books as a tell. But that's how I read it. So how does your faith influence you?

Well, every policy decision I make should be equally fair to people of every faith and no faith. It should be as defensible to me as somebody who is religious as it would be if I were not.

At the same time, you can't help but notice certain rhymes between your religious convictions and the choices you're called on to make in a job like this. There's a lot in the faith tradition that I hold close about "the least of these" [the imperative to help the needy]. This doesn't just go to the worth of your choices, but even your worth as a person, which depends in no small measure on how you make yourself useful to those who have the least power and the least means.

When you're making public policy, you're often asking yourself, "How does this choice help people who would have the least going for them?" So that's part of it.

Photograph: Argus Paul Estabrook

Running DOT seems to suit you. Are there more ways the challenges of transportation speak to your spiritual side?

There's just a lot in the scriptural tradition around journeys, around roads, right? The conversion of Saint Paul happens on the road. I think we are all

nearer to our spiritual potential when we're on the move. Something about movement, something about travel pulls us out of the routines that numb us to who we are, to what we're doing, to everything from our relationships with each other to our relationships with God. That's part of the reason why so many important things in the Bible happen on highways.

And then journeys—they're also just marvels. Every flight is a marvel that pulls us out of that in the same way that religious rituals, holidays, liturgies are one kind of routine that pulls us out of another kind of routine. When you get on a plane, people buckle their seat belts and listen to the flight attendants' very predictable pronouncements. It's routine. It's almost a ritual, right? And yet you're preparing to fly through the heavens.

Life is a combination of drudgery and miracles. Part of what keeps me at home in the Episcopal faith is that it is liturgically rather conservative. I like that routine.

I don't know if you'll remotely agree with me, but I've come to consider January 6 as a triumph of something like drudgery—or at least of the mundane. Even after terrible violence, destruction, and bloodshed came to the US Capitol, Congress returned to carry out its clerical workday. The paperwork got filed. The flag of the ordinary was still there.

Yeah, I agree there's something that bears more attention about how Congress stayed, came back, finished the job. That's real. And the fact that the Republic held is real. And another under-remarked fact is the courts did a good job of surfacing what was true and what was false. Because in the US court of law there are actual consequences to lying, and you have to actually present evidence in favor of your client, so it turns out to be less susceptible to the warping of reality.

That being said, part of why we would hesitate to assign any triumph to that day—in addition to just the awfulness of it—is that we don't yet know how the story ends. When we look back at moments further in history, we think of the outcome as settled and stable. We have to go out of our way to be rightly afraid of how close we came. If you study the Cuban Missile Crisis,

it's a study in leaders doing the right thing. But, also, the more you put yourself in their shoes, the more terrifying it is.

How do you think this particular crisis will resolve?

I think a lot now about the worst experience of my life, the critical hospitalization of my son. He was treated with RSV, which is a respiratory disease. Like many viruses, it takes a certain course where it gets worse and worse and worse. It reaches the worst moment. And, if the patient survives, then it gets better and better.

The terror of it as a parent is the only way you know it's getting better is when it's stopped getting worse. There are a lot of things like that in the world. The conditions of our democratic institutions—we don't know how much rougher things might get before things get better.

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[Katherine Alejandra Cross](#)

[Ideas](#)

May 17, 2023 8:00 AM

Remote Workers of the World, Unite!

Zoom did not set us free. But solidarity can strengthen the porous boundary between home and workplace.

PHOTOGRAPH: SHAWN MICHAEL JONES

The masses who settled in to [remote or hybrid](#) work during the [pandemic](#) are waking up to the fact that Zoom-mediated labor isn't all it was promised to be. Instead of being liberated from unnecessary drudgery, demands on their time have ballooned, they feel permanently on call, and some can't shake the sense that they're working harder than ever for less pay.

They're experiencing a lesson that everyone who's ever used so-called labor-saving devices has learned the hard way: Expectations swell to fill the gaps left by the time you save. Women have always felt this most acutely; if a washing machine saved you hours on doing laundry, then you had to fill that time with other displays of devotion to your family. Zoom is no different: The hour you save on your unpaid commute is now an hour that can be filled with a pointless meeting.

A bit of pushback is required, because over the past three years much of the public has too often treated remote work as an inherent good. The managers and bosses who wailed to the high heavens about how remote work would end civilization certainly did nothing to *hurt* the impression that it could be a mighty strike against capitalist exploitation. If it were making them this mad, surely it was revolutionary. But it's not. Like expectations, capitalism expands to fill all available space, co-opting anything put before it. Remote

work is no different, and if we're not careful, the tech that makes it possible will obliterate the already porous wall between home and workplace.

The pandemic revealed that a lot of work, especially white-collar work, could be done remotely—or at least that it required less time on-site than we'd been led to believe. For disabled employees, this was an especially powerful revelation; so often denied work on the basis of their perceived inability to consistently show up to an office, they were suddenly participants in a global experiment that demonstrated nearly everyone could do their jobs just fine by telecommuting. Flexibility, control, the comforts of home, the ability to more easily balance the competing needs of labor and family, and the chance to avoid sitting for hours on a freeway turned parking lot? Remote work has benefits for all.

But those benefits are eroding. Meetings that should've been emails are becoming endless Zoom calls. A friend was asked to attend an unpaid, hour-long tech-prep session for giving a remote guest lecture; previously this would've required a mere 10 minutes of faffing around before her appearance. Emerging norms for video calls demand you stay in your seat at all times, negating the benefits of being close enough to your kitchen to get a cup of coffee.

But it can get even worse. When I was teaching my college classes remotely during the pandemic, I resisted the use of software like Proctorio, which claimed to rely on “machine learning and advanced facial detection technologies” to spot cheating. In practice this meant tracking my students’ eyeballs, which felt like an unfathomably Kafkaesque cruelty. I was asking my students to give me their time and attention as the world burned; I wasn't going to demand their webcams be turned on so Proctorio could surveil their every movement. It's not terribly dissimilar from a piece of Chinese software called DiSanZhiYan, or Third Eye, which monitors browser activity and produces reports for managers about time spent looking at social media, streaming services, or even job-search websites.

If we're not careful, the tech that makes remote work possible will obliterate the already porous wall between home and workplace.

While a lot of executives are resisting the push to make remote work the norm, it's worth remembering that if they lose this battle, they *will* turn to these surveillance tools and their inevitably nastier descendants to reclaim whatever power they think they're losing.

The pandemic and remote work turbocharged techno-solutionism, leaving us with the impression that Zoom alone could allow us to claw back everything the ever-expanding demands of the office had been stealing from us. Unfortunately, outsmarting capitalism requires something more than one weird trick that bosses hate. We have to stop believing that technology, in and of itself, will emancipate us, and instead embrace our collective power to shape how technology is used. That requires organizing.

Remote and hybrid workers can start by ensuring that when they settle into new communities, they're not bringing social problems along for the ride. Already, cities around the world are groaning under the weight of self-styled “[digital nomads](#)” migrating with their laptops and six-figure salaries to low-income economies, proving that it's possible to globalize gentrification. This was not a sociological experiment we needed to conduct in the wake of a deadly pandemic that rented the soul of every society. Instead, be a responsible member of the community; don't prop up exploitative landlords or Airbnb superhosts. Get to know your neighbors, brush up on the language, and use your extra money to help local businesses and residents in the community. Don't be someone who's merely using it for the exotic background on Zoom.

Work-from-homers can also push to shape their community in ways that serve all of its members. Right now, public transit networks are designed around the assumption that commuters travel from the suburban periphery to the urban core on a 9-to-5 schedule. The shift to remote work provides the spark to redesign transit systems to fulfill the long-standing needs of those who actually live in cities: building lateral, loop, and intra-neighborhood lines that let people rapidly journey between peripheries rather than transfer in the downtown core. That requires organizing as a constituency and a voting bloc, joining in coalition with working-class residents who may have similar needs for different reasons.

Of course, the best way to secure the right to work remotely, or hybridly, and to form a basis for the kind of political organizing that can reshape your town or city, is to organize as a union. It will also ensure that you and your colleagues retain the benefits of remote work and form a bulwark against the next logical step that your bosses will take if they concede on the matter: bulldozing the last remaining vestiges of that wall between work and home.

You see, as a remote worker, that's the trade-off you're asked to make. In exchange for not spending hours of your life commuting and getting to wear your soft pajama bottoms while otherwise looking perfectly classy on Zoom, your bosses believe they're entitled to a more intrusive view of your private life. If you want to make your living room into the office, then it will be treated like an office, a place that's controlled by your company, subject to surveillance any time your superiors wish.

You need to stop this—and you're not going to do it alone.

This article appears in the June 2023 issue. [Subscribe now.](#)

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[Sabrina Weiss](#)

[Science](#)

May 11, 2023 1:01 PM

Your Dog Is a Secret Weapon in the Fight Against Cancer

Every year, thousands of pets develop tumors very similar to those found in people. Find drugs that work for canines, and human treatments should follow.

Illustration: James Marshall; Getty Images

Jellybean continues to defy expectations. The 5-year-old Labrador retriever mix jumps up and down from her favorite spot on the couch and walks around the living room with such ease, it's as if she hadn't ever had metastatic cancer. Her owners, Patricia and Zach Mendonca, still can't quite believe the miracle. "She's got a little bit more of a tug to her step," Patricia says.

Jellybean was diagnosed with bone cancer in her hind leg almost three years ago. Despite amputation and chemotherapy, the cancerous cells quickly spread through her blood to her lungs, as they do in 90 percent of cases in dogs. Survival time at this stage averages two months. "We didn't have any hopes of curing her," says Patricia. "We were pretty devastated."

So in November 2020, the Mendoncas enrolled Jellybean in a clinical trial at Tufts University, about an hour's drive from their home in Rhode Island in the US. Jellybean was given a trio of pills, at no cost, which the Mendoncas stuffed daily into her favorite chicken-flavored treats. By Christmas, Jellybean's tumors had begun to shrink, and they haven't come back since. The response surprised even the vets treating Jellybean, and raised hopes that these drugs could help not just other dogs, but humans too.

Jellybean's bone cancer, osteosarcoma, also affects people—particularly children and teens. Fortunately, it's relatively rare: Some 26,000 new cases are diagnosed worldwide each year. The problem is that there haven't been any new treatments for over 35 years, says veterinary oncologist Amy LeBlanc, and those available aren't very effective. Osteosarcoma patients have a survival rate of only [around 30 percent](#) if cancerous cells spread to other parts of the body.

Canine studies, like Jellybean's trial, could change all this. Cancers that arise in pet dogs are molecularly and microscopically similar to cancers in people—in the case of osteosarcoma, the similarities are striking. When compared under the microscope, a canine tissue sample and a human tissue sample of a tumor are indistinguishable. But while it's thankfully rare in humans, osteosarcoma is at least 10 times as common in dogs—meaning there are huge numbers of canine cancer patients out there to help with research and drug testing. “The families and dogs that participate are an important piece of the puzzle in moving this research forward,” says Cheryl London, the veterinary oncologist at Tufts University’s Cummings School of Veterinary Medicine who is treating Jellybean.

Importantly, dogs are not subject to the same federal regulations that limit treatment options for humans; veterinarians are much freer to use existing drugs off-label against diseases for which there aren't currently good treatments. All told, this makes for quicker and cheaper clinical trials.

Such trials are part of the [Cancer Moonshot](#) initiative that US president Joe Biden relaunched last year and for which he has asked Congress to provide an additional [\\$2.8 billion](#) in the 2024 budget. “They're designed to fill a knowledge gap that is not sufficiently filled by traditional studies in mice or by data that cannot yet be easily gathered in humans,” says LeBlanc, who directs the Comparative Oncology Program at the US National Cancer Institute. The program oversees clinical trials on dogs with cancer, which are carried out by Tufts and [21 other veterinary universities](#) in the US and Canada.

Apart from the fact that many dogs get cancer and are treated every year, they are also better suited for studies than laboratory mice. Tumors occur naturally in dogs and they are exposed to a [similar living environment as](#)

humans; in comparison, researchers raise and keep mice in cages, and study the spread and treatment of cancer under artificial conditions, by injecting the mice with malignant cells. In addition, the accelerated lifespan of dogs can help researchers see results quicker than they might in a human study.

Dogs also respond to treatments in similar ways to humans, as several clinical studies in recent years have shown. In 2019, scientists at Colorado State University completed a trial of 28 dogs with osteosarcoma that had spread to the lungs. In addition to a commercially available cancer drug, they prescribed the dogs a common blood pressure drug, losartan, which acts on the immune system by blocking the recruitment of a type of white blood cell that stimulates tumor growth. Three years later, the scientists reported that this pair of drugs had helped shrink or stabilize lung tumors in 50 percent of the dogs. (Jellybean is receiving these along with a third drug, not yet approved for humans, as part of a parallel study at Tufts University.)

Already this losartan research is having a knock-on effect for humans. Around 40 children with resistant or recurrent osteosarcoma are now receiving losartan and the human equivalent of the canine cancer drug to determine the safety and dose range of the treatment. It's a promising step, but according to Steve Dow, veterinarian and director of the Center for Immune and Regenerative Medicine at Colorado State University, it's too early to make an assessment of the impact it could have in people, because the human trial "is not at the high-dose range yet, which is where we saw activity in dogs."

But another clinical trial, involving an experimental vaccine, is already a step further: Scientists and doctors are testing how effective the bacterium *Listeria monocytogenes* is at treating human osteosarcoma patients. This nasty bacterium usually causes food poisoning, but in its weakened form, it stimulates the immune system. In dogs, immune cells have been shown to patrol the body after vaccination and destroy any cancer cells remaining after conventional therapy. The study to see whether the same happens in humans is due to be completed later this year.

LeBlanc is excited about the results of these trials. But, she says, the canine work the National Cancer Institute oversees is also helping scientists better

understand cancer in general. Blood tests and subsequent DNA analyses, for example, provide important insights into the genes that drive the development and growth of cancers. “We are poised to release a significant amount of data this year and show what we can learn about dogs with osteosarcoma—where they share key similarities, but also where they’re different,” she says.

Medical companies have also recognized the potential of pet cancer data, especially in the field of [precision medicine](#), where patients receive personalized treatments that target cancer-causing mutations that are specific to their genes. This personalized approach is considered the holy grail of cancer therapy—but it relies on analyzing huge amounts of genetic information. Gaining enough data to reliably predict how a drug will perform is one of the biggest challenges when it comes to developing a new cancer treatment, says James Zou, an assistant professor of biomedical data science at Stanford University.

In a [study](#) published in January this year, Zou and his colleagues, working with One Health Company, which focuses on precision medicine, showed that dogs can expand the pool of useful clinical data. With the help of a computer model, the team compared the genetic mutations and treatment outcomes of dogs with cancer. They drew on a dataset of nearly 800 dogs treated for different types of cancer in American veterinary clinics and whose tumor tissue had been sequenced to detect mutations. Based on a comparison with data from a small number of human studies, the team found that dogs and humans who have similar genetic mutations and receive similar treatments have similar clinical outcomes—thus showing that dog data can help with developing human drugs.

Once researchers have access to a canine dataset like this, and have analyzed which gene-drug combinations appear to be effective in dogs, existing drugs could then be repurposed or further developed for human use without having to start from scratch. The traditional pipeline of a single cancer drug is at least 10 years and [costs billions of dollars](#), in part because recruiting enough people for clinical trials is so difficult, time-consuming, and costly. Applying machine learning to dog cancer data could speed up the process.

This will be needed if President Biden's overall cancer vision is to be met. He wants to reduce cancer-related mortality rates by at least 50 percent over the next 25 years. This will require progress not only on the deadliest but also the rarest human cancers, including those of the bones, lymph glands, and brain, where clinical expertise is still lacking and pharmaceutical companies have had less incentive to conduct trials because the potential market is small. Anything that can bring down the costs of drug testing for these conditions will be massively helpful.

LeBlanc believes Zou's research underscores the promise of precision medicine, and sets the stage for follow-up studies in which drugs are prescribed to dogs in a controlled setting and data is gathered over a period of time. But she would like to see research and drug development continue to be guided by the principle that dogs with cancer are not just study subjects, but first and foremost patients themselves. "Their care and welfare as they help us along this journey are always going to be our top priority," she says.

This is also the top priority for Jellybean's owners. She is the only one of the 23 dogs who is still alive after receiving the same treatment as part of the Tufts University trial. The median survival time was about five months. "The work that Tufts has done and the science behind it have touched our lives so strongly and saved our dog," says Patricia. She is glad to know that the ongoing treatment and regular check-ups could help other dogs and people in the future. "But on a day-to-day basis, it's just the fact that she's still with us."

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[Morgan Meaker](#)

[Business](#)

May 10, 2023 2:00 AM

This European Satellite Giant Is Coming for Starlink

To compete with American rivals, Eutelsat's Eva Berneke first has to navigate Russia's war in Ukraine, Brexit politics, and jamming attacks by Iran.

Photograph: Adrien Daste/Eutelsat

Eva Berneke describes her first year at the helm of the world's third-largest satellite company as a "whirlwind." That's an understatement. Since she took over the top job at Eutelsat in January 2022, the Danish CEO has become a direct competitor to Elon Musk, been accused by the Ukrainian government of aiding Russian propaganda, and found herself in the thick of bitter Brexit politics—and that's before you even mention the Iranian sabotage attempt.

Despite all this, Berneke gives the impression that she has everything under control. When she arrived at Eutelsat, the French company's bread-and-butter business was beaming TV channels into homes using geostationary satellites—which move at the same speed as Earth and so stay in a fixed position. The organization she inherited was stable and solid, she says—but also stagnating in an industry that is undergoing radical change. Although Eutelsat was starting to use its geostationary fleet to offer satellite internet, its TV revenues were dwindling.

The entrance of two of the world's richest men—Elon Musk with SpaceX's Starlink network and Jeff Bezos with Project Kuiper—was also beginning to change the way incumbents thought about their future. "When you have

two of the biggest business innovators getting interested in your industry, you should expect a little bit of shaking up,” says Berneke.

Undaunted, Berneke responded by initiating her own shake-up. In July, the company announced plans to merge with struggling British satellite provider OneWeb. As part of the deal, Eutelsat absorbed OneWeb’s constellation of 648 low-orbit satellites. At just 1,200 km above Earth, the OneWeb fleet delivers faster internet speeds than Eutelsat’s geostationary satellites, which sit 35,000 km above the planet’s surface.

OneWeb is Eutelsat’s ticket to the booming low-orbit satellite market. Rural homes, ships, airlines, militaries, and autonomous vehicles are turning to satellite internet to stay connected in places previously considered dead zones.

“Even in France, a country with very high fiber and 5G coverage, it’s estimated that around 4 percent of households are without good connectivity,” says Berneke. She expects this figure to rise to 15 percent of households in countries with less fiber and 5G. “So it’s not that small a niche.”

The OneWeb-Eutelsat merger has been touted as Europe’s entry into the space race. It is the only company currently competing with Musk’s Starlink in the low-orbit market. But to claim its title as a European space giant, Eutelsat first has to navigate messy post-Brexit politics. Both France’s Eutelsat and Britain’s OneWeb were part-owned by their respective governments, and the two countries will continue to own stakes in the new business.

Berneke admits Brexit has brought challenges. “But there’s been a willingness on both sides to reach across the Channel to try and find a good way of collaborating,” she says. If Europe wants a homegrown satellite giant, Britain and France will have to resolve their differences. “[OneWeb’s fleet] is going to be one of the only non-US-based constellations for a while,” she says.

Brexit politics are not the only hurdle. OneWeb’s Gen One satellites need upgrading, and Eutelsat is planning to have more advanced Gen Two

satellites in orbit by 2027. Berneke says this upgrade will cost 3 billion to 4 billion euros (\$3.3-4.4 billion), a bold move for a company with a reputation for playing it safe.

Analysts at J.P. Morgan have described the merger as “high risk.” But Berneke says this new approach to running the company is a conscious decision—partly influenced by Musk. “Starlink has really, truly innovated, making [satellite] launches much more industrial,” she says. “I think that’s something we all should be looking at and saying, ‘how can we move forward much, much faster?’ It’s also being open to risk.”

SpaceX’s willingness to embrace risk was demonstrated by its close collaboration with the Ukrainian government, which exposed Starlink satellites to Russian jamming attacks. Eutelsat was pulled into the war for a different reason. In November, Ukraine’s culture minister, Oleksandr Tkachenko, published an article in French newspaper *Le Monde*, criticizing Eutelsat for continuing to broadcast TV channels that carried Russian propaganda. Berneke did not deny the claims. “We’ve always had what we call a policy of neutrality,” she says. Eutelsat follows guidance issued by French media regulator ARCOM on which channels are and aren’t sanctioned.

Berneke resists the idea that executives should implement their own sanctions on top of legally binding restrictions—a trend that has been gathering pace since Russia’s invasion of its neighbor. Apple, for example, voluntarily halted product sales in Russia following pressure from the Ukrainian government. “We’re not going to try to do more ourselves,” she says.

Instead she argues that this stance gives the company more legitimacy to push back when regimes, like Iran, do not want some Western channels broadcast locally.

In October 2022, the company accused Iran’s regime of jamming its satellites. “We did all kinds of technical hoops and loops to make sure that we continued broadcasting because we had paying customers and we thought it was important that channels were not sanctioned,” she says. “So it goes both ways.”

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By [Jason Parham](#)

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May 9, 2023 6:00 AM

Reality TV Saved Me

During the worst year of my life, I needed it more than ever. And I needed to understand why.

Photograph: Shawn Michael Jones

One Thing I was never told about reality TV—and I’m willing to bet you weren’t either—is that it can heal. Nobody tells you it’s a curative medium. What they do tell you about reality TV is everything else: how it’s reductive and superficial, how it’s cultural rot. It’s a circus, they shout. It microwaves the mind to mush.

It’s also the most dominant form of entertainment today. Reality TV has been called a “volume business”; many of us swallow whole seasons in a single sitting. The shows are operatic, polarizing, and unrepentant about what they are—all id and impulse. Name a setup, pastime, premise, gimmick, and it probably exists as a reality TV show.

We refuse to look away. Or maybe it’s that we can’t. Perhaps it’s because we’re addicted to spectacle. Or because we demand our pop culture in every color, shape, and size. Everything is primed for content-making. No, seriously—*everything*. Across Instagram and TikTok and YouTube, we optimize our lives for the screen. We enjoy letting other people into our curated worlds and being let into theirs in return. It’s OK to admit it: You are good and truly hooked.

So am I. In the best of times, I watch a fair amount of reality TV. But it was only during this past year—one shot through with heartache, a breakup, and what felt like piled-up grief—that I came to depend on it. In a genre built on

stock phrases and digestible tropes, let me offer one more: Reality TV saved me.

This article appears in the June 2023 issue. [Subscribe to WIRED](#). Photograph: Dan Winters

Last Spring, I grieved for a lost friend. By August, I grieved for my grandmother who was here and then suddenly wasn't. Weeks after that, I grieved for my relationship with T, one that had cratered right in front of me, one that I'd felt—finally—might not end in what-ifs, or end exactly as it did: with a lingering unanswered voice note. I felt like a bodiless thing outside myself.

Depression rose like a tidal wave, and then pulled me under. I went from working out six days a week to one, if that. Writing, which had always sustained me, felt like a chore. My diet was all over the place. I moved through the day with hesitancy. Present time was bad enough, but what intensified anxiety was the time ahead and unplanned, the tyranny of the minutes that were to come.

In all of this, what emerged was a feeling of inauthenticity. It wasn't as though I felt like a fraud or an imposter, the cheeky buzzwords people of my generation like to fling around. I just wasn't sure how to make it through the sadness this time. I was stuck on replay. I spoke to a professional but kept it a secret from almost everyone I knew. I wasn't ashamed. I just didn't feel like talking about it.

And then I did what I always do: I turned to TV. TV was easy. TV was a constant, a plane with the “ability to transmit and receive and then to apply layers of affection and longing and doubt,” as the media critic George W. S. Trow wrote in 1981.

I make no qualms about my dependency on reality TV. I especially love dating shows. At 37 and chronically single, I would describe my reality as a jumble of failed relationships, mostly trivial one-night stands, and maybe what could have been two or three chances at the kind of real love Mary J. Blige sang about all those years ago.

So I wasn't surprised when my year of grief turned into all-night binges of *Love Island*. But I was surprised by the depth of my need for this distraction. I wanted to understand it. There was one place I had to go.

It's just shy of noon on a Saturday in October, inside the Javits Center, when I hear a woman make a confession. "I just spilled my wine!" All around me, women and gay men of all ages are drinking wine, waiting in line for wine, searching for wine. They flash big smiles and wear big hair, sporting T-shirts with taglines that snap, "Who gon' check me boo?" The halls are frothing, at times uncontrollably, with people from all corners of the country, and I am not so much here as lost in the crowd—which will peak at around 30,000 attendees by weekend's end. This, in all its Botoxed glow and kitschy maximalism, is BravoCon.

Launched in 1980 as a cable network, Bravo is best known for its *Real Housewives* franchise, the glammed-up lifestyle soaps that follow groups of women in different locales (Orange County, Miami, Atlanta) as they raise kids, fall in and out of love, establish careers, and snipe shade like trained assassins. Once a year, Bravo superfans—"Bravoholics"—convene for a three-day, rosé-tinted reality palooza. Part empowerment summit, part celeb meet-and-greet, BravoCon is a sharp distillation of how reality, as an entertainment genre and a business, gets manipulated beyond the frame of television. I thought it might give me some insight into my obsession.

How to describe the convention? The whole thing isn't real—it's *too* real. At one point, I witness fans boo *Beverly Hills* Housewife Lisa Rinna, looking every bit the Bond villain in a vibrant tangerine pantsuit, as she crosses the convention floor. At the brand bazaar, I sample a lasagna-flavored Lay's chip (inspired by *New York City* Housewife Dorinda Medley's lasagna) and spot Jake from State Farm (yes, that Jake from State Farm) surrounded by a circle of grinning women, posing for photos as they cheer "One more!" Many of the Housewives have booths set up, hawking their latest products: moisturizers, lip gloss, candles, lube, "camel-toe-proof" underwear, dildos. During one of the scheduled cast discussions, *Potomac* Housewife Karen Huger exclaims, "I am not produced!"

That Saturday morning, before my tour of the convention grounds, and before more than 140 "Bravolebrities" begin sweet-talking fans for the next

nine hours, an NBCUniversal rep semi-jokingly tells me that Bravo fandom is “like a cult.” I get a taste of that devotion when I remark to a woman from California that the most recent season of *The Real Housewives of Atlanta* is a far cry from the show’s pioneering early days. She pauses for a beat, sizes me up. “It’s still everything,” she says. This is no place for nonbelievers.

Loyalty is a requirement in the Kingdom of Bravo—but not only that. As one development exec behind *Love Is Blind* puts it to me: Fans want to be involved themselves. Sure enough, during a panel with *Potomac*’s Ashley Darby, a young man approaches the mic and confesses, though it comes off more like a brag, that he has had sex with her ex-husband. Darby’s divorce was a major plot point last season. The audience lets out a collective gasp. My initial reaction—*Oh shit!*—dissolves in an instant because I can’t escape the fact that I secretly love that this is happening.

Which is maybe the point. Which is maybe exactly the point.

This is what makes reality TV so mouthwatering. The pageantry of destruction—a failed marriage, a cringeworthy date, the betrayal of a friend—should perhaps not entice the eyes, yet it is often the sole reason for our looking. As I watch Darby squirm and then toss it off with a smile, I am struck by an odd feeling. All weekend, my memory on loop, I’ve been replaying the end of my relationship with T. Yet here I am, amused by the ruin of someone else’s, knowing damn well I’d hate for my worst moments to be turned into a public punch line.

Our relationship to reality TV has never been bound by moral purity, or even good manners. “For all its carnivalesque aspects, the genre reflects how steadfastly we cling to simplistic, collective notions about who and what is legitimate and ‘real,’” the sociologist Danielle J. Lindermann writes in [*True Story: What Reality TV Says About Us*](#). “But in doing so, it allows us to poke at these assumptions, revealing the socially constructed natures of what we consider to be ‘true,’ ‘normal,’ ‘healthy,’ ‘legitimate,’ and ‘good.’ The genre exposes our conservative reality, but it also exposes *reality itself* to be a social fiction.”

At BravoCon, this is especially evident, and it's what I take away. My deeper need for reality TV? It starts with the fact that it makes me feel good about feeling bad.

Photograph: Shawn Michael Jones

Back when I was 14—a piston of arousal—I was instantly horny for *Blind Date*. I loved how primal the show was. The premise was purposefully uncomplicated: Two people go on a date. The result was a zoo of human behavior. Contrast that with *The Real Housewives of Dubai*, Bravo's 11th iteration of the megafranchise. When it premiered last year, the women materialized as precooked avatars, lacking the originality and surprise of their forebears (minus Chanel Ayan; she's a hoot).

This air of performance is typical of the genre today. Every viewer knows it: Events are planned, tensions fluffed, storylines steered. There now exists—it's almost too obvious to point out—a whole industry, from gossip blogs and podcasts to full-on scripted dramas, that tracks behind-the-scenes manipulations on shows like *The Bachelor*. In some cases, cast members are pushed into uncomfortable situations, with minimal concern for their well-being.

A week after BravoCon, I call Michael Montgomery. He's a veteran producer of reality TV, and he tells me, though I don't believe him at first, that in the future the form will no longer hinge on the elaborately crafted drama we have come to expect. All the human error and tart moral knottiness that defines so much of the reality TV we watch will soon be a thing of the past. "I don't feel like there is much of an appetite for conflict anymore," Montgomery says. "People are tired of it."

Montgomery wants to take reality TV into (back to?) a more authentic place. I press him on this. I ask him to define it. Selfishly, I want to know for myself. But I don't say that. That fall day over the phone, I don't show my scars. *What do you mean exactly?* I say instead. Montgomery laughs, as if he's been waiting for someone to ask just these questions.

Montgomery has been involved in everything from morning talk shows and *Celebrity Big Brother* to Sacha Baron Cohen's *Da Ali G Show* and Russia's

adaptation of *The Apprentice*. And who could forget the David Hasselhoff travel show? He also spent time at 3 Ball Productions, famous for developing *Bar Rescue* and *Extreme Weight Loss*, among other genre staples. Now, Montgomery wants to reinvent the genre.

This, he tells me, is how Seen came to be. Seen is “a reality show in a dating app's body.” I'd heard of it before our call. The app is all about radical transparency; it does away with any last vestige of anonymity. When sifting through potential daters, Montgomery says, Seen does more than “reduce people” to the usual cropped headshot and pared-down bio. It transforms one's profile into a buffet of personal detail. It's primed for the social media age, where “your content is your conversation.” Interested in a prospective dater? You can see who they've already matched with, previous text exchanges, even video chats. Nothing is off-limits. “When people first hear about this, they think it sounds crazy,” Montgomery says, punctuating the claim with more laughter. “But it's not nearly as scary as it sounds.”

PHOTOGRAPHS: SHAWN MICHAEL JONES

Seen isn't just a dating app in the way Tinder and Bumble are, where the end goal, more often than not, is for two people to make a genuine connection, or at the very least hook up. Seen is a means to a more efficient reality TV landscape. The app works as an incubator for Montgomery's slew of potential reality shows—“dater-tainment,” he's tagged them. If you sign up to be featured on a prospective show and clear a casting process, you're a “verified dater.”

“There was a natural connection between dating apps and some sort of machine that would generate reality stories for us,” Montgomery says. Reality TV, to him, is a dinosaur stuck in the past. He wants the old ways to die. He wants to shepherd in what he calls the “reactive” format. The future “lies in plugging into a lot of the user-generated content that's out there. And plugging into it in a way that gives producers the ability to track multiple stories in real time.”

I express skepticism. Montgomery, who is 52, is quick to shoot back. “You're not the first.” Still, I want to hear more. Maybe what he is attempting to pull off is, in a way, the beginning of a turning point in how

the genre is produced, in determining the stories told. He wants the genre to be more than a gimmick or a ploy for attention. “When you make reality shows,” he says, “quite often talent will turn to you behind the camera and go, ‘Hey, what do you want me to do next?’ The moment talent does that, you understand that in their head, they are being directed down a storyline by the producer and director. That was a symptom of the old format.”

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At the moment, Seen averages 5,000 monthly active users, most of whom are based in San Diego, where Montgomery is testing the market. (Last year he launched a casting event there called 500 First Dates.) He says he hopes to raise \$10 million in funding by the end of this year and shoot 150 to 200 episodes, which will live on an ad-funded streaming channel as proof of concept. He's in discussions with various big-name streamers. “Our mission,” Montgomery emphasizes, “is for it to be authentic and uplifting.”

I understand his vision, I think. Some version of Montgomery's scheme probably *is* the future of reality TV. But I also wonder whether Montgomery gets something about that word wrong. *Authenticity* doesn't mean what it used to. It's different for everybody now.

In the 1960S, the political historian Daniel J. Boorstin predicted the rise of influencers, suggesting that individuals would become famous simply for their “well-knownness.” In *The Image*, he theorized that people were finding less relevance in facts. What would soon matter was the “convenience” of a given fact to a person's own story, to their own life. Today, enjoying reality TV is a matter of your subjective view, the convenience of what you choose to buy into or not. If a nice woman from California still thinks *Real Housewives* is “everything,” so be it. It no longer matters how believable a storyline or character is, but instead who it is real to.

In season 3 of the American version of *Love Island*, a love triangle between housemates becomes a focal point of the show. Basically, Cashay liked Cinco and Cinco liked Cashay, so they “coupled” (show lingo for “they shared a bed”) until the next recoupling ceremony; remaining single contestants are booted from the villa. But Trina also liked Cinco. And hearing that Trina liked him, Cinco realized he liked her. So they became a couple. Attempting to move on, Cashay coupled with Charlie, which only made Cinco, who was coupled with Trina, miss Cashay even more.

During that recoupling ceremony, the camera freezes on Cinco, and what he cannot bring himself to utter in that moment—“I miss you, Cash, and I want you back”—is unnervingly clear. I recognized it. I knew it. It's in everything he doesn't say. I saw his mind do that familiar thing, rewinding back, back, back to that before place. It's the same place I go when I want to remember the best of what T and I shared. What I imagined Cinco asked himself that night was the same thing I'd ask myself the week following our split: *What if I hadn't gotten afraid? What if I hadn't messed up?*

In moments like these—the messiest moments—reality TV is realest to me. For all those hours and days and weeks on my couch, as my world fell apart, I wasn't just looking for those moments. I was reaching for them. For the recognition, the mess, the permission to let go. And the more I reached, the lighter I felt.

The thing about reality, on TV as in life, is that it's only predictable until it isn't. Maybe that's what Montgomery was getting at when he kept using the

word *authenticity*. To truly capture it, you can't engineer control. You must accept the loss of it.

These days, my depression doesn't feel as stifling. I still encounter the occasional fog, but it isn't as dense. I see reality TV for what it is. In this space, one's drama and grief don't carry the baggage of shame but arc toward a kind of redemption. Not all fluff and sunshine, but something, yes, realer. In this ending, redemption is accepting things for what they are and moving forward in a way that acknowledges the weight of what happened without losing sight of who I can still be.

Some mornings, when I decide to work from home, I turn on *Watch What Happens Live*. It's Bravo's reality TV talk show, hosted by Andy Cohen, about reality TV. It plays in the background as I scroll Twitter, check emails, "make" coffee in my Keurig. Where is this new place I find myself in, this reality I'm both making up and giving in to all at once? It's not so bad. Maybe it's a total mess. I kinda like it.

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May 4, 2023 6:00 AM

Where to Find the Energy to Save the World

Jamie Beard is pouring everything into a singular vision: Tap into the awesome potential of geothermal power in Texas, and beyond. She has no time to lose.

Photograph: Dan Winters

jamie beard was worried. She was at the wheel of a black Toyota Prius, multitasking at 80 mph down the Hardy Toll Road out of George Bush Intercontinental Airport. Just before picking me up, she had been interviewed for a national TV news show. Now, swerving through lanes, she was running through various shit scenarios: What if something she said pisses off one of the [oil](#) and gas executives she had come to adore, or one of her fellow [climate activists](#)?

As she was ruminating and driving, a Ford F-150 with tires higher than the Prius is tall squeezed by us in the fast lane, so close that Jamie gripped the wheel tight to keep the little car steady. One side of her hair was buzz-cut; the other was a bob. It, like the rest of her, was steady and roiling at the same time. “Welcome to Texas,” she hollered. A grin spread across the small oval face that makes her look more 24 than 44, and she turned her attention to our destination: “Just wait until you see the Woodlands. The cops patrol the streets on white horses!”

The Woodlands is a self-described master-planned destination about 30 miles north of downtown Houston, developed in the 1970s by George Mitchell. A Texas legend. He’s the guy who made it financially viable to

fracture rock and extract natural gas from shale. Now, nearly 50 years on, the suburb is a bonanza of luxury homes, hotels, woods, condominiums, and fountains with musical water shows—and offices of some of the biggest oil and gas companies in the world. Big Oil Palooza. As we sped closer to our hotel, home base for this whirlwind trip, Jamie started rolling through our tightly packed schedule of meetings with current and former oil industry folks: drillers, startup founders, geologists, CEOs at multinational corporations. When she took a breath, I asked her about the new Earth-piercing technologies that she was excited about. And I asked her about fracking. Then she remembered her worries. And got anxious again.

The anxious energy, the worries, they were because Jamie—an [energy](#) lawyer and entrepreneur and lifelong environmentalist (“the kind that would have chained myself to a tree”)—was desperate not to screw up the delicate plans she’d been orchestrating for the past six years. They’re big. Too big, and she knew it. But she was certain that if she could put in all the days and hours and minutes she could possibly spare, and if she could [get the right people talking](#) to each other and help raise the money for a bunch of startups and better tech, she might, just might, just *maybe* help harness all those people to actually, fabulously, fairly [cleanly](#) solve [the world’s energy needs](#). Yeah.

So Jamie talked fast. She didn’t waste time. As we walked to dinner near the Woodlands Waterway Marriott, her sentences piled up: “We can’t sit around and twiddle thumbs and try to have working groups and retreats with environmental organizations and oil and gas. There’s just no time for that shit. It’s going to have to get on an exponential curve now. *Now.*” The word came out as if shot from a cannon: Now!

Sage Geosystems used a Nabors F-35 drilling rig at its geothermal test site in Starr County, Texas. It can drill to about 25,000 feet and lift and suspend 1 million pounds.

Photograph: Dan Winters

I met Jamie at a TED conference in August 2021, where she [gave a talk](#) called “The Untapped Energy Source That Could Power the Planet.” As she paced the stage, her sentences, tinged with a gentle Southern drawl, rose up,

then softened, then lifted again with enthusiasm: “What we’re talking about here is a pivot from hydrocarbons to heat,” she said. She talked about this awesome abundant green resource, and how we (right now!) have this mighty industry that knows how to get it. She was also, for sure, making some people in the room squirm at the thought of sleeping with the enemy. She seemed undaunted: “If we want to turn the ship, we recruit the sailors.”

After the conference, we talked, then started emailing, her energy ricocheting out of my inbox. *Ping!* She invited me to meet her in Texas. Come see! I was tempted. “I wish, but my life is too complicated,” I told her. Husband, cancer, medical appointments. He and I were on year four of what we’d been told might just be two.

Within minutes she responded, “My life is complicated too.” She attached a picture of herself lying on a floor, reading a book to her young son. He looked like he was in a hospital gown. “I hear you,” she wrote.

This article appears in the June 2023 issue. [Subscribe to WIRED](#). Photograph: Dan Winters

So there I was in Texas—while my husband was at home sorting his morning and nighttime meds. And Jamie was racing through the world with the relentless intensity of a person whose life, the minute they slow down, will be consumed with personal trauma, and the only viable thing to do was to run fast at something that matters enough to dull the existential ache inside. For Jamie, that meant harnessing the heat from below the Earth’s surface in the form of [geothermal energy](#). And she was hell-bent to start in the heart of the hydrocarbon industry, the kingdom of crude, Texas.

If you’re not one of the half million people on an airplane or 10 astronauts in space at this very moment, you are standing on a giant nuclear ball. There’s a truly monstrous source of heat below our feet. For a long time, people have been gathering that heat and using it to warm nearby buildings or turn turbines that generate electricity. [Iceland](#) gets about two-thirds of its energy—and nearly 100 percent of its heat—from geothermal sources. The city of Boise, Idaho, uses geothermal to warm some downtown buildings, and it has for more than a century. The first geothermal power plants built in the United States, put online in 1960, can send about 835 megawatts of

electricity onto the California grid in a place called the Geysers. That kind of geothermal power—which a lot of engineers call hydrothermal, and which the folks in Texas call “your grandma’s geothermal”—is harvested in places where tectonic plates have left fissures. Those fissures offer easy pathways for steam to rise to the Earth’s surface. This easy energy, grandma’s, is only a tiny fraction of what’s possible.

What Jamie was aiming to do is the hard part: create geothermal *everywhere*. That meant figuring out how to corral the heat [from all of the dry rock below ground](#). That heat could provide a reliable, abundant, always flowing source of power. No need for the sun to shine or the wind to blow. No need for batteries to store it all. And it wouldn’t be geopolitically volatile, subject to complicated supply chain disruptions.

Jamie was living in a crisis already. She was not deterred. To her, there are problems in everything big. being afraid of them helps nobody, and the climate doesn’t have time.

There were, of course, hurdles. Big hurdles. Just a few: (1) Investment. Like most big energy projects, geothermal demands huge up-front funding, but the federal government hasn’t provided consistent support like it did with solar, wind, even fossil fuels. And private markets didn’t want to touch it. (2) Information, even the basics. We don’t know enough about the conditions below the surface—exactly what kind of rock is where, how hot it is, what kind of pressure it’s under—and what drilling methods to use. (3) Salability. Given the costs of the tech and construction for a geothermal power plant, it isn’t yet obvious that an operator could sell the electricity at a reasonable price.

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This is to say, the financials have been driving stakes into the heart of geothermal projects for years. “Early return on investment is miserable—half of the investors would be dead before they made money on it,” Tony Pink, a VP at a drilling company, told me.

Add to all that, a lot of the people who are in powerful enough positions and care deeply about the health of the planet might have to get on board with something else: hydraulic fracturing. *Fracking?* Forcing cracks into subterranean rocks to get at the heat inside. Forget it. The word brings worries about contamination from chemicals pushed into and out of the Earth (lead, salt, acid, more) and “seismicity,” or earthquakes. Then, talk about geothermal with lawyers and bureaucrats and all they can think of are the regulations you need to write, legal issues to parse.

But Jamie was living in a crisis already. She was not deterred. To her, there are problems in everything big. Being afraid of them helps nobody, and [the climate doesn't have time.](#)

the words that pour from Jamie form their own little electrical charges: enthusiasm, exclamation, expletive. (“Have you heard this whole narrative about oil rig electrification? That’s fucking greenwashing. Don’t give me that shit. Right?”) She was born in Georgia, raised in southern Alabama. In undergrad at Appalachian State University, she got a degree in industrial technology, focusing on alternative energy. By 2004, after chapters as a climate activist and rock-climbing instructor, she was living in Massachusetts, getting a law degree at Boston University. After that, she took a job at a giant law firm in the environment and energy department. She thought she’d be able to make a difference as an insider. Turns out, not so much. On April 20, 2010, the Deepwater Horizon rig exploded, killing 11 workers and spilling 4 million barrels of oil into the Gulf of Mexico. Jamie watched the live feed of the spill for a week from her comfortable

office. Big Oil hired companies like the one she was working at for its defense. She resigned.

Around the same time, Jamie met an engineer (“You know, crazy mad-scientist dude”) who’d invented a new kind of ultracapacitor—a device for storing and delivering energy, like a battery but with different guts. He was starting a company. She signed up. Early on, the idea was to use ultracapacitors in electric vehicles. They also happened to work well in extreme conditions—like when a hulking drill is boring into intense heat, pressure, and violence underground. Jamie started spending a lot of time on oil and gas rigs in Canada, Denver, West Texas.

One day, while reading about green energy technologies, she came across [a report](#) from MIT and the US Department of Energy called *The Future of Geothermal Energy*. It made the case that we could vastly expand our use of heat from the core of the Earth. She was riveted: You could power the entire country 2,000 times over. Wow. But something else really stuck for her, she says. “This is a set of engineering problems? And then energy is *solved*? Holy shit, we should do this.”

“It was a little bit pie-in-the-sky,” she admits, “pretty moonshot.” She kept working with the ultracapacitor, getting out in the oil field. And she moved to Texas. It just so happened that the industry was in the thick of the shale boom, and engineers were working to quickly iterate. Jamie saw engineers refine, say, directional drilling technology that could shave thousands of dollars off every foot to grind. She realized she was now alongside the very people who could make geothermal everywhere happen. “I was like, dude, it’s going to need to be the oil and gas industry.” So Jamie quit the ultracapacitor.

She was also excited because she was pregnant.

She convinced the University of Texas at Austin to hire her into a role as the director of an entrepreneurship center. She went after a \$1 million grant from the Department of Energy for the school to start a program focused on geothermal—and got it. She called it [the Geothermal Entrepreneurship Organization](#), or GEO. Her aim was to build a thriving geothermal

ecosystem within the oil and gas industry. Texans already had all the skills: They were engineers, geologists, rig operators, oil-field roughnecks.

The future seemed so *possible*.

when her son was a few weeks old, Jamie knew something was very wrong. He cried for days. He would quiet for an hour, then cry again. She just sensed he was in pain. For two years, doctors handed her a litany of possible diagnoses, including that it was in her head. Finally, she found a neurologist who—maybe just to get this intense single mother out of the office—offered to do a genetic test.

Her son had a metabolic disorder called [mucopolysaccharidosis](#) (MPS) type II, or Hunter syndrome. That meant he was missing a snippet of DNA that codes for an enzyme necessary to break down cellular waste. He'd inherited the deletion from her. "His cells just get progressively damaged," she told me over dinner, glancing away. "They're not able to take the trash out." His organs were being slowly destroyed. Her son's version of the disease was both rare and severe. "Maybe one in a million," she said. She found out he probably had about 10 years to live.

When she managed to calm her boy, get him to sleep, or have a nanny help out, Jamie started interviewing doctors and reading everything she could about MPS. Then she came across a paper out of Japan, a study of stem cell transplants on MPS II kids. Doctors had rebuilt the children's immune systems. "Kill your blood factory, replace it with a new one," Jamie explained. Duke University was doing a related study.

By the time her son was 3, the damage done to his organs was profound. He was never going to be verbal; his development essentially stopped somewhere around 18 months, and then started declining. The transplant, docs explained, had a 10 or 15 percent fatality rate. Step one was basically destroying the patient's entire immune system with chemotherapy. Jamie's choices were excruciating: Go for the fences and do a science experiment, or watch him die for 10 years. Jamie went for the fences. She packed up her things in Texas. Her son became one of the first MPS II kids in the US to undergo the transplant.

For every detail Jamie told me, I could see pain. But she also spoke in technical, clinical terms—language I recognized from my husband’s years in and out of hospitals. During the six months Jamie and her son lived in the Duke hospital, she became habituated to speaking in crisis terms and moving at crisis velocity.

In the between moments—between doctor appointments, treatments, finding food her son would eat—Jamie kept her mind from spiraling into despair by calling anyone in Texas who would talk to her about a geothermal future. She’d met the former CTO of Halliburton at a conference. She called him. He told her to call Lance Cook, a former VP of technology and chief scientist at Shell. Geothermal sparked Lance’s curiosity. Jamie kept calling. The kind of geothermal she was after was spectacularly expensive. He got used to saying to Jamie, “That’ll never work.” Each time she hung up, she’d go read more, talk to more Texans. Then she’d call Lance again.

After a while, after talking to so many people, she ran up against a roadblock: The folks in oil and gas didn’t want to be the first to talk about geothermal; they were nervous about jumping in. So to get them talking to one another, and publicly, Jamie turned her energy to planning a five-day virtual conference, and she invited everyone, including experts from grandma’s geothermal. She put a lot of different people on panels together. She called it [Pivot2020: Kicking Off the Geothermal Decade](#). She hoped 1,000 people would log in; 4,000 showed up. A year later she did it again. 14,000 people. Folks were now talking, publicly.

for our second night in Texas, Jamie invited a bunch of former oil guys to meet us at the Baja Cantina and Fiesta, perched above a man-made waterway in the Woodlands. We ordered piles of nachos and quesadillas and wings and beers. As the guys (yeah, they were all guys) showed up, it became clear they had met at the Pivot conference. Now they were working in geothermal startups. Jamie was helping them however she could: advice, chasing grants and other funding sources, contacts, data, information.

As the beers arrived, I asked the engineers and scientists, why geothermal? [For climate change](#), sure. For other reasons too. Spencer Bohlander, a former deep-water drilling engineer and a company man (who designs

wells), expanded: “Our entire world is about heat. Bring heat up. Use it. Power something.” He added, “It’s a no-brainer.” (Jamie yelled from the far end of the table: “Don’t burn shit to make heat. Just use heat for heat.”)

The guys chimed in to lay out the two hefty ideas the industry was chasing: “closed loop” and “enhanced geothermal systems” (EGS in the vernacular).

Spencer explained: Closed loop pretty much means drilling pipes straight into hot, dry rocks, then circulating fluid down and up the pipes. The rocks heat the pipes, and the liquid absorbs the heat from the pipes. (And no fracking!)

Simon Todd, a baby-faced, curly-haired Irishman and geologist who’d been at BP for 25 years, worked at a company called Causeway GT that was pursuing closed-loop systems for perhaps the most obvious idea: direct-use heating. His company aimed to tap right into the hot rock below large industrial buildings or regions—a big data center, a military base—to heat and cool those spaces. (Kind of like massive, available-anywhere versions of the geothermal heat pumps that some people use to heat their homes.)

Nice. And these systems are straightforward enough to build. But models and tests were showing that wellbores generally didn’t have enough surface area to collect the necessary heat. Which could mean deeper, longer drills. Deeper rocks, though, can be dauntingly hard, and the intense temperatures down there will melt a lot of stuff. You could end up drilling as slowly as 6 feet a day, and you might be going tens of thousands of feet deep—even 60,000. At the high end, that could cost \$40,000 or more a foot.

That leaves us with EGS. The method depends on fracking: You bore a hole (first down, then usually horizontally too) and force pressurized fluid into the rock. The rock cracks, creating fissures. Then you fill the fissures with more fluid, which picks up heat from the rock. Now, when you switch your pumps on, your system is circulating liquid through a much bigger surface area—not a loop, but a reservoir. But again, fracking means environmental and political resistance, and no one yet knows if EGS can work commercially.

So what would it take? “Money,” Spencer said. “And not just money but guaranteed money.” Jamie nodded vigorously. The others backed him up. Money to get through the hurdles, to test and fine-tune the tech, to build the power plants. To get things going so the costs can come down. Leon Vanstone, a British scientist whose company was trying to improve drilling into hard rock, added, “Money and certainty.”

In her relentlessness to get this industry off the ground, Jamie had been beating on the doors of multinational oil-field-services companies like Nabors and Baker Hughes—the very companies that had been improving hydraulic fracturing—to get them to help. They had started to throw funding at some of these projects. But considering the massive up-front costs, it wasn’t yet enough.

The sketch of the whisk got Lance thinking about how you might be able to build a geothermal system with just one well. And that would change everything about the price tag. Lance looked at the drawing and thought, “Holy shit. We can do this.”

As the beers drained and the nachos got soggy, the guys, now kind of deflated, reinforced the point: Without the promise of, say, government investment to absorb the riskier startup costs, it was hard to see a thriving future.

On our walk along the waterway back to the hotel, Jamie told me how, back in the ’70s and ’80s, the feds had maddeningly started and stopped research in geothermal—even creating demonstration projects just outside of Houston. “The federal government R&D for geothermal is in total maybe \$100 to \$200 million,” she said. “Solar and wind get billions.” You had people fighting for crumbs. “And venture capital won’t engage.” Now agitated, she added: “You have fucking fusion startups that have been doing the same thing for 10 years and getting a billion dollars. If you had a billion for geothermal, you’d have so much. Then you’d get on a learning curve. From there it’s a snowball.”

Jamie understood that the budding industry was making decisions from a place where the baseline was bad. But failure wasn’t in her lexicon. “To really cut into world energy demand by 2050 means there can’t be friction

points,” she says. “There can’t be frack bans. There can’t be lawsuits. There can’t be half-assed geothermal projects. It literally needs to just go.”

Before Jamie’s son had the stem cell transplant, the doctors warned her how vulnerable he’d be as he recovered. Any infection could be dire, deadly. Not long after the treatment, in the hospital, a problem with his feeding tube caused an infection. Then his chemotherapy left him with serious respiratory issues. For weeks he struggled to breathe, so much so that instructions for how to resuscitate him were taped to his crib. To push her fears from her mind, Jamie, lying on an air mattress beside the crib, would pencil out drawings for how she thought an enhanced geothermal system might work.

One day she sent Lance Cook some of the sketches. One of them looked like a whisk. Another was drawn on a postcard promoting a program for kids with cancer. By now, Lance had been pretty used to, well, accommodating Jamie. (“It was that or *Tiger King*,” he joked, “and she wasn’t annoying.”) But that day, when he looked at the lateral lines and loops she had sketched, he saw something else. With all other EGS proposals he’d seen, the idea was to build two wells, one to pump fluid in and the other to get it out, with an expanse of hot rock in between. The drawing got Lance thinking about how, with geothermal, heat could be gathered from all around a wellbore. A bunch of loops through the rock, all emerging from and converging back to the same place. (The fracked reservoir is a whisk-ish shape.) This meant you might be able to do it with just *one* well. And that would change everything about the price tag. Lance looked at the drawing and realized, “Holy shit. We can do this.”

As he thought about it all, he called an old Shell colleague, Lev Ring. At the time, the Russian-born physicist and engineer was running a software company. Lev told me the call went like this (please imagine this with an elegant, discernible Russian accent): “Lance said, ‘Who cares about your software company, OK? I met this lady. You really need to talk to her.’” So Lev did. And the two guys decided to start a company.

Jamie, ecstatic, added them to the list of new geothermal enthusiasts she was hell-bound to support. Her first quest: help them raise money. Venture capital wasn’t interested. Wall Street wasn’t interested. She went after

climate philanthropy. Chris Anderson, of TED, leaped in with support from Virya, his climate impact fund. Nabors, the multinational drilling company, gave Lance and Lev a cheap lease for office space and \$9 million. Now the two needed the right engineer, someone with a lot of drilling experience. They needed Cindy Taff.

Cindy is an unprepossessing, unflappable mechanical engineer who was born near Dallas and grew up moving around oil country. Her dad was a geophysicist with Mobil Oil, and when she was about 10, the family settled in New Orleans. She stayed local for college—Louisiana State. She got a job at Shell and as a young drilling engineer ended up working for Lance. She loved it. She stayed at Shell for more than three decades, the last seven years as VP of “unconventionals.” Cindy also happened to have managed the drilling of wells all across a region that was super promising for geothermal: southern Texas. When Lance and Lev asked her to come work with them, she lined up her retirement paperwork.

Cindy Taff, 61, has been working in drilling since pretty much right after college. She’s known around southern Texas as a badass.

Photograph: Dan Winters

As soon as that was done, the trio set about building the company. They often hopped on the phone with Jamie. They also often heard strange noises in the background. From time to time, someone would ask her where she was. Jamie finally let slip that she was at a hospital, and she told them a little bit about her son. Cindy, Lance, and Lev happened to be in search of a name for their new company. Now, it was obvious to them: It had to be her son’s name.

Jamie protested. Then she cried. And she was scared. She slipped into her energetic anxieties: What if someone thought she was on the payroll? Or playing favorites? She sent them a list of other names. She felt she had to remain neutral in her support for all her geothermal projects. She was also frightened for a more superstitious reason: “What if they fail?”

Right, right. We hear you. But the trio was adamant. The new company would be named Sage, Sage Geosystems.

the gulf coast of Texas has, for a very long time, been dotted with oil and gas wells. That means we actually know a lot about the conditions below the surface there. In the '70s, when the feds were exploring geothermal resources, they ran a bunch of programs along the state's southern border. They shuttered them in 1992, but the reports that came from those projects left behind a pile of data. It pointed at two counties—Hidalgo and Starr, down in the very tip of Texas—as damn promising. The subsurface conditions, sedimentary rock (so not that hard) with a good amount of heat, were ripe for geothermal, the report said. Which is why, early on a Friday afternoon, Jamie and I left Houston on an hour-long flight toward the Rio Grande and disembarked at McAllen International Airport, 5 miles from the Mexican border.

Back when Cindy was at Shell, she'd helped build a gas well 19,000 feet deep on the Rancho Santa Fe, a truly sprawling windswept property where prized Akaushi beef cattle roam. The well was one of the deepest around. ("They found gas, but it was too expensive to bring it up, so they dumped the project," she tells me. "They probably spent \$10 million.") Cindy knew Rancho Santa Fe was a perfect location to see whether their ideas about doing EGS with a single well could actually work.

Saturday morning, Jamie and I followed Cindy, Lance, and Lev in Cindy's F-150 (her other car is a Prius) out of McAllen, about 45 minutes along flat, flat, flat roads past miles (and miles) of massive wind turbines. When we turned in to the ranch, a guy at the gates made us promise to drive under 10 mph to avoid hitting the prized cattle. About a mile along, towering over all the sagebrush around, was a tall black rig, thumping out a consistent, clanging beat.

By then, drillers, derrick men, and roustabouts working for Sage Geosystems had dropped new pipes down to 11,200 feet. The team took me on a walk around the site, hard hats and steel-toe boots and fireproof coveralls on, a light rain falling. If their plans worked, Cindy and Lev said, wells like this could be drilled in a lot of places, without a very big footprint. Their aim was to build a system and plant that could supply, at first, 3 megawatts of power—enough to power about 3,100 typical homes for a year. Once they made sure it worked, they'd go for 50 megawatts.

A few weeks later, the engineers pumped fluid down into the wells to try to get a big enough, workable reservoir. When I called Cindy to see how it went, she was nearly giddy. The frack had been a success. It created a reservoir “10 times what we expected,” Cindy said, laughing. The team ran fluid through the fracture to confirm it was all connected. (It was.) And their seismic monitors held steady; no earthquakes. It was super good news—not just for Sage, but for a small constellation of people who were deeply, emotionally invested in geothermal in this tip of Texas.

because of the promising conditions in Starr and Hidalgo Counties, Jamie had been helping a handful of people there. The Sage team, of course. The public utility manager for the city of McAllen, who desperately wants to build a geothermal plant for his city. She’d been talking to Dario Guerra, a local water engineer who had been preaching the gospel of geothermal for years. One person she hadn’t met, though, was James McAllen.

So, late in the afternoon, Jamie and I headed about an hour northwest from the city of McAllen to the 50,000-acre San Juanito Ranch, widely known as McAllen Ranch. We were buzzed through an inconspicuous gate, and James—thin, tall, with an ivory cowboy hat on his head—strode up to meet us, a big smile on his face. We made our way to the ranch headquarters: the Rock House, a low-slung stone building that’s more than a century old. Yep. James’ great-great-grandfather gave the town its name. The ranch has worked cattle and horses since before Texas was a state. But, he explained, there’s no more profit in cattle.

The McAllen family ranch includes a cattle farm and a hunting lodge. But James McAllen’s central focus is the stewardship of the place for his heirs, so now he wants to build a geothermal plant there.

Photograph: Dan Winters

“My job is to see how we can get this ranch down the road for the next 100 years,” he said. “And we aren’t going to do that with livestock.” Instead the family looks to every single resource, “from the sun to the wind to the grass to the dirt to the gravel.” About five years ago, James and a partner installed an array of solar panels. The ranch happens to share a property line with an

energy substation, and they now sell power back to the electric company. He was planning to build four more solar arrays.

But one of his nephews, who was studying at UT Austin, had recently called him up. “Hey, you know, Uncle Jim,” the kid said, “I just had a class about geothermal. And McAllen Ranch was all over it.” Turns out, in the late ’70s, when the government was looking for places to test out geothermal, they had approached James’ dad to see whether he wanted to work with them on a demonstration plant. “It was kind of science fiction technology,” James explained. So, no.

After his nephew’s call, James got to thinking. He talked to the utility company he sells solar to; they were excited by the prospect of buying geothermal energy, because it’s a baseload—always available—source. So he called his friend Dario Guerra (the very same), and Dario told James about the Sage crew and their work nearby. Pretty soon, Cindy and Lev and Lance showed up for dinner with bottles of tequila. Within a few weeks, James signed a joint-venture agreement with the team: He’d work on raising the \$27 million or so they’d need, and Sage would begin planning for wells on the ranch.

Jamie had been sitting a bit quiet, for her, on the far side of the table as James told us this whole story. But during a pause, she busted in with enthusiasm. “Wait. Is your nephew in petroleum engineering?” she asked. “That class exists because of GEO!” she exclaimed—GEO being the program she had started at the university. “I feel like I’m in a simulation,” she said. The kid’s professor was the first instructor Jamie had recruited to UT.

Jamie is, of course, just one of a group of evangelists, people who don’t have clear job titles like CEO or director, but who—while they can—are on relentless missions to try to make something better, something livable happen.

On our last morning in Texas, I found Jamie in the dining room of the hotel, some cereal and yogurt on the table in front of her. She was watching a video of her boy. Tears on her cheeks. She handed me her phone so I could see Sage. He was at a table eating breakfast. He’s a gorgeous child: wide

smile, fabulous curly dark hair. He communicates via sweet grunts and laughs. She missed him. But she was also crying because she was exhausted and overwhelmed. That's because after seeing how far Sage Geosystems had come, and meeting James McAllen, it was sinking in that after all the hours and days and minutes she'd spent pushing this project along, the quest for geothermal had taken on a life of its own.

When I got home from the Texas trip, my husband and I had to face new test results, and horrible conversations with our doctors. Then he had the first of two major surgeries. In the moments between ER visits and desperate phone calls, I filled up as much space in my mind as I could to keep my thoughts off of the inconceivable. But as the scaffolding of the life we had built began to shudder, facing the simple requirements of getting through a day became hard. Then harder still.

When Jamie got home, she left the GEO program at the university. It didn't need her anymore. She'd been living back in Boston for a while now, closer to her parents, but Sage wasn't doing too well. He'd had multiple brain surgeries. He would only eat a few things. She moved across town to get him into a school where he (and she) might get better support.

When Sage was sleeping or at school, or when a nanny was giving her a break, Jamie threw even more of herself at geothermal everywhere. She scrapped for more climate philanthropy and launched a program called [Project InnerSpace](#)—to chase missing subsurface data and more accurate maps, to start a competition to focus engineers on the lingering tech problems, to spread geothermal globally. And she turned to publishing [a huge report](#) about the state of geothermal in Texas.

Then, things took a strange turn: When the Inflation Reduction Act was signed in August 2022, it finally—*finally*—offered good tax-based incentives for geothermal projects. Companies could now get a 30 percent tax credit for their projects, maybe even more. If the equipment were made in the US, they could add another 10 percent. Great, amazing! But the law wasn't really set up for geothermal; it was built much more for solar and wind. Which meant it had terrific incentives for the holy grail of solar and wind—[energy storage](#).

It also happened that for many months, Cindy and Lev and Lance had been wondering whether the reservoirs they were creating underground could be, essentially, pressurized storage tanks. Use the excess energy from the grid to fill it up with fluid; when you release the fluid, turbines turn. “Same well design, and same power plants,” Cindy said. Months later, she added, test results showed that they could, in some scenarios, rival the cost of lithium-ion batteries. Sage was diversifying.

Right, nothing happens in a straight line. But there was one conversation I kept remembering from the trip in Texas that seems worth mentioning. Over Italian food, Cindy and Lance and Lev started talking about their kids, all adults now. Their children, they said, were *finally* proud of them, proud of their work. Lance’s kids joked that they could, for the first time, tell people what their father did for a living. Cindy said her 23-year-old daughter knew there was no future in oil and gas. In fact, Cindy’s daughter is now a mechanical engineer working at Sage, using technology that was born out of her mother’s and grandfather’s industry for [wind and solar storage](#), and for a geothermal future.

of course it’s delicious to think the industry that’s been at the heart of such a massive problem, a massive accomplice, could be transformed into a massive solution. No one is that naive; Wall Street is too powerful.

But things are certainly different than when Jamie started. For sure, the thing that she glimpsed when she was at the ultracapacitor startup was coming true: The oil field had accomplished so much that could get us closer to geothermal everywhere. Some big oil companies—Chevron, Shell, Ecopetrol—started in-house programs. And the feds doubled their funding to leverage tech and workforce from the oil and gas industry to expand geothermal. The report Jamie was working on, a 15-chapter, 350-page collaboration between five Texas universities, the International Energy Agency, and a bunch of other organizations, laid out a hopeful picture of how to scale geothermal in coming years. All of it was, in part, because of every hour she put in, every call she made, every dollar she raised.

Jamie is, of course, just one of a group of evangelists, people who don’t have clear job titles like CEO or director, but who—while they can—are on relentless missions to try to make something better, something livable

happen. At that Italian dinner in Texas, when she left the table for a moment, Dario Guerra told me, “Four years ago, when I tried to push this, there wasn’t a Jamie. Four years makes a huge difference.”

Cindy added, “There’d be none of this without Jamie.”

This past fall, Jamie came through San Francisco, trying to raise more money. On a dark, wet night, we met for dinner before she got on a red-eye back across the country—she wanted to be home to take Sage to school. She seemed more exhausted than ever. Tears came easy. The new school district wasn’t working out too well. Sage had never been around other kids. He was struggling. His needs were so intricate that even the complex care department at Boston Children’s Hospital would soon tell her Sage was too complicated for them.

By then, my husband’s cancer had taken the turn I’d dreaded for four years. I lost him. Finding strength to just get through a few hours or a day, much less do any work at all, became excruciating. From that vantage, as I watched Jamie move through the night, I worried about what seemed true: Maybe it was going to take the kind of driving, roiling energy she uses to be able to breathe in a heartbreakin world to do the really big things. The things that really need to be done.

Before she got into a taxi, she told me once more that she thinks Sage’s illness is probably still terminal. I understand, deeply. We need to temper hope in the face of a scary and maybe inevitable future. And we need the energy of that fear, too.

Jamie Beard’s hair and makeup by Pepper Pastor. This article appears in the June 2023 issue. [Subscribe now.](#)

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May 2, 2023 6:00 AM

The Untold Story of the Boldest Supply-Chain Hack Ever

The attackers were in thousands of corporate and government networks. They might still be there now. Behind the scenes of the SolarWinds investigation.

Play/Pause Button



Illustration: Tameem Sankari

Steven Adair wasn't too rattled at first.

It was late 2019, and Adair, the president of the [security](#) firm Volexity, was investigating a digital security breach at an American think tank. The intrusion was nothing special. Adair figured he and his team would rout the attackers quickly and be done with the case—until they noticed something strange. A *second* group of hackers was active in the think tank's network. They were going after email, making copies and sending them to an outside server. These intruders were much more skilled, and they were returning to the network several times a week to siphon correspondence from specific executives, policy wonks, and IT staff.

Adair and his colleagues dubbed the second gang of thieves “Dark Halo” and booted them from the network. But soon they were back. As it turned out, the hackers had planted a [backdoor](#) on the network three years earlier—malicious code that opened a secret portal, allowing them to enter or communicate with infected machines. Now, for the first time, they were

using it. “We shut down one door, and they quickly went to the other,” Adair says.

His team spent a week kicking the attackers out again and getting rid of the backdoor. But in late June 2020, the hackers somehow returned. And they were back to grabbing email from the same accounts. The investigators spent days trying to figure out how they had slipped back in. Volexity zeroed in on one of the think tank’s servers—a machine running a piece of software that helped the organization’s system admins manage their computer network. That software was made by a company that was well known to IT teams around the world, but likely to draw blank stares from pretty much everyone else—an Austin, Texas, firm called SolarWinds.

This article appears in the June 2023 issue. [Subscribe to WIRED](#). Photograph: Dan Winters

Adair and his team figured the hackers must have embedded another backdoor on the victim’s server. But after considerable sleuthing, they couldn’t find one. So they kicked the intruders out again and, to be safe, disconnected the server from the internet. Adair hoped that was the end of it. But the incident nagged at him. For days he woke up around 2 am with a sinking feeling that the team had missed something huge.

They had. And they weren’t the only ones. Around the time Adair’s team was kicking Dark Halo out of the think tank’s network, the US Department of Justice was also wrestling with an intrusion—one involving a server running a trial version of the same SolarWinds software. According to sources with knowledge of the incident, the DOJ discovered suspicious traffic passing from the server to the internet in late May, so they asked one of the foremost security and digital forensics firms in the world—Mandiant—to help them investigate. They also engaged Microsoft, though it’s not clear why. (A Justice Department spokesperson confirmed that this incident and investigation took place but declined to say whether Mandiant and Microsoft were involved. Neither company chose to comment on the investigation.)

According to the sources familiar with the incident, investigators suspected the hackers had breached the Justice Department server directly, possibly by

exploiting a vulnerability in the SolarWinds software. The Justice Department team contacted the company, even referencing a specific file that they believed might be related to the issue, according to the sources, but SolarWinds' engineers were unable to find a vulnerability in their code. After weeks of back and forth the mystery was still unresolved, and the communication between investigators and SolarWinds stopped. (SolarWinds declined to comment on this episode.) The department, of course, had no idea about Volexity's uncannily similar hack.

As summer turned to fall, behind closed doors, suspicions began to grow among people across government and the security industry that something major was afoot. But the government, which had spent years trying to improve its communication with outside security experts, suddenly wasn't talking. Over the next few months, "people who normally were very chatty were hush-hush," a former government worker says. There was a rising fear among select individuals that a devastating cyber operation was unfolding, he says, and no one had a handle on it.

In fact, the Justice Department and Volexity had stumbled onto one of the most sophisticated cyberespionage campaigns of the decade. The perpetrators had indeed hacked SolarWinds' software. Using techniques that investigators had never seen before, the hackers gained access to thousands of the company's customers. Among the infected were at least eight other federal agencies, including the US Department of Defense, Department of Homeland Security, and the Treasury Department, as well as top tech and security firms, including [Intel](#), [Cisco](#), and [Palo Alto Networks](#)—though none of them knew it yet. Even Microsoft and Mandiant were on the victims list.

After the Justice Department incident, the operation remained undiscovered for another six months. When investigators finally cracked it, they were blown away by the hack's complexity and extreme premeditation. Two years on, however, the picture they've assembled—or at least what they've shared publicly—is still incomplete. A full accounting of the campaign's impact on federal systems and what was stolen has never been provided to the public or to lawmakers on Capitol Hill. According to the former government source and others, many of the federal agencies that were

affected didn't maintain adequate network logs, and hence may not even know what all was taken. Worse: Some experts believe that SolarWinds was not the only vector—that other software makers were, or might still be, spreading malware. What follows is an account of the investigation that finally exposed the espionage operation—how it happened, and what we know. So far.

on November 10, 2020, an analyst at Mandiant named Henna Parviz responded to a routine security alert—the kind that got triggered anytime an employee enrolled a new phone in the firm's multifactor authentication system. The system sent out one-time access codes to credentialed devices, allowing employees to sign in to the company's virtual private network. But Parviz noticed something unusual about this Samsung device: It had no phone number associated with it.

She looked closely at the phone's activity logs and saw another strange detail. The employee appeared to have used the phone to sign in to his VPN account from an IP address in Florida. But the person didn't live in Florida, and he still had his old iPhone enrolled in the multifactor system. Then she noticed that the Samsung phone had been used to log in from the Florida IP address at the same time the employee had logged in with his iPhone from his home state. Mandiant had a problem.

The security team blocked the Samsung device, then spent a day investigating how the intruder had gotten into the network. They soon realized the issue transcended a single employee's account. The attackers had pulled off a Golden SAML attack—a sophisticated technique for hijacking a company's employee authentication system. They could seize control of a worker's accounts, grant those accounts more privileges, even create new accounts with unlimited access. With this power, there was no telling how deep they had burrowed into the network.

On November 17, Scott Runnels and Eric Scales, senior members of Mandiant's consulting division, quietly pulled together a top-tier investigative team of about 10, grabbing people from other projects without telling managers why, or even when the employees would return. Uncertain what the hunt would uncover, Runnels and Scales needed to control who knew about it. The group quickly realized that the hackers had been active

for weeks but had evaded detection by “living off the land”—subverting administration tools already on the network to do their dirty deeds rather than bringing in their own. They also tried to avoid creating the patterns, in activity logs and elsewhere, that investigators usually look for.

The Mandiant team was facing a textbook example of a supply-chain hack—the nefarious alteration of trusted software at its source.

But in trying to outsmart Mandiant, the thieves inadvertently left behind different fingerprints. Within a few days, investigators picked up the trail and began to understand where the intruders had been and what they had stolen.

On Friday morning, November 20, Kevin Mandia, Mandiant’s founder and CEO, clicked out of an all-hands meeting with 3,000 employees and noticed that his assistant had added a new meeting to his calendar. “Security brief” was all it said. Mandia, a 52-year-old former Air Force intelligence officer who still sports taper-cut military hair two decades after leaving service, was planning to get an early start on the weekend, but he dialed into the call anyway. He expected a quick update of some kind. Five minutes into the conversation, he knew his weekend was shot.

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Many of the highest-profile hacks of the past two decades have been investigated by Mandia's firm, which he launched in 2004. Acquired by FireEye in 2013, and again last year by Google, the company has threat hunters working on more than 1,000 cases annually, which have included breaches at Google, Sony, Colonial Pipeline, and others. In all that time, Mandiant itself had never suffered a serious hack. Now the hunters were the hunted.

The intruders, Mandia learned, had swiped tools his company uses to find vulnerabilities in its clients' networks. They had also viewed sensitive information identifying its government customers. As his team described how the intruders had concealed their activity, Mandia flashed back to incidents from the early days of his career. From 1995 to 2013, while in the Air Force Office of Special Investigations and in the private sector, he had observed Russian threat actors continuously testing systems, disappearing as soon as investigators got a lock on them. Their persistence and stealth made them the toughest adversaries he'd ever faced. Now, hearing about the activity inside his own network, he "started getting pattern recognition," he later told a conference audience. The day after getting the unsettling news of the breach, he reached out to the National Security Agency (NSA) and other government contacts.

While Mandia conferred with the government, Charles Carmakal, the CTO of Mandiant Consulting, contacted some old friends. Many of the hackers' tactics were unfamiliar, and he wanted to see whether two former Mandiant colleagues, Christopher Glycer and Nick Carr, had seen them before. Glycer and Carr had spent years investigating large, sophisticated campaigns and had tracked the notorious hackers of the SVR—Russia's foreign intelligence agency—extensively. Now the two worked for Microsoft, where they had access to data from many more hacking campaigns than they had at Mandiant.

Carmakal told them the bare minimum—that he wanted help identifying some activity Mandiant was seeing. Employees of the two companies often shared notes on investigations, so Glycer thought nothing of the request. That evening, he spent a few hours digging into the data Carmakal sent him,

then tapped Carr to take over. Carr was a night owl, so they often tag-teamed, with Carr passing work back to Glycer in the morning.

The two didn't see any of the familiar tactics of known hacking groups, but as they followed trails they realized whatever Mandiant was tracking was significant. "Every time you pulled on a thread, there was a bigger piece of yarn," Glycer recalls. They could see that multiple victims were communicating with the hackers Carmakal had asked them to trace. For each victim, the attackers set up a dedicated command-and-control server and gave that machine a name that partly mimicked the name a real system on the victim's network might have, so it wouldn't draw suspicion. When Glycer and Carr saw a list of those names, they realized they could use it to identify new victims. And in the process, they unearthed what Carmakal hadn't revealed to them—that Mandiant itself had been hacked.

It was a "holy shit" moment, recalls John Lambert, head of Microsoft Threat Intelligence. The attackers weren't only looking to steal data. They were conducting counterintelligence against one of their biggest foes. "Who do customers speed-dial the most when an incident happens?" he says. "It's Mandiant."

As Carr and Glycer connected more dots, they realized they had seen signs of this hack before, in unsolved intrusions from months earlier. More and more, the exceptional skill and care the hackers took to hide their tracks was reminding them of the SVR.

Video: Tameem Sankari

back at mandiant, workers were frantically trying to address what to do about the tools the hackers had stolen that were designed to expose weak spots in clients' defenses. Concerned that the intruders would use those products against Mandiant customers or distribute them on the dark web, Mandiant set one team to work devising a way to detect when they were being used out in the wild. Meanwhile, Runnels' crew rushed to figure out how the hackers had slipped in undetected.

Because of the pandemic, the team was working from home, so they spent 18 hours a day connected through a conference call while they scoured logs

and systems to map every step the hackers took. As days turned to weeks, they became familiar with the cadence of each other's lives—the voices of children and partners in the background, the lulling sound of a snoring pit bull lying at Runnels' feet. The work was so consuming that at one point Runnels took a call from a Mandiant executive while in the shower.

Runnels and Scales briefed Mandia daily. Each time the CEO asked the same question: How did the hackers get in? The investigators had no answer.

On December 8, when the detection tools were ready and the company felt it had enough information about the breach to go public, Mandiant broke its silence and released a blockbuster [statement](#) revealing that [it had been hacked](#). It was sparse on details: Sophisticated hackers had stolen some of its security tools, but many of these were already public, and there was no evidence the attackers had used them. Carmakal, the CTO, worried that customers would lose confidence in the company. He was also anxious about how his colleagues would react to the news. “Are employees going to feel embarrassed?” he wondered. “Are people not going to want to be part of this team anymore?”

What Mandiant did not reveal was how the intruders got in or how long they had been in the company’s network. The firm says it still didn’t know. Those omissions created the impression that the breach was an isolated event with no other victims, and people wondered whether the company had made basic security errors that got it hacked. “We went out there and said that we got compromised by a top-tier adversary,” Carmakal says—something every victim claims. “We couldn’t show the proof yet.”

Mandiant isn’t clear about exactly when it made the first discovery that led it to the source of the breach. Runnels’ team fired off a barrage of hypotheses and spent weeks running down each one, only to turn up misses. They’d almost given up hope when they found a critical clue buried in traffic logs: Months earlier, a Mandiant server had communicated briefly with a mysterious system on the internet. And that server was running software from SolarWinds.

SolarWinds makes dozens of programs for IT administrators to monitor and manage their networks—helping them configure and patch a lot of systems at once, track performance of servers and applications, and analyze traffic. Mandiant was using one of the Texas company’s most popular products, a software suite called Orion. The software should have been communicating with SolarWinds’ network only to get occasional updates. Instead it was contacting an unknown system—likely the hackers’ command-and-control server.

Back in June, of course, Mandiant had been called in to help the Justice Department investigate an intrusion on a server running SolarWinds software. Why the pattern-matchers at one of the world’s preeminent security firms apparently didn’t recognize a similarity between the two cases is one of the lingering mysteries of the SolarWinds debacle. It’s likely that Runnels’ chosen few hadn’t worked on the Justice case, and internal secrecy prevented them from discovering the connection. (Mandiant declined to comment.)

Runnels’ team suspected the infiltrators had installed a backdoor on the Mandiant server, and they tasked Willi Ballenthin, a technical director on the team, and two others with finding it. The task before him was not a simple one. The Orion software suite consisted of more than 18,000 files and 14 gigabytes of code and data. Finding the rogue component responsible for the suspicious traffic, Ballenthin thought, would be like riffling through *Moby-Dick* for a specific sentence when you’d never read the book.

But they had been at it only 24 hours when they found the passage they’d been looking for: a single file that appeared to be responsible for the rogue traffic. Carmakal believes it was December 11 when they found it.

The file was a .dll, or dynamic-link library—code components shared by other programs. This .dll was large, containing about 46,000 lines of code that performed more than 4,000 legitimate actions, and—as they found after analyzing it for an hour—one illegitimate one.

The main job of the .dll was to tell SolarWinds about a customer’s Orion usage. But the hackers had embedded malicious code that made it transmit

intelligence about the victim's network to *their* command server instead. Ballenthin dubbed the rogue code "Sunburst"—a play on SolarWinds. They were ecstatic about the discovery. But now they had to figure out how the intruders had snuck it into the Orion .dll.

This was far from trivial. The Orion .dll file was signed with a SolarWinds digital certificate, which was *supposed* to verify that the file was legitimate company code. One possibility was that the attackers had stolen the digital certificate, created a corrupt version of the Orion file, signed the file to make it look authentic, then installed the corrupt .dll on Mandiant's server. Or, more alarmingly, they might have breached SolarWinds' network and altered the legitimate Orion .dll source code *before* SolarWinds compiled it—converting the code into software—and signed it. The second scenario seemed so far-fetched that the Mandiant crew didn't really consider it—until an investigator downloaded an Orion software update from the SolarWinds website. The backdoor was in it.

The implication was staggering. The Orion software suite had about 33,000 customers, some of whom had started receiving the hacked software update in March. That meant some customers might have been compromised for eight months already. The Mandiant team was facing a textbook example of a [software-supply-chain attack](#)—the nefarious alteration of trusted software at its source. In a single stroke, attackers can infect thousands, potentially millions, of machines.

In 2017 hackers had sabotaged a software supply chain and delivered malware to more than 2 million users by compromising the computer security cleanup tool [CCleaner](#). That same year, Russia distributed the malicious [NotPetya worm](#) in a software update to the Ukrainian equivalent of TurboTax, which then spread around the world. Not long after, Chinese hackers also used a software update to slip a backdoor to thousands of [Asus customers](#). Even at this early stage in the investigation, the Mandiant team could tell that none of those other attacks would rival the SolarWinds campaign.

it was a Saturday morning, December 12, when Mandia called SolarWinds' president and CEO on his cell phone. Kevin Thompson, a 14-year veteran of the Texas company, was stepping down as CEO at the end of the month.

What he was about to hear from Mandia—that Orion was infected—was a hell of a way to wrap up his tenure. “We’re going public with this in 24 hours,” Mandia said. He promised to give SolarWinds a chance to publish an announcement first, but the timeline wasn’t negotiable. What Mandia didn’t mention was that he was under external pressure himself: A reporter had been tipped off about the backdoor and had contacted his company to confirm it. Mandia expected the story to break Sunday evening, and he wanted to get ahead of it.

Thompson started making calls, one of the first to Tim Brown, SolarWinds’ head of security architecture. Brown and his staff quickly confirmed the presence of the Sunburst backdoor in Orion software updates and figured out, with alarm, that it had been delivered to as many as 18,000 customers since the spring of 2020. (Not every Orion user had downloaded it.) Thompson and others spent most of Saturday frantically pulling together teams to oversee the technical, legal, and publicity challenges they faced. They also called the company’s outside legal counsel, DLA Piper, to oversee the investigation of the breach. Ron Plesco, an attorney at Piper and former prosecutor with forensic expertise, was in his backyard with friends when he got the call at around 10 pm.

Plesco beelined to his home office, arrayed with whiteboards, and started sketching out a plan. He set a timer for 20 hours, annoyed by what he felt was Mandia’s arbitrary deadline. A day was nowhere near enough to prepare affected customers. He worried that once SolarWinds went public, the attackers might do something destructive in customers’ networks before anyone could boot them out.

The attackers had infected thousands of networks but only dug deep into a tiny subset of them—about 100. The main goal appeared to be espionage.

The practice of placing legal teams in charge of breach investigations is a controversial one. It puts cases under attorney-client privilege in a manner that can help companies fend off regulatory inquiries and fight discovery requests in lawsuits. Plesco says SolarWinds was, from the start, committed to transparency, publishing everything it could about the incident. (In interviews, the company was mostly forthcoming, but both it and Mandiant withheld some answers on the advice of legal counsel or per government

request—Mandiant more so than SolarWinds. Also, SolarWinds recently settled a class action with shareholders over the breach but still faces a possible enforcement action from the Securities and Exchange Commission, making it less open than it might otherwise be about events.)

In addition to DLA Piper, SolarWinds brought on the security firm CrowdStrike, and as soon as Plesco learned this, he knew he wanted his old friend, Adam Meyers, on the case. The two had known each other for decades, ever since they'd worked on incident response for a defense contractor. Meyers was now the head of CrowdStrike's threat intelligence team and rarely worked investigations. But when Plesco texted him at 1 am to say "I need your help," he was all in.

Later that Sunday morning, Meyers jumped on a briefing call with Mandiant. On the call was a Microsoft employee, who told the group that in some cases, the hackers were systematically compromising Microsoft Office 365 email accounts and Azure cloud accounts. The hackers were also able to bypass multifactor authentication protocols. With every detail Meyers heard, the scope and complexity of the breach grew. Like others, he also suspected the SVR.

After the call, Meyers sat down in his living room. Mandiant had sent him the Sunburst code—the segment of the .dll file that contained the backdoor—so now he bent over his laptop and began picking it apart. He would remain in this huddled position for most of the next six weeks.

at solarwinds, shock, disbelief, and “controlled chaos” ruled those first days, says Tim Brown, the head of security architecture. Dozens of workers poured into the Austin office they hadn't visited in months to set up war rooms. The hackers had compromised 71 SolarWinds email accounts—likely to monitor correspondence for any indication they'd been detected—so for the first few days, the teams communicated only by phone and outside accounts, until CrowdStrike cleared them to use their corporate email again.

Brown and his staff had to figure out how they had failed to prevent or detect the hack. Brown knew that whatever they found could cost him his job.

One of the team's first tasks was to collect data and logs that might reveal the hackers' activity. They quickly discovered that some logs they needed didn't exist—SolarWinds didn't track everything, and some logs had been wiped by the attackers or overwritten with new data as time passed. They also scrambled to see whether any of the company's nearly 100 other products were compromised. (They only found evidence that Orion was hit.)

Around midmorning on Sunday, news of the hack began to leak. Reuters [reported](#) that whoever had struck Mandiant had also breached the Treasury Department. Then around 5 pm Eastern time, *Washington Post* reporter Ellen Nakashima [tweeted](#) that SolarWinds' software was believed to be the source of the Mandiant breach. She added that the Commerce Department had also been hit. The severity of the campaign was growing by the minute, but SolarWinds was still several hours from publishing its announcement. The company was obsessing over every detail—a required filing to the Securities and Exchange Commission got so heavily lawyered that Thompson, the CEO, quipped at one point that adding a single comma would cost \$20,000.

Around 8:30 that night, the company finally published a blog post announcing the compromise of its Orion software—and emailed customers with a preliminary fix. [Mandiant](#) and [Microsoft](#) followed with their own reports on the backdoor and the activity of the hackers once inside infected networks. Oddly, Mandiant didn't identify itself as an Orion victim, nor did it explain how it discovered the backdoor in the first place. Reading Mandiant's write-up, one would never know that the Orion compromise had anything to do with the announcement of its own breach five days earlier.

Monday morning, calls started cascading in to SolarWinds from journalists, federal lawmakers, customers, and government agencies in and outside the US, including president-elect Joe Biden's transition team. Employees from across the company were pulled in to answer them, but the queue grew to more than 19,000 calls.

The US Cybersecurity and Infrastructure Security Agency wanted to know whether any research labs developing Covid vaccines had been hit. Foreign governments wanted lists of victims inside their borders. Industry groups

for power and energy wanted to know whether nuclear facilities were breached.

As agencies scrambled to learn whether their networks used Orion software —many weren’t sure—CISA issued an [emergency directive](#) to federal agencies to disconnect their SolarWinds servers from the internet and hold off on installing any patch aimed at disabling the backdoor until the security agency approved it. The agency noted that it was up against a “patient, well-resourced, and focused adversary” and that removing them from networks would be “highly complex and challenging.” Adding to their problems, many of the federal agencies that had been compromised were lax about logging their network activity, which effectively gave cover to the hackers, according to the source familiar with the government’s response. The government “couldn’t tell how they got in and how far across the network they had gone,” the source says. It was also “really difficult to tell what they had taken.”

It should be noted that the Sunburst backdoor was useless to the hackers if a victim’s Orion server wasn’t connected to the internet. Luckily, for security reasons, most customers did not connect them—only 20 to 30 percent of all Orion servers were online, SolarWinds estimated. One reason to connect them was to send analytics to SolarWinds or to obtain software updates. According to standard practice, customers should have configured the servers to only communicate with SolarWinds, but many victims had failed to do this, including Mandiant and Microsoft. The Department of Homeland Security and other government agencies didn’t even put them behind firewalls, according to Chris Krebs, who at the time of the intrusions was in charge of CISA. Brown, SolarWinds’ security chief, notes that the hackers likely knew in advance whose servers were misconfigured.

But it soon became clear that although the attackers had infected thousands of servers, they had dug deep into only a tiny subset of those networks—about 100. The main goal appeared to be espionage.

The hackers handled their targets carefully. Once the Sunburst backdoor infected a victim’s Orion server, it remained inactive for 12 to 14 days to evade detection. Only then did it begin sending information about an infected system to the attackers’ command server. If the hackers decided the

infected victim wasn't of interest, they could disable Sunburst and move on. But if they liked what they saw, they installed a second backdoor, which came to be known as Teardrop. From then on, they used Teardrop instead of Sunburst. The breach of SolarWinds' software was precious to the hackers —the technique they had employed to embed their backdoor in the code was unique, and they might have wanted to use it again in the future. But the more they used Sunburst, the more they risked exposing how they had compromised SolarWinds.

Through Teardrop, the hackers stole account credentials to get access to more sensitive systems and email. Many of the 100 victims that got Teardrop were technology companies—places such as Mimecast, a cloud-based service for securing email systems, or the antivirus firm Malwarebytes. Others were government agencies, defense contractors, and think tanks working on national security issues. The intruders even accessed Microsoft's source code, though the company says they didn't alter it.

victims might have made some missteps, but no one forgot where the breaches began. Anger against SolarWinds mounted quickly. A former employee claimed to reporters that he had warned SolarWinds executives in 2017 that their inattention to security made a breach inevitable. A researcher revealed that in 2018 someone had recklessly posted, in a public GitHub account, a password for an internal web page where SolarWinds software updates were temporarily stored. A bad actor could have used the password to upload malicious files to the update page, the researcher said (though this would not have allowed the Orion software itself to be compromised, and SolarWinds says that this password error was not a true threat). Far worse, two of the company's primary investors—firms that owned about 75 percent of SolarWinds and held six board seats—sold \$315 million in stock on December 7, six days before news of the hack broke, prompting an SEC investigation into whether they had known about the breach.

Government officials threatened to cancel their contracts with SolarWinds; lawmakers were talking about calling its executives into a hearing. The company hired Chris Krebs, CISA's former head, who weeks earlier had

been fired by President Donald Trump, to help navigate interactions with the government.

Meanwhile, Brown and his security team faced a mountain of work. The tainted Orion software was signed with the company's digital certificate, which they now had to invalidate. But the same certificate had been used to sign many of the company's other software products too. So the engineers had to recompile the source code for every affected product and sign those new programs with new certificates.

But they still didn't know where the rogue code in Orion had come from. Malicious code could be lurking on their servers, which could embed a backdoor in any of the programs being compiled. So they ditched their old compilation process for a new one that allowed them to check the finished program for any unauthorized code. Brown says they were under so much stress to get the recompiled programs out to customers that he lost 25 pounds in three weeks.

While Brown's team rebuilt the company's products and CrowdStrike tried to figure out how the hackers got into SolarWinds' network, SolarWinds brought on KPMG, an accounting firm with a computer forensics arm, to solve the mystery of how the hackers had slipped Sunburst into the Orion .dll file. David Cowen, who had more than 20 years of experience in digital forensics, led the KPMG team.

The infrastructure SolarWinds used to build its software was vast, and Cowen and his team worked with SolarWinds engineers through the holidays to solve the riddle. Finally, on January 5, he called Plesco, the DLA Piper attorney. A SolarWinds engineer had spotted something big: artifacts of an old virtual machine that had been active about a year earlier. That virtual machine—a set of software applications that takes the place of a physical computer—had been used to build the Orion software back in 2020. It was the critical puzzle piece they needed.

Forensic investigations are often a game of chance. If too much time has passed since a breach began, traces of a hacker's activity can disappear. But sometimes the forensic gods are on your side and evidence that should be gone remains.

To build the Orion program, SolarWinds had used a software build-management tool called TeamCity, which acts like an orchestra conductor to turn source code into software. TeamCity spins up virtual machines—in this case about 100—to do its work. Ordinarily, the virtual machines are ephemeral and exist only as long as it takes to compile software. But if part of the build process fails for some reason, TeamCity creates a “memory dump”—a kind of snapshot—of the virtual machine where the failure occurred. The snapshot contains all of the virtual machine’s contents at the time of failure. That’s exactly what occurred during the February 2020 build. Ordinarily, SolarWinds engineers would delete these snapshots during post-build cleanup. But for some reason, they didn’t erase this one. If it hadn’t been for its improbable existence, Cowen says, “we would have nothing.”

In the snapshot, they found a malicious file that had been on the virtual machine. Investigators dubbed it “Sunspot.” The file had only 3,500 lines of code, but those lines turned out to be the key to understanding everything.

It was around 9 pm on January 5 when Cowen sent the file to Meyers at CrowdStrike. The CrowdStrike team got on a Zoom call with Cowen and Plesco, and Meyers put the Sunspot file into a decompiler, then shared his screen. Everyone grew quiet as the code scrolled down, its mysteries slowly revealed. This tiny little file, which should have disappeared, was responsible for injecting the backdoor into the Orion code and allowing the hackers to slip past the defenses of some of the most well-protected networks in the country.

Now the investigators could trace any activity related to Sunspot. They saw that the hackers had planted it on the build server on February 19 or 20. It lurked there until March, when SolarWinds developers began building an Orion software update through TeamCity, which created a fleet of virtual machines. Not knowing which virtual machine would compile the Orion .dll code, the hackers designed a tool that deployed Sunspot into each one.

At this point, the beauty and simplicity of the hack truly revealed itself. Once the .dll appeared on a virtual machine, Sunspot quickly and automatically renamed that legitimate file and gave its original name to the hackers’ rogue doppelgänger .dll. The latter was almost an exact replica of

the legitimate file, except it contained Sunburst. The build system then grabbed the hackers' .dll file and compiled it into the Orion software update. The operation was done in a matter of seconds.

Once the rogue .dll file was compiled, Sunspot restored the original name to the legitimate Orion file, then deleted itself from all of the virtual machines. It remained on the build server for months, however, to repeat the process the next two times Orion got built. But on June 4, the hackers abruptly shut down this part of their operation—removing Sunspot from the build server and erasing many of their tracks.

Cowen, Meyers, and the others couldn't help but pause to admire the tradecraft. They'd never before seen a build process get compromised. "Sheer elegance," Plesco called it. But then they realized something else: Nearly every other software maker in the world was vulnerable. Few had built-in defenses to prevent this type of attack. For all they knew, the hackers might have already infiltrated other popular software products. "It was this moment of fear among all of us," Plesco says.

the next day, January 6—the same day as the insurrection on Capitol Hill—Plesco and Cowen hopped on a conference call with the FBI to brief them on their gut-churning discovery. The reaction, Plesco says, was palpable. "If you can sense a virtual jaw drop, I think that's what occurred."

A day later they briefed the NSA. At first there were just two people from the agency on the video call—faceless phone numbers with identities obscured. But as the investigators relayed how Sunspot compromised the Orion build, Plesco says, more than a dozen phone numbers popped up onscreen, as word of what they'd found "rippled through the NSA."

But the NSA was about to get another shock. Days later, members of the agency joined a conference call with 50 to 100 staffers from the Homeland Security and Justice Departments to discuss the SolarWinds hack. The people on the call were stumped by one thing: Why, when things had been going so well for them, had the attackers suddenly removed Sunspot from the build environment on June 4?

The response from an FBI participant stunned everyone.

The man revealed matter-of-factly that, back in the spring of 2020, people at the agency had discovered some rogue traffic emanating from a server running Orion and contacted SolarWinds to discuss it. The man conjectured that the attackers, who were monitoring SolarWinds' email accounts at the time, must have gotten spooked and deleted Sunspot out of fear that the company was about to find it.

Callers from the NSA and CISA were suddenly livid, according to a person on the line—because for the first time, they were learning that Justice had detected the hackers months earlier. The FBI guy “phrased it like it was no big deal,” the attendee recalls. The Justice Department told WIRED it had informed CISA of its incident, but at least some CISA people on the call were responding as if it was news to them that Justice had been close to discovering the attack—half a year before anyone else. An NSA official told WIRED that the agency was indeed “frustrated” to learn about the incident on the January call. For the attendee and others on the call who hadn’t been aware of the DOJ breach, it was especially surprising, because, the source notes, in the months after the intrusion, people had been “freaking out” behind closed doors, sensing that a significant foreign spy operation was underway; better communication among agencies might have helped uncover it sooner.

Instead, says the person with knowledge of the Justice investigation, that agency, as well as Microsoft and Mandiant, surmised that the attackers must have infected the DOJ server in an isolated attack. While investigating it in June and July, Mandiant had unknowingly downloaded and installed tainted versions of the Orion software to its own network. (CISA declined to comment on the matter.)

the discovery of the Sunspot code in January 2021 blew the investigation open. Knowing when the hackers deposited Sunspot on the build server allowed Meyers and his team to track their activity backward and forward from that time and reinforced their hunch that the SVR was behind the operation.

The SVR is a civilian intelligence agency, like the CIA, that conducts espionage outside the Russian Federation. Along with Russia’s military intelligence agency, the GRU, it hacked the US Democratic National

Committee in 2015. But where the GRU tends to be noisy and aggressive—it publicly leaked information stolen from the DNC and Hilary Clinton’s presidential campaign—SVR hackers are more deft and quiet. Given various names by different security firms (APT29, Cozy Bear, the Dukes), SVR hackers are noted for their ability to remain undetected in networks for months or years. The group was very active between 2014 and 2016, Glycer says, but then seemed to go dark. Now he understood that they’d used that time to restrategeize and develop new techniques, some of which they used in the SolarWinds campaign.

Investigators found that the intruders had first used an employee’s VPN account on January 30, 2019, a full *year* before the Orion code was compromised. The next day, they returned to siphon 129 source code repositories for various SolarWinds software products and grabbed customer information—presumably to see who used which products. They “knew where they were going, knew what they were doing,” Plesco says.

The hackers likely studied the source code and customer data to select their target. Orion was the perfect choice. The crown jewel of SolarWinds’ products, it accounted for about 45 percent of the company’s revenue and occupied a privileged place in customer networks—it connected to and communicated with a lot of other servers. The hackers could hijack those connections to jump to other systems without arousing suspicion.

Once they had the source code, the hackers disappeared from the SolarWinds network until March 12, when they returned and accessed the build environment. Then they went dark for six months. During that time they may have constructed a replica of the build environment to design and practice their attack, because when they returned on September 4, 2019, their movements showed expertise. The build environment was so complex that a newly hired engineer could take months to become proficient in it, but the hackers navigated it with agility. They also knew the Orion code so well that the doppelgänger .dll they created was stylistically indistinguishable from the legitimate SolarWinds file. They even improved on its code, making it cleaner and more efficient. Their work was so exceptional that investigators wondered whether an insider had helped the hackers, though they never found evidence of that.

Not long after the hackers returned, they dropped benign test code into an Orion software update, meant simply to see whether they could pull off their operation and escape notice. Then they sat back and waited. (SolarWinds wasn't scheduled to release its next Orion software update for about five months.) During this time, they watched the email accounts of key executives and security staff for any sign their presence had been detected. Then, in February 2020, they dropped Sunspot into place.

On November 26, the intruders logged in to the SolarWinds VPN for the last time—while Mandiant was deep into its investigation. The hackers continued to monitor SolarWinds email accounts until December 12, the day Kevin Mandia called Kevin Thompson to report the backdoor. Nearly two years had passed since they had compromised SolarWinds.

Illustration: Tameem Sankari

steven adair, the Volexity CEO, says it was pure luck that, back in 2019, his team had stumbled on the attackers in a think tank's network. They felt proud when their suspicion that SolarWinds was the source of the intrusion was finally confirmed. But Adair can't help but rue his missed chance to halt the campaign earlier. "We were so close," he says.

Mandiant's Carmakal believes that if the hackers hadn't compromised his employer, the operation might have gone undetected for much longer. Ultimately, he calls the SolarWinds hacking campaign "a hell of an expensive operation for very little yield"—at least in the case of its impact on Mandiant. "I believe we caught the attackers far earlier than they ever anticipated," he says. "They were clearly shocked that we uncovered this ... and then discovered SolarWinds' supply chain attack."

But given how little is still known publicly about the wider campaign, any conclusions about the success of the operation may be premature.

The US government has been fairly tight-lipped about what the hackers did inside its networks. News reports revealed that the hackers stole email, but how much correspondence was lost or what it contained has never been disclosed. And the hackers likely made off with more than email. From targeting the Departments of Homeland Security, Energy, and Justice, they

could plausibly have accessed highly sensitive information—perhaps details on planned sanctions against Russia, US nuclear facilities and weapons stockpiles, the security of election systems, and other critical infrastructure. From the federal court’s electronic case-files system, they could have siphoned off sealed documents, including indictments, wiretap orders, and other nonpublic material. Given the logging deficiencies on government computers noted by one source, it’s possible the government still doesn’t have a full view of what was taken. From technology companies and security firms, they could have nabbed intelligence about software vulnerabilities.

More concerning: Among the 100 or so entities that the hackers focused on were other makers of widely used software products. Any one of those could potentially have become [a vehicle for another supply chain attack](#) of similar scale, targeting the customers of those companies. But few of those other companies have revealed what, if anything, the hackers did inside their networks. Why haven’t they gone public, as Mandiant and SolarWinds did? Is it to protect their reputations, or did the government ask them to keep quiet for national security reasons or to protect an investigation? Carmakal feels strongly that the SolarWinds hackers intended to compromise other software, and he said recently in a call with the press that his team had seen the hackers “poking around in source code and build environments for a number of other technology companies.”

What’s more, Microsoft’s John Lambert says that judging by the attackers’ tradecraft, he suspects the SolarWinds operation wasn’t their first supply chain hack. Some have even wondered whether SolarWinds itself got breached through a different company’s infected software. SolarWinds still doesn’t know how the hackers first got into its network or whether January 2019 was their first time—the company’s logs don’t go back far enough to determine.

Krebs, the former head of CISA, condemns the lack of transparency. “This was not a one-off attack by the SVR. This is a broader global-listening infrastructure and framework,” he says, “and the Orion platform was just one piece of that. There were absolutely other companies involved.” He says, however, that he doesn’t know specifics.

Krebs takes responsibility for the breach of government networks that happened on his watch. “I was the leader of CISA while this happened,” he says. “There were many people in positions of authority and responsibility that share the weight here of not detecting this.” He faults the Department of Homeland Security and other agencies for not putting their Orion servers behind firewalls. But as for detecting and halting the broader campaign, he notes that “CISA is really the last line of defense … and many other layers failed.”

The government has tried to address the risks of another Orion-style attack —through presidential [directives](#), [guidelines](#), [initiatives](#), and other security-boosting [actions](#). But it may take years for any of these measures to have impact. In 2021, President Biden issued an executive order calling on the Department of Homeland Security to set up a Cyber Safety Review Board to thoroughly assess “cyber incidents” that threaten national security. Its first priority: to investigate the SolarWinds campaign. But in 2022 the board focused on [a different topic](#), and its second investigation will also [not be about SolarWinds](#). Some have suggested the government wants to avoid a deep assessment of the campaign because it could [expose industry and government failures](#) in preventing the attack or detecting it earlier.

“SolarWinds was the largest intrusion into the federal government in the history of the US, and yet there was not so much as a report of what went wrong from the federal government,” says US representative Ritchie Torres, who in 2021 was vice-chair of the House Committee on Homeland Security. “It’s as inexcusable as it is inexplicable.”

At a recent conference, CISA and the US’s Cyber National Mission Force, a division of Cyber Command, revealed new details about their response to the campaign. They said that after investigators identified Mandiant’s Orion server as the source of that firm’s breach, they gleaned details from Mandiant’s server that allowed them to hunt down the attackers. The two government teams implied that they even penetrated a system belonging to the hackers. The investigators were able to collect 18 samples of malware belonging to the attackers—useful for hunting for their presence in infected networks.

Speaking to conference attendees, Eric Goldstein, the leader for cybersecurity at CISA, said the teams were confident that they had fully booted these intruders from US government networks.

But the source familiar with the government's response to the campaign says it would have been very difficult to have such certainty. The source also said that around the time of Russia's invasion of Ukraine last year, the prevailing fear was that the Russians might still be lurking in those networks, waiting to use that access to undermine the US and further their military efforts.

Meanwhile, software-supply-chain hacks are only getting more ominous. A recent report found that in the past three years, such attacks increased more than 700 percent.

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How the Piano Helped Me Fall Back in Love With Tech

Forget crypto, VR, AI. When it comes to empowering humans, new technology has nothing on the well-tempered clavier.

Illustration: Allie Sullberg

It is possible to fall out of love with [technology](#). I have seen skilled, successful software engineers give up their laptops to become farmers or therapists or realtors. They may use spreadsheets and software to manage their crops, but [code](#) is no longer their main concern; they're more worried about the disposition of their goats.

No one wants to talk about it at the morning stand-up, but everyone is thinking: How could someone turn their back on the [future](#)? Especially when so many people are trying to find their way in. But replacements are hired, memories fade, and new JavaScript frameworks are released.

“Remember Jeff?” people say. “One of his goats gave birth on [Instagram](#).”

The basic ethos of tech is that once you’re in, you’re in for life—after you launch your first app, you’ll never want to do anything ever again but make more apps, or manage other people as they make apps. Merely wanting a paycheck is suspect; passion is required. Which is why, whenever I fall out of love with technology—as has happened to me perhaps five times—I keep my mouth shut. I’m a professional software-*liker* and the cofounder of a software startup. I browse GitHub for fun and read random code. So I cannot, must not, tell people that one day last month I was getting coffee before a meeting and looked up from Slack and thought, “Man, coffee is hot

and liquid, and people drink it. I would like to do things that have flavors and temperatures.”

I should confess further: The drift started a few months ago. I no longer felt like parsing Wikidata or exploring obscure corners of PostgreSQL or hacking climate data sets the way I used to. I especially didn’t want to learn about whatever AI thing they’re releasing this Wednesday. My excitement took on an inverse relationship to the industry’s.

So I began to fill the time by teaching myself to play the piano. (OK, a synthetic piano.) I found a bunch of old practice books on Archive.org and loaded them into an e-reader. I played chords over and over, and scales. One of the books, *Peters’ Eclectic Piano-Forte School Enlarged*, shows a proper 19th-century lady on the cover. Her hair is tied back and she’s wearing a fancy dress. The picture is silly in a typical Victorian way, but I kept thinking about this woman as I practiced. She and her piano represented the only way her family could regularly listen to [music](#). She was the Sonos of her time. If you know any audiophiles, you know how exhausting they can be about choosing their equipment. But back then, a man married his stereo. The stakes were high.

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The piano itself, or rather its keyboard, made me very angry. Who designed this foolishness? Seven white keys, five black ones, all arranged around one scale, forcing you to twist up your fingers to play anything else. It’s a legacy interface, the Unix of music. Of course, as I learned more, I began to understand why things are the way they are.

The medieval keyboard development teams had to figure out how to organize an infinitude of frequencies into convenient groupings. They were managing scope, you see. They decided that 12 notes per octave worked best, particularly when notes were tuned in ratios of the twelfth root of two (for obvious reasons). And they figured out an interface for those 12 notes so users could easily control the frequencies, regardless of their musical ability. Then the piano developers added control of not just pitch but also

volume and duration—quiet little staccato notes and sustained ringing chords, available to anyone with fingers. The whole idea of the piano is a ridiculous hack of physics, math, and engineering.

And what did humanity do with this machine? Did we use it for its designed purpose, to play churchy, chanty music mostly in C major? Of course not. We utterly ignored the intent of the designers. Beethoven, Lizst, weird jazz voicings, John Cage sticking stuff in the strings, Elton John in his sunglasses, engineers taking the ancient interface and jamming it on top of some oscillators and making synths. I've fallen in love with the piano not because I can play it—I'm intolerable—but because it represents hundreds of years of sheer human perversity and disrespect for everything that came before.

Whenever the—our, my—industry gets excited, it starts talking about how we're going to replace things with machines. [Crypto](#) was meant to replace banks. [VR](#) could still replace reality. [AI](#) is supposed to replace, you know, potentially everything and everyone. Behind the marketing, though, you always find the most banal damn concept of human nature. The industry is desperate for us to become rational, self-interested consumers with goals (*Homo sapiens*), instead of what we actually are—a screeching panoply of annoying semiconscious super-chimps (*Homo molestus*). And yet, as annoying as we are, given a 12-note interface, no matter how hard to learn, we'll make centuries of music.

Now I've got a spreadsheet open where I'm trying to figure out chords from first principles. I've been making little synths in my web browser, using the Tonal music theory library and the Tone.js synth library, both in JavaScript. I like how the math sounds. Here we go again.

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[Paul Ford](#)

[Ideas](#)

Apr 25, 2023 7:00 AM

So Your Kid Wants to Be a Twitch Streamer

Don't panic. Instead, teach your beloved offspring to answer the Three Questions of Streaming.

Illustration: Twisha Patni

My son and I were out for a walk when he told me he wanted to be a [streamer](#) when he grows up. He's 11. I instantly grew a long and bushy beard.

"Son," I said, "there are many things to know before you can stream."

"Father," he said, "you have already told me these things. You have told me that I must learn to use OBS, the Open Broadcaster Software, and become familiar with the [Twitch](#) community guidelines. You have told me that I must set up my 'scenes' ahead of time and make sure that my room is acoustically balanced before I spend too much on microphones. I know I can do all of that. And I believe that the people of the world wish to watch me play *Luigi's Mansion 3*."

"Beloved child," I said, "I've spent a lifetime producing content for the internet, and I have seen the streamers come and go. I have watched the baking streams, the synthesizer and Eurorack streams, the piano skills streams, the headphone aficionado streams, the antique toy restoration streams—and, yes, the makeup and gaming streams, with their hundreds of millions of views. I have seen bakers stare into the camera in anguish and say, 'There is a terrible problem in the fondant community.' These things I

have witnessed and more. So I would not have you become a streamer. But if you must, I will teach you about the Three Questions of Streaming.”

“I await your counsel,” said my son, realistically.

“First question: What are your brands?”

I could see that my son was confused.

“Well, I like Nintendo—”

“No, my Beloved Pumpkin. You may think you are playing a video game on the internet. But that is an illusion. In truth you are a tiny data point at the intersection of vast brands. And you must give the brands what they want.”

“What is that?”

“Transactions. When you start a stream, a transaction is taking place inside of Twitch, which is within [Amazon](#). When a person sends you a message in the stream, that is also a transaction. When you connect to a server and start co-op play of an FPS, that is a transaction. For every transaction, some data is logged. For every bit of data, another ad can be targeted. What gaming chair do you use? What mouse? What supplements do you take to keep you awake? What beverage do you drink?”

“I like Mountain Dew Spark Raspberry Lemonade.”

Illustration: Twisha Patni

“I pray that one day you will not. But look *inside* the can, beyond the neon-pink ichor. You want that beverage. But when you are a streamer, that beverage wants things from *you*. It wants you to drive transactions. And what happens when we drive transactions? I sense your befuddlement, so I will tell you: We monetize.”

“But Father ... What if I don’t want to monetize transactions?”

“Then throw away your devices and dive into the sea. But even there you will find server farms. They put them in the ocean to cool them. And those servers, too, are processing transactions, in barnacle-encrusted undersea data centers.”

“So if I monetize ... I can make a living as a streamer?”

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“No, Son. Not at all. You can drive transactions that *brands* can monetize, but self-monetization requires far more work. For that, you must place a link in your bio.”

“And where does that link lead?”

“To many, many places. You could write a book of tips and tricks. You could record birthday shout-outs on Cameo. You could resell the goods that brands send you. You could train others to become streamers so that they might have a taste of your success. You could promote cryptocurrencies, at least when bitcoin is high. You could sell ads for mattresses on your podcast.”

“Must I do a podcast too?”

“Everyone must do a podcast. And of course, while I hate to say it, there is Patreon.”

He looked at the ground. “But these things have nothing to do with *Luigi's Mansion*.”

“That is the truth, and you must accept it. Now we come to the third and most important Question.” I paused for effect. “Are you Face or are you Hands?”

He looked at me, waiting for me to go on. “There are two kinds of influencers. There are Faces, who show up on camera, even if in the corner,

as they stream. They exist in the moment and talk for hours. They sometimes become very famous, and if they can survive being famous on the internet, sometimes they can monetize themselves and become wealthy. Hands influencers, however—they record and edit. They show you things. They are deliberate. They put the camera above the table and you see them at work, their knowledge and skills. You imagine your hands doing the same work. They can teach you to cook, play piano, do calligraphy, crochet, and fix old toys—and, yes, how to make Luigi stockpile golden bones to get one-ups. You may watch them for years and never see their faces. They add tables of contents to their videos. They are your teachers, not your friends. They command respect.”

“Faces are more famous,” he said.

“When they are successful, that is true,” I said. “But Hands are happier. They are rarely in a situation where they must look at the camera and apologize for having relations with another streamer’s spouse, or for watching deepfaked pornography of another streamer, or for saying racist things while they play videogames. Faces must always apologize. Hands need never say they are sorry.”

“But my favorite streamers are Faces!”

“There is a joke—you’re old enough to understand this now—about a statue of a man and a woman sculpted in an embrace, brought to life by a mischievous god for one day. But when he brought them to life they did not sleep together, as the god expected. Instead they caught pigeons and pooped on them.”

Illustration: Twisha Patni

“Why would they do that?”

“Perhaps I am not doing justice to the joke. The point is, your viewers will see you like a pigeon sees a statue. They will poop on you with [emoji](#), in forums, in comments, in chat. They will project their unhappiness onto you, and you will need to sit there radiating your love for them. Eventually you will crack into pieces, and when you attempt to express how sad you are,

they will mock you and tell you to kill yourself, and you will no longer be given as many soft drinks to promote. So if you must stream, son, then be Hands.”

We were almost home. A man walked by with an expensive dog.

“I will take the Three Questions to heart,” said the boy.

My beard grayed even further. “Sweetest progeny,” I said finally, “I don’t know if I am truly helpful. I fear the Three Questions will not be enough for the future that awaits you. When you are ready to make this your living, it will be trivial to change your face, your voice, your apparent age—many aspects of your being—using machine-learning and style-transfer technologies. Perhaps you’ll control an avatar that has some faked intelligence of its own, so that rather than being a streamer, you’ll be more like a puppeteer. But what if millions of others do this too? Will the brands simply spin up their own fake influencers in order to drive transactions? I worry, my boy. How will people like us—real, human people—monetize for brands in this uncertain future?”

“Don’t worry, Papa,” said my son. “I will start now, and I will work hard. When we get home, I will play *Plants vs. Zombies: Battle for Neighborville*, and I would like to experiment with the Elgato lighting rig you bought at the beginning of the pandemic for conference calls but never used. I will stream in my heart all day and night, until the brands take notice and I can add a link to my bio and monetize.”

I sighed. An Amazon truck was backing up, cawing like a crow. “But are you sure,” I asked, “that you wouldn’t consider sports medicine?”

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Apr 20, 2023 6:00 AM

My Balls-Out Quest to Achieve the Perfect Scrotum

A new breed of self-care companies has a salve for fragile masculinity: lavender- and tapioca-scented deodorants and moisturizers for the nutsack. What is all of this sudden zhuzhing of and attention to their testicles really doing for men?Photograph: Alex Wallbaum

I could say it started when I turned 33—my Jesus year, the year I vowed to transcend anxiety and exhaustion and do my most important work, the year I would emerge from my cave of pandemic isolation and early parenthood and couples therapy as the second coming of myself. But I am a millennial, not a messiah. The truth is that my search for rebirth began a few months later, with a Slack message about ball deodorant.

“Just been emailed asking if we’d like to review this—am trying not to be offended,” a fellow WIRED editor wrote in a group channel. A Chicago-based company called Ballsy had developed a pH-balanced scrotal deodorizer made with lavender, aloe vera, green tea, and chamomile. “Your pits aren’t the only place that need deodorant,” a line of ad copy said. Beneath it was a photo of a 2-ounce black bottle, boldly labeled Sack Spray against a background of subtle undulating lines. I squinted, unable to tell whether I was looking at a topographical map or an extreme close-up of a nutsack.

This article appears in the June 2023 issue. [Subscribe to WIRED](#).Photograph: Dan Winters

My more enlightened colleagues either reacted with the “face vomiting” emoji or ignored the matter entirely. Nothing new here, just the self-care machine trying to expand its reach from women to men. My response was different. I hovered my cursor over the “face with raised eyebrow” emoji. I am the director of fact-checking at a national journalistic outlet, supposedly the chief skeptic in a workplace of skeptics. I wondered: Was Sack Spray for real? Could it truly keep the “funk off your junk” and “improve your daily comfort, confidence, and skin health”? I Googled “ball deodorant.”

Sack Spray, it turns out, is no prank product. It is part of a Silicon Valley–imagineered and venture-capital-funded explosion of scrotal potions (scrotions?) over the past half-decade or so. Testicles today can be sprayed, spritzed, scrubbed, and smeared with—to name just a few—ToppCock Silver Gel, Swamp-Stop Ball Spray, Beast Blue Ball Powder, Ballgasmic Sack Wash, Super Fresh Man Parts, Comfy Boys Chocolate Intimate Deodorant, Below the Belt Fresh and Dry Balls, Derm Dude Happy Sack Nut Love, and Tame the Beast Nutt Butter Extreme. The olfactory options are endless: arrowroot, oats, bourbon, birchwood, cedarwood, sandalwood, smoke, leather, moss, bergamot orange, tapioca, patchouli, black pepper. The [tyranny of choice](#) in ball sprays is second only to the tyranny of choosing which [ball spray guides](#) to read. Men’s magazines and [grooming blogs](#) have spawned a veritable Subsack.

Go Down the Rabbit Hole

This is the first story in our new series on obsessions, curiosities, and deep dives.

You don’t need to consult even one board-certified dermatologist (which is what a fact-checker would do) to know that scrotions serve no medical purpose. But that hasn’t stopped millions of men from self-prescribing them. I watched a 15-minute review of Sack Spray by a product-testing YouTuber named Tom Kiker, who said, “You want a promotion? You got a big interview to go to? Spray this on your goddamn nuts. Guaranteed more money.” I scrolled through the 5,000 Amazon reviews for Ballsy’s cucumber-scented Ball Wash, some three-quarters of which gave it five stars. (Typical exaltations: “My son likes it,” “My girlfriend loves this.”)

Same story with the ecstatic connoisseurs of Happy Nuts Comfort Cream. (“Does the job so well my wife started using it too!”)

I, like most men (or so I once thought, like a numb nut), typically cogitated on my *cojones* for no more than a few seconds a year—when my doctor checked them for a hernia or if they intercepted a projectile. I rarely even thought about being a man, or what my role as one should be. That started to shift. I’d become a parent. I’d moved to New York and told myself I would become more financially secure. And after being disembodied on a screen for two pandemic years, I was more aware of having a body, which was feeling less like a man’s and more like mush.

What, I wondered, was all this sudden zhuzhing of and attention to their testicles really doing for men? For reasons strictly professional, I told myself, I ordered a suite of scrotions and started calling their makers and users.

Journalists have a term for the paragraph that appears early in a story to tee up what it’s about. We call it a “nut graf.” As I waited for my orders to arrive, I wondered what my nut graf would say. Maybe I would write something smart about 21st-century male anxieties and evolving gender norms, or the movement to detoxify masculinity (in this case, literally). Maybe I would quote something from a cultural history of the penis or a recent Brookings Institution report. Maybe I would prove my coworker’s theory, borrowed from the German-Korean philosopher Byung-Chul Han, that this was an extension of how “modern aesthetics don’t tolerate any bit of ugliness” and render all surfaces smooth and frictionless (iPhones, Teslas, TikTok, Skims, Pina Pro table lamps, Midjourney AI drawings, scrotums). Maybe I would have a line about how sack sprays offer temporary relief from modern manhood itself. And maybe I would admit there was something in them for me.

“Men feeling ashamed at the way that their balls smell? It hurts my heart,” says Cathy Reisenwitz, who writes the Substack *Sex and the State*.

Photograph: Alex Wallbaum

When I told my wife what would soon be arriving in the mail, she said, ““Oh hi, guys, it’s beauty standards, we’ve been waiting for you!”” Which was a nice way of saying that women have been expected to spend their money on this shit for eons.

As deodorants first caught on in the 1910s, marketers peddled the idea that women who didn’t use them would be cast out of polite society (a society in which, notably, they couldn’t vote). Chloé Cooper Jones, a philosophy professor and the author of *Easy Beauty*, told me that around the same time, and for decades thereafter, vaginal douches were touted “as a necessary hygienic thing, to keep clean, acceptable, and to be courteous to a male partner.” Women have long lived under the capitalist, misogynist edict, she added, that they shouldn’t “smell like a woman, that nothing about women is supposed to be natural.”

That doesn’t mean that men have always been free to be their natural selves. Before the Great Depression, most men considered it unmanly, or “sissified,” to mask their natural musk—but then ads began warning them that unleashing their stench in the workplace would threaten their livelihoods. Men today spend \$500 on serums to smooth wrinkles, \$30,000 on liposuction to have a fake six-pack permanently etched onto their torso, \$75,000 on excruciating leg-lengthening surgery to gain 6 inches. In a recent *Bloomberg Businessweek profile*, Bryan Johnson, a 45-year-old software entrepreneur, detailed his plans to spend some \$2 million this year experimenting with anti-aging techniques. Johnson reportedly wants “the brain, heart, lungs, liver, kidneys, tendons, teeth, skin, hair, bladder, penis, and rectum of an 18-year-old.” Good for him.

A company called Manscaped is the top dog in the groin upkeep business, raking in some \$300 million in sales a year and, until last summer, in talks to go public via a special purpose acquisition company—a sack SPAC. Manscaped, a company that tweets things like “trimming your ballsack is main character energy,” has a stated mission to “*move men forward on a global scale and spark a movement to unlock men’s confidence, allowing them to lead their best lives.*” Paul Tran, who founded the company in 2016, told me he did it out of “sheer frustration” with the lack of proper tools to trim himself. In addition to its flagship product, the Lawn Mower,

the company offers various formulations for testicular upkeep—the Crop Cleanser; Crop Preserver; Crop Exfoliator; Crop Gel; Crop Reviver; and Crop Mop Ball, Butt, and Body Wipes.

It took Manscaped and its competitors a lot of trial and error to find their target demographic. “Women had grown to be really comfortable talking about their hygiene behaviors with each other,” Tran says. Men, he suspected, had developed similar behaviors, “but were too embarrassed to talk about it.” The company “started with the scientific approach,” he says. “‘Hey, you should do this because it’s a damp area, which is more prone to bacteria growth.’ Men didn’t care.” Things began to take off when the company arrived at a cheeky tone, full of innuendo—ads depicting testicles as grenades, billiard balls, or an [anthropomorphized office desk shrub](#). Manscaped was the official urinal sponsor at the San Francisco 49ers’ Levi’s Stadium for two seasons and is the official grooming partner of both the Testicular Cancer Society and ... Ball State University. Pete Davidson, America’s most boinked bachelor, is the current face of the company.

As of late 2022, Manscaped also had an army of more than 6,000 influencers—2,000 of them women—including drag queens, UFC fighters, models, sports and comedy podcasters, and dating coaches. One TikTok dating coach with half a million followers [had this to say](#) while she brandished the Crop Preserver and Crop Reviver: “It’s 2022, not 1970. Shag rugs are out. I’m done sifting through forests.” Jose Zuniga, an alpha-male YouTuber with 6 million subscribers, slips sponsored content from Manscaped into his guides to help men stop being “losers” and “[simps](#).” “We’re hooking up dudes globally, bro,” he says.

Most manscapers tend to be [men in their thirties](#), but the sack spray community spans 13-year-olds to octogenarians. There are long-haul truckers seeking relief from chafing along a mid-July drive down I-80. There are trans men seeking relief after gender confirmation surgery. Beau Hayhoe, a 31-year-old style writer in Brooklyn (and coauthor of a Gear Moose guide to the [12 Best Ball Deodorants](#)), says he manscapes to “look good, feel good,” and “play good.” The Spray, from Meridian, he says, adds “the finishing touches of confidence.” I found other superusers in the replies to Manscaped’s tweets. Minty, 41, who works the help desk at a

breathalyzer and ankle-monitor manufacturer in Colorado, says he uses a scrotion primarily as part of his calming bedtime routine. “Personally I don’t smell that bad,” he said, but by applying a ball deodorant every night, he goes to bed “more than fresh.” Marcus, a 25-year-old real estate agent’s assistant and Twitch streamer in South Carolina, was diagnosed with multiple sclerosis at 19. A couple years ago, after a long stay in the hospital, he “wanted to get really clean.” He uses his Lawn Mower every two weeks and wipes his testicles with a Crop Mop after every shower. “It makes me feel healthier,” he says. “I want kids someday, and in order to have kids you have to be healthy in all areas, especially that area.”

I was beginning to understand the appeal of sack sprays, but their deeper meaning was still eluding me. When I wrote to David Friedman, the author of *A Mind of Its Own: A Cultural History of the Penis*, hoping for some guidance, he declined by writing, “I’m no longer a working ‘Dick Guy.’ I’ve renounced my ‘professional’ status and have happily returned to being an amateur.” I was filled with envy.

By the size of the package, I thought it was new sneakers for my toddler until I saw that familiar nutsack pattern. The outside of the box encouraged (warned?) me to #LIVEBALLSOUT. Inside was Ballsy’s [Sack Pack](#) (\$45), one tallboy-sized bottle, a little black spritzer bottle, and a tiny tin that together pledged “to help you achieve a flawless sack.” But there were, unthinkably, no instructions on the order in which to use them.

I hopped in the shower and lathered in some Ball Wash, a black gloop with charcoal and lavender oil. It left my skin feeling claggy. Once dry, I splotched on a pinch of the “ocean and air”-scented Nut Rub cologne. Strangely thick and smudgy, and I smelled like a middle school dance. Finally, Sack Spray. There *were* instructions: “Spray 1 to 2 pumps to your groin after a workout, shower, or whenever you could use a refresh.” (*Whenever.*) No amount of mental rehearsal would have prepared me for the total mind-body break that occurred while hearing the petite *kkssh kkssh* and feeling the yelpingly cold, tickly mist.

A few days later, Manscaped’s [Performance Package 4.0](#) (\$140) arrived. The box had no copy, save the brand’s logo: an upside-down heart in which the triangular part is stylized as a diamond and the two semicircles as, yes, a

veiny nutsack. (Marcelo Kertész, Manscaped's chief marketing officer and formerly the creative director of Luiz Inácio Lula da Silva's [first Brazilian presidential campaign](#), told me that the testes represent "literally where we all came from.") Inside, hiding the products, was a placard in gold serifed font: "The modern man is a man who takes care of himself. Manscaping isn't just for life's special occasions. It's a requirement for optimal health, superior hygiene, and healthy self-esteem." Nestled underneath were the Lawn Mower 4.0 trimmer, ball deodorant, a hydrating ball toner, and a nose hair trimmer. As Tran, the founder, told the Securities and Exchange Commission in 2021, Manscaped views the groin "as the entryway to the rest of the male body."

I used all the products in one go. The whole project took half an hour. The Mower's slick blade shaved so close I was suddenly prepubescent again. I felt maybe a little cleaner, and definitely a lot sillier. When I presented the results to my wife, she stared, quizzically, the same way she looked at my parents' dachshund when the groomer got a little carried away. "Your balls smell insane," she said.

Her reaction reminded me of something Cathy Reisenwitz, who writes the Substack [Sex and the State](#), told me. "How you smell is a really important part of sex and being attracted to someone. If you don't like the way their balls smell, find somebody whose ball-smell you like." She went on: "Men feeling ashamed at the way that their balls smell? It hurts my heart."

"Sack sprays are douches for dudes. Or, like my wife said, 'Goop for the gonads.' But that's not all they are."

Photograph: Alex Wallbaum

A few weeks into my experiments, two packages arrived: a tube of Super Fresh Man Parts ball lotion and a copy of Richard Reeves' [Of Boys and Men: Why The Modern Male is Struggling, Why It Matters, and What to Do About It](#). It's a thoroughly sobering account of what Reeves calls the "male malaise." Boys today are dropping out of high school at almost twice the rate of girls. They represent only 40 percent of college graduates. The typical American man earned less in 2019, adjusted for inflation, than he did in 1979. A fifth of fathers don't live with their children. Men are four

times more likely to commit suicide than women. “It is not that men have fewer opportunities. It is that they’re not taking them,” Reeves writes. He thinks people tend to assume that individual men are at fault for failing to thrive, when the crisis of masculinity really arises from structural changes —the education system disadvantages boys, the labor market has “shifted away from traditionally male jobs.”

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Millions of men are adrift, withdrawn, confused, enraged, and susceptible to messages that they stink—culturally, psychologically, and bodily. On the extreme end, they hear Tucker Carlson touting “testicle tanning” as a “bromeliopathic” therapy to bolster testosterone; Jordan Peterson barking at them to “toughen up, you weasel”; and Andrew Tate, the nunchuck-wielding internet misogynist, telling them only “soy boys” eat sushi. (Tate is currently under investigation on charges of rape and human trafficking in Romania, accusations he denies.) On the more mundane end, men get ads for sack sprays, all of which bear an implicit message: You stink *because* you’re a man. So yeah, it’s vaginal douches for dudes. Or, like my wife said, “Goop for the gonads.” But that’s not all they are, and that’s not all they’ve been for me.

Masculinity—as Phil Christman [put that squirrelly word best](#)—has always been “an abstract rage to protect,” an ingrained idea that “one must train and prepare for eventualities one has no reason to anticipate, must keep one’s dwelling and grooming spartan in case of emergencies,” often at the expense of taking care of oneself. In my early thirties, emerging back into a post-Covid world with a family, that rage suddenly burned hot. At the same time, I also wanted to obliterate my masculinity, which felt like an obstacle to the kind of curiosity, vulnerability, and whimsy that would make me a better parent, partner, and person. The purveyors of sack sprays cleverly allow men to choose both, deftly framing the vulnerability of self-care as a way to *enhance* masculinity.

I maintained a daily ball routine for about two months. Then one morning in the shower, I rinsed away some Ball Wash and looked down. After all

this cleansing, toning, exfoliating, buffing, and moisturizing, I saw the exact same sack I'd always had, and it hit me: The sack can't be hacked. Nor should it.

The ballsack's essential, inescapable ugliness is its beauty. A bizarre, asymmetrical, nubby, loose pouch of veins and folds, precariously and ridiculously hanging between the legs—yes, a gross thing to look at. But loose for climate control, to shrink and expand! And asymmetrical for shock absorption! One theory of why the human sack is distended outside the abdomen is because we move unevenly; the family jewels migrated outward so that all the pressure changes from our herky-jerky behavior wouldn't expel sperm and exterminate the gene pool. We gallop. We sprint. We take leaps. We extend beyond ourselves, ergo the sack. And the ugly sack protects the stuff of life, all future leaps, all future beauty.

I stepped out of the shower, resurrected.

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Apr 19, 2023 7:00 AM

Are Screens Stealing My Childhood?

WIRED's spiritual advice columnist responds to a preteen who's worried about already having wasted too much of their life.

Illustration: Isabel Seliger

“As a 12-year-old, I’ve spent much of my life on screens, in school and at home, which can definitely be fun. But I also struggle with depression, and sometimes I feel like I haven’t done enough ‘kid’ things. When I grow up, will I feel like I wasted my childhood?”

—Future Me

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Spiritual Troubleshooting for the Digital Age

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Dear Future,

The ability to project oneself into times yet to come, to think about the present as one phase in a much longer life, is a sign of uncommon maturity —though this prudence often comes with burdens of its own. You appear to be searching for a way to “live deliberately.” That phrase, as you might already know, comes from the opening line of Henry David Thoreau’s

Walden, a literary experiment that was similarly driven by a suspicion of modern technologies and the fear of future regrets. Whereas you are trying to anticipate the disappointments of your adult self, Thoreau was looking even further into the future. He went into the woods because he was afraid that, upon his death, he would find that he “had not lived.”

It seems to me that you are burdened by common misperceptions about the purpose of childhood. On the one hand, youth in the 21st century is often regarded as a means to an end: a time to cultivate the skills and personal qualities that will allow you to excel as an adult, which requires postponing your immediate desires for the sake of some future ideal—scholastic success, [hireability](#), financial stability. On the other hand, childhood is often said to be a unique period (as I’m sure many adults in your life remind you) of freedom, perhaps the only years when you can indulge in fun, creativity, and personal enjoyment without the ambient worries and responsibilities that adulthood brings. While this second idea seems to provide license for aimless exploration, I can sense that you find it just as stressful as the mandate to prepare for the future. I don’t think you’re alone in this. In a way, the injunctions against wasting one’s childhood belong to the same future-oriented logic that regards the formative years as an investment. Doing “kid things” becomes, in other words, just another checklist to tackle, a way to ensure that you become the kind of well-rounded adult who has happy memories of the past and is immune to regrets.

Adding to the stress and confusion of childhood is the fact that digital technologies have insidiously blurred the distinctions between work and play. When you spend your free time [gaming](#), reading, and posting on the same devices that you use to complete homework assignments, it’s easy to become confused about whether you are having fun or merely fulfilling duties. And when you realize that all the adults in your life similarly spend much of their work and leisure time on screens, it’s tempting to conclude that your own adulthood will be a slightly upgraded continuation of your current existence: The image quality will be sharper, the processing speed will be faster, but the basic structure of your days will remain the same.

The thing is, projecting oneself into the future is always a treacherous gambit. Our assumptions about how life will be 10 or 20 years from now

are unavoidably limited by the conditions of the present. If you've ever watched sci-fi movies from several decades ago, you've probably noticed that the imaginations of even the most visionary directors contain the odd anachronism. Stanley Kubrick, in *2001: A Space Odyssey* (1968), envisioned a bold future of commercial space travel and sentient robots but could not, apparently, wrap his mind around the possibility of a world without pay phones (his space stations are full of them). The citizens of 2015, as envisioned in *Back to the Future* (1989), have access to flying hoverboards and hi-def video walls but still use fax machines to transmit highly sensitive information.

Given the pace of technological development, it's very possible that your adulthood will be radically different from your life now. Maybe screens will be replaced with retinal implants and you'll spend your days immersed in a [metaverse](#), one that makes your childhood memories of clicking and scrolling seem quaint by comparison. Or maybe AI will have automated most occupations and created enormous wealth, such that you'll be free to spend your limitless leisure time gardening, traveling, and attending philosophy lectures.

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I don't say this, Future, to cause more anxiety about the path ahead. Quite the opposite. To my mind, the uncertainty about what adult life will be like gives you an unusual measure of freedom. If childhood cannot be seen as the kiln of future ambitions (or a time to frantically gather ye rosebuds for the sake of fond memories), then it might be viewed, somewhat radically, as an end in itself. Instead of trying to tick off the kinds of things your future self might wish you had done as a child, perhaps you should attend to how you feel about those things now. When you think about the activities usually grouped under the rubric of "kid things"—going to the zoo, catching fireflies, creating your own graphic novels, to name just a few possibilities—do any of them excite you? When you think back on the times when you were most happy and content, or felt life to be particularly meaningful, do they share anything in common? More importantly, when

you spend all day on screens, how does it make you feel afterward? If you suspect that your depression is connected to the technologies you use, that's reason enough to think about how you could [reorder your life](#).

Spending more time outdoors might be something to experiment with, but tempering your use of technology needn't lead to an infatuation with nature. The tendency to associate childhood activities with wilderness pursuits (climbing trees, building forts, swimming) comes to us from the Romantic tradition, which idealized both nature and youth as sites of innocence and spontaneity. And it's precisely during times of technological change that we most long to see nature as a realm of unchanging purity.

Thoreau's time in the wilderness taught him just the opposite. The natural world is itself full of change: Seasons come and go, birds migrate from north to south and back again. While these conditions don't preclude the possibility of planning for the future, they also reveal how futile it is to live in service to one's future self. Thoreau wrote in his journal, in 1859, that in a world of constant flux, we must "let the season rule us." The life of intention can only be lived in the present, by giving energy to the things that have value in the here and now. Given that he put this better than I can, I will leave you with his words: "You must live in the present, launch yourself on every wave, find your eternity in each moment ... Do what you love ... let nothing come between you and the light."

Faithfully,

Cloud

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Apr 15, 2023 7:00 AM

Are You Being Tracked by an AirTag? Here's How to Check

If you're worried that one of Apple's trackers is following you without consent, try these tips.

Photograph: Melina Mara/Getty Images

When the AirTag launched in 2021, Apple's Bluetooth tracker with ultra-wideband was lauded as a step toward the [future of augmented reality](#) and a great way to find everyday objects, like your [lost TV remote](#). Cybersecurity experts expressed concern that the tracking device would be [exploited by stalkers](#).

The warnings were prescient; multiple women reported frightening encounters where AirTags were used as [stalking devices](#) that could be slipped in a purse or taped to a car. Police departments across the United States issued warnings about the potential [criminal uses of AirTags](#). Newer AirPods have tracking abilities similar to AirTags, but the higher cost of Apple's earbuds limits their disposability as a tracking device.

Apple released firmware updates late in 2022 in an effort to curb misuse. Even though Tile and other competitors to the AirTag exist, the vastness of Apple's ecosystem sets the device apart. From the US Drug Enforcement Administration using it to [track international drug shipments](#) to a man in Texas using it to find his stolen car and [kill the suspect](#), AirTags are everywhere.

If you are concerned that a secret AirTag may be recording your location, these signs may help detect the tracker.

The type of smartphone you own affects how easily you can discover hidden AirTags. Owners of iPhones running iOS 14.5 or newer should receive a push alert whenever an unknown AirTag is nearby for an extended period of time and away from its owner. Apple's website does not provide an exact time frame for when this alert is triggered.

Owners of newer iPhones should turn on Bluetooth and [check their settings](#) to ensure they'll receive notifications. Under **Settings**, go to **Privacy & Security**, and toggle **Location Services** on. Scroll to the bottom of that page, tap on **System Services**, and activate **Find My iPhone**. Also, search for the **Find My** app, visit **Me** in the bottom right corner, then tap **Customize Tracking Notifications** to double-check that notifications are enabled.

When you click on the iPhone alert for an unrecognized AirTag, you may be given the option to play a sound on the AirTag to help locate it. If your iPhone runs iOS 16.2 or later, you might be able to use precision location data to find the hidden device.

Months after the release of the AirTag, Apple launched the [Tracker Detect app](#) for Android phones. Unlike the security features available for the iPhone, the Android app does not automatically look for unknown AirTags. Users must initiate the scan.

According to Eva Galperin, director of cybersecurity at the [Electronic Frontier Foundation](#), the reason for the app's limited functionality is complicated. "This is actually a limitation of how the Android ecosystem works and how Android apps can work," she says. "I have called on Apple and Android to work together to incorporate the level of mitigations that Apple provides in iOS into the Android operating system, but this requires a lot of cooperation between two groups who are normally rivals."

While some guides to finding AirTags recommend using Bluetooth scanners, Galperin does not consider this method to be reliable for tracker

searching. “I have tried using various Bluetooth scanners in order to detect AirTags, and they do not work all the time,” she says.

Millions of Americans still [do not own a smartphone](#). Without a device on hand, you must rely on visual and audible clues to find any hidden AirTags. The circular white disc is slightly larger than a quarter. As reported by [The New York Times](#), Ashley Estrada discovered an AirTag lodged under her license plate, and her [video](#) documenting the incident was viewed over 20 million times on TikTok.

When the AirTag was first released, the tracker would emit a beeping noise if away from the owner for longer than three days. Apple has since shortened the time to 24 hours or less. Despite the update, you might not want to rely only on sound to detect AirTags. Numerous videos on YouTube offer DIY instructions to disable the speaker, and [noiseless versions](#) of the trackers were even listed for a short time on Etsy.

The best way to disable an AirTag is to remove the battery. To do this, flip the AirTag so the metallic side with an Apple logo is facing you. Press down on the logo and turn counterclockwise. Now you will be able to remove the cover and pop out that battery.

Apple’s [support page](#) for the AirTag suggests reaching out to the police if you believe you are in a dangerous situation. “If you feel your safety is at risk, contact your local law enforcement, who can work with Apple to request information related to the item,” the support page reads. “You might need to provide the AirTag, AirPods, Find My network accessory, and the device’s serial number.” One way to figure out the serial number is to hold the top of an iPhone or other near-field-communication-enabled smartphone to the white side of an AirTag. A website with the serial number will pop up.

This page may also include a partial phone number from the person who owns the tracking device. If you feel hesitant about scanning the AirTag or do not have the ability, a serial number is printed on the device beneath the battery.

In the viral stories shared online and in police reports, women are often the victims of AirTag stalking, but Galperin cautions against framing unwanted tracking as solely an issue for women. “I have been working with victims of tech-enabled abuse for many years,” she says, “and I would say that about two-thirds of the survivors that come to me are women. But a third of them are men. I suspect that number would be higher if there wasn’t such a stigma around being an abuse victim or survivor.”

She emphasized how men, women, and nonbinary people can all be victims of abuse, as well as perpetrators. “When we paint it all with this really broad brush, we make it really hard for victims who don’t fit that mold to come forward,” says Galperin.

For more resources, you can visit the website for the [National Domestic Violence Hotline](#). Contact the hotline by calling 1-800-799-7233 or texting “START” to 88788.

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By [Kate Knibbs](#)

[Backchannel](#)

Apr 11, 2023 6:00 AM

How Bookshop.org Survives—and Thrives—in Amazon’s World

Andy Hunter’s ecommerce platform was a pandemic hit. Now he’s on a mission to prove that small businesses can scale up without selling out. Andy Hunter, the founder of Bookshop.org (pictured here at Spoonbill & Sugartown Books in Brooklyn) developed his love for books early. “I became a reader, in the beginning, because it provided me solace,” he says. Photograph: Yael Malka

“Do you remember what kind of beer it was?”

Andy Hunter pauses for so long before answering my question, it’s awkward. He’s racking his brain. I’ve asked him to tell me about the night he came up with the idea that led to his improbably successful [bookselling startup](#), Bookshop.org. As a former magazine editor, he wants to get the details right.

He remembers the easy stuff: It was 2018. He was on the road for work. At the time, Hunter ran the midsize literary publishing house Catapult, a job that required schmoozing at industry events. The night of his big brainstorm, he was away from his two young daughters and his usual evening obligations—dishes, bedtime rituals—and had a rare moment to think, and drink a beer.

This article appears in the Jul/Aug 2023 issue. [Subscribe to WIRED](#). Illustration: Vivek Thakker

But what kind of beer? “It was, uh, a Dogfish Head IPA,” Hunter finally answers. OK, so, picture this: There he is, alone in a tidy Airbnb, a light-blue bungalow on a quiet road in Berkeley, California. His brown hair is a little mussed, and he’s nursing a pale ale. He’s grooving to music. (“You can say I was listening to Silver Jews,” Hunter says.)

He couldn’t stop thinking about something a board member of the American Booksellers Association, the industry’s largest trade group, had said to him during a recent work dinner. *What if ecommerce was a boon for independent bookstores, instead of being their existential threat?* The Booksellers Association ran IndieBound, a program that gives bloggers and journalists a way to link to indies instead of [Amazon](#) when they cite or review a book. But it hadn’t gained much traction.

That night, in Berkeley, the unusual combination of evening solitude and a touch of alcohol knocked something loose in Hunter’s brain. Or maybe it knocked something together. Either way, by the morning, he wasn’t hungover and he had a proposal for how to grow IndieBound, including simplifying the logistics of buying online and integrating it with [social media](#). Plus: “I wanted it to be better-looking,” he says.

The cat on the wall in Andy Hunter’s home office in Williamsburg, Brooklyn, where he runs [Bookshop.org](#).

Video: Yael Malka

When he got back home to New York, Hunter sent his proposal to Oren Teicher, then the CEO of the Booksellers Association. Teicher liked the idea, but said no. The trade organization wasn’t actually interested in expanding IndieBound. But if Hunter was willing to take on the project himself, to create this new-and-improved version on his own? Well—the group could invest some money.

Even though Catapult kept him plenty busy, Hunter really believed in his vision of a souped-up ecommerce platform uniting the indies. Little stores deserved to find customers online, too, even if they didn’t have the resources to set up their own online shops. Offering them a way to band

together felt like a righteous crusade. Plus, Hunter figured it could be a low-effort side gig.

What started as a favor done on a business-trip whim has since become the great project of Hunter's professional life. In its first few years of existence, Bookshop defied even its founder's expectations and demonstrated how helpful its model could be for small businesses. Now, Hunter has a new plot twist in mind: He wants to show business owners how to scale up without selling out—without needing to kill the competition.

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Kate Knibbs

The problem for independent bookstores is that many of them don't have the bandwidth to run their own online stores. Their inventories and shipping capabilities are limited by their non-Amazonian budgets. Plus, sometimes they don't *want* to participate in ecommerce; the romance of stuffed shelves and reading nooks and thoughtfully selected staff picks are central to their existence. Removing those experiences seems antithetical—even though it might be necessary—to the bottom line.

Bookshop offers another option. Say you're a small bookstore owner. It takes only a few minutes to set up a digital storefront on Bookshop's website, list what books you want to sell, and, if you want, curate

collections of titles to reflect your store's worldview. You don't have to actually stock any of the books yourself; Bookshop partners with the wholesaler Ingram to fulfill orders, so you're off the hook for inventory and shipping. You get a 30 percent cut of the cover price on any [book](#) sold through your storefront. (If you're a blogger, writer, influencer, or other bookish type, you can join Bookshop as an individual, even if you don't own a brick-and-mortar bookstore, and take home a 10 percent cut on whatever you sell.)

Bookshop itself also sells books—you can type a name in the search bar at the top of its homepage and soon find yourself staring at an Add to Cart button. Physical stores can make money off of these sales, too, if they join the company's profit-sharing pool. Bookshop gives 10 percent of these sales to the pool.

Bookshop doesn't have a pitch tailored for traditional venture capital. If anything, it has the opposite.

Technically, Bookshop doesn't *need* independent stores to join its platform. If the goal were merely to sell books online, it could do just that, like Barnes & Noble or an early-days Amazon. But then, of course, it wouldn't be special. And Hunter would have never bothered. Helping the indies is the whole point, something he feels an almost spiritual drive to do.

Hunter had the turbulent childhood of a young-adult novel protagonist. His dad left when he was 11, and his mother was institutionalized for mental illnesses at different points throughout his youth. Many times, Hunter and his older brothers had to figure things out on their own. Without an adult regularly looking after him—someone to make sure he had clean clothes or shampoo—Hunter struggled to make friends. He spent a lot of time alone.

His Massachusetts town didn't have a bookstore, but it had a library; he headed there after school and on weekends. "I became a reader, in the beginning, because it provided me solace," he says. He read everything; he read all the time. *The Chronicles of Narnia*, Judy Blume. He became so obsessed with *Watership Down* that he carried a copy with him wherever he went. Even his teachers teased him about it.

One summer, when Hunter was 16, his mother took him and his brothers to a cabin in Maine. While the others swam and sunbathed, Hunter raided the cabin's library. The owners had shelves of books that astounded the teenager: *Soul on Ice* by Eldridge Cleaver, *The Autobiography of Malcolm X*, *The Women's Room* by Marilyn French, James Simon Kunen's *The Strawberry Statement*. "Those books completely blew my mind," Hunter says. He went on a countercultural binge, staying up late and reading by the fire.

During the next few years, Hunter's social life took a turn. "By the time high school ended, I was in a better place socially than I was at 11," says Hunter. "Because I didn't have parents around, we had huge keg parties ... That made me popular." Hunter remained an avid reader—he studied philosophy at the University of Massachusetts—but he no longer lived in the margins. In 1993, shortly after graduating from UMass, he cocreated a music fanzine with the Freudian title *Mommy and I Are One*, and hosted events and parties with performers like Cat Power.

Photograph: Yael Malka

After graduation, Hunter wasn't sure what to do. He moved to LA and started working at Disney—not exactly his dream job. After six years, he finally landed a gig as the editor of *Mean* magazine, a freewheeling project started by some former staffers of the Beastie Boys' *Grand Royal* magazine. While there, he began dabbling in small-scale publishing on the side—an early sign of his entrepreneurial spirit. "If you wanted a magazine, I'd make a magazine for you," he says. Clients ranged from the music festival Lollapalooza to a neuroscience organization. (It put out a magazine called *Brain World*.) He also met a visual artist, Alison Elizabeth Taylor. They fell in love.

In 2004, Taylor got into graduate school at Columbia, and they moved to New York to live together in student housing while Hunter worked remotely for *Mean*. Taylor would go on to establish herself as a significant force in certain contemporary art circles, and watching his partner pursue her creative dreams, Hunter wondered whether he should take his own writing ambitions more seriously. He enrolled in Brooklyn College's MFA program, where he met Scott Lindenbaum, a fellow student. As they

commiserated over how hard it was for literary magazines to find audiences, Hunter's publishing itch returned. He and Lindenbaum decided to make a magazine anyone could read online for free. In 2009, Electric Literature debuted; it drummed up buzz by releasing a Rick Moody short story line-by-line on a nascent service called Twitter. It was a proudly techno-utopian creation, one Hunter and Lindenbaum claimed was the first literary magazine with an app.

"Electric Literature was born in a time where there was tons of anxiety about what digital was going to do to literary culture," Hunter says. "We decided to become the optimists in the room." The literary establishment disdained digital, but it turned out people wanted to read about books on their laptops.

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Electric Literature was a hit from the start, attracting established writers like Colson Whitehead, Michael Cunningham, and Lydia Davis and accumulating a loyal subscriber base. It was never a huge moneymaker, and its operating budget was measly. They shifted to a nonprofit model in 2014. Hunter, now hooked on entrepreneurship, began eyeing his next projects.

He had made connections with people such as Morgan Entrekin, the president of the independent publishing company Grove Atlantic, who liked what he was doing with Electric Literature. With Entrekin, Hunter cofounded the newsy literary-culture website Literary Hub in 2015.

That same year, he also cofounded Catapult, with Elizabeth Koch. (Yes, from *that* Koch family.) Catapult soon merged with Counterpoint Press, which meant Hunter was suddenly in charge of an imprint that had put out books from authors who had blown his young mind, like Gary Snyder. Catapult also hosted writing classes and published an online magazine. Electric Literature had brought Hunter into the publishing world, but Catapult took him to a new level. For a time, Hunter worked for the three companies simultaneously, and though that meant shelving his 650-page novel, *God Exploded*—about a guy who tries to start a religion around the

idea that the Big Bang was actually the suicide of a deity—Catapult’s books and magazines won critical recognition, including a National Magazine Award and a PEN/Faulkner Award.

(This year, Catapult abruptly shuttered its writing classes and magazine as [Koch shifted her focus to Unlikely Collaborators](#), the New Agey nonprofit organization she founded in 2021.)

All the while, Hunter watched as Amazon steadily obliterated bookstores. He started obsessing over how to stop it. The answer seemed to lie in getting small, independent booksellers online. He remembers discussing the idea of a nonprofit alternative to Amazon with industry insiders—and being met with derision.

Photograph: Yael Malka

After the American Booksellers Association passed on Hunter’s plan to enhance IndieBound, he decided to go ahead and bring to life his vision for ecommerce. But to do so, he had to find more money. Hunter was still working full-time as the publisher of Catapult while also serving as the publisher of LitHub and chair of Electric Literature. Whenever he could, he aggressively pitched potential investors. “I was schlepping from meeting to meeting,” he says. “It was just me, and it was very lonely.” As soon as he had enough funding, he went looking for help.

In 2019, Hunter approached the boisterous, bearded veteran magazine publisher David Rose, who had spent years at the *London Review of Books* and *Lapham’s Quarterly*. When Hunter laid out his plan in their first meeting, Rose remembers “seeing dollar signs.” He thought it was wild that the model Hunter was proposing didn’t exist already. Here, thought Rose, was the rare lit nerd with a business brain. Hunter considered it a miracle that the well-respected Rose believed in him, and he brought Rose on as executive director—Bookshop’s first hire.

At the time, Rose had been consulting for the left-wing magazine *The Baffler*. For a while, the pair tag-teamed the startup sprint, with Rose handling administrative details and Hunter working on the logistics of launching an ecommerce site on a shoestring budget. Eventually, they hired

two others to manage the company’s social media presence and to develop partnerships with booksellers.

Rose continued to work for *The Baffler* and had a desk in the magazine’s office. He didn’t like trekking to the Catapult office, which was small and hot, so he asked *The Baffler*’s then-executive director, Valerie Cortes, whether Bookshop could also squat in *The Baffler*’s Manhattan headquarters. The two staffs mingled, sometimes grabbing drinks or going out for karaoke—but not even Rose’s involvement could convince the team at *The Baffler* that Bookshop was a good idea. “People weren’t on board at first,” Cortes says. According to Rose, the Bookshop team felt like the “weirdos in the corner,” grinding away at a pipe dream. “There was a running joke about how long we could last,” he says. Going up against Amazon seemed like a fool’s errand.

Even Bookshop’s investors, including Morgan Entrekin, didn’t have high hopes. “In my email to the handful of friends that I asked to get involved, I said, ‘Look, supporting this is a very worthy thing to do. But you’re not going to get a VC return,’” Entrekin says. Still, Hunter got his money, including an investment from William Randolph Hearst III. He persuaded around 200 bookstores to sign up in advance of the launch, and he struck a deal with Ingram, the book-wholesaler, which ensured that getting books to buyers wouldn’t be an issue.

On January 28, 2020, Bookshop.org went live, and it made its first sale at 7 am. Some *Baffler* staffers suppressed their skepticism long enough to celebrate with the Bookshop squad that evening. Even then, Hunter erred on the side of restraint: Rose teased him about bringing a single bottle of champagne for the whole group to share. Hunter, who says he only expected his staff—of four—to be there, believed in the project, but he worried about its chances. “We had a very, very short runway,” he says.

Hunter figured maybe, eventually, they might earn a million dollars. He kept his day job as the publisher at Catapult.

But then, the pandemic. “A stroke of luck for Bookshop,” as Entrekin put it. Lockdowns left many independent shops, dependent on foot traffic, in deep trouble—they didn’t have digital stores. But [here was Bookshop](#), with a

low-stakes ecommerce option for brick-and-mortar booksellers. All they had to do was create a digital storefront and Bookshop took care of everything else, including fulfilling orders and paying taxes.

The financial and promotional support from the American Booksellers Association helped legitimize the new company in store owners' eyes. Bookshop didn't have an advertising budget, but Hunter hired a publicist, and she pushed the anti-Amazon angle hard. Stuck at home, people wanted to support local businesses; Bookshop's first wave of press showed them that there was an easy way to do so just as they went looking for one. Suddenly, Bookshop became the sourdough of ecommerce. It rose with surprising velocity, taking even its teensy staff by surprise.

Bookshop smashed Hunter's million-dollar goal in four months. "We sold \$50,000 worth of books in February," he remembers. By the end of March, Bookshop was doing about \$75,000 per day in sales, setting a new daily sales record of \$102,000 on the 31st. Hunter and his handful of employees worked frantically, sometimes logging 18- or 20-hour workdays to keep up with customer service requests and ensure orders were shipped on time. "We really had to scramble," Rose says. They knew people were trying them out for the first time, so botched orders could sink their reputation. "It was intense," he says.

That summer, Bookshop got even bigger, reaching a sales apex it hasn't yet replicated. "\$900,000 in one day," Hunter says.

Hunter's daughter's pet rat, Agent Jellybean, lives in a two-story cage next to his desk.

Photograph: Yael Malka

Every six months, Bookshop dumped 10 percent of its sales, in equal shares, into the accounts of bookstores that had opted into its earnings pool. Some store owners were caught by surprise when they checked their accounts. VaLinda Miller, who runs Turning Page Bookshop in the suburbs of Charleston, South Carolina, was facing a crisis when a broken air conditioner caused a gnarly mold outbreak in her shop. She realized she would have to move but couldn't afford to give a new landlord several

months' rent, replace damaged merchandise, and pay movers all at once. When she finally remembered to check her Bookshop account, she was astonished to see that Turning Page had more than \$19,000—enough to cover the move. "It hit during the perfect time," she says. "It's been a blessing."

Danielle Mullen, a former art curator and the owner of Semicolon in Chicago, never liked worrying about online sales. Her curatorial flair makes her store a distinctive community space: Art she selects hangs on the walls, shelves are stocked with books primarily from writers of color, and her sales associates are knowledgeable and chatty. She was focused on the store as an in-person experience, a gathering place. But one night, while drinking spiked hot apple cider with a friend, she signed up for a Bookshop page on a whim. For her, too, the service suddenly became the store's "lifeblood," she says. "The most necessary thing."

As uprisings for racial justice swept the United States in the summer of 2020, Bookshop highlighted Black-owned bookstores and curated anti-racist reading lists. Mullen is only the third Black woman bookstore owner in Chicago—a fact that appealed to book-buyers looking to support Black businesses. "I think we did \$2 million on Bookshop that year," she says. "It was crazy."

I met Mullen last summer at a café next to her shop on a busy street in Wicker Park. It was so hot out that the metal patio tables burned to the touch. Mullen was in a great mood. Semicolon was doing great. So great, in fact, that she was planning to open an outpost in Miami. She wasn't sure she'd stick with Bookshop indefinitely. She preferred focusing on her brick-and-mortar store, and she didn't especially like the idea that indies needed a third-party tech company to compete in online sales, even if said third-party tech company had good intentions.

Mullen isn't alone in her ambivalence. Jeff Waxman, a former bookseller who now works as a publishing sales representative, was a consultant for Bookshop before it launched. He worries that the company is diverting people who would have bought directly from their local store to its own website. "The fact is, it's always going to be better to buy a book directly through a store than through a middleman," he says.

Hunter understands these critiques. He agrees that the best way to buy a book—for bookstores, the economy overall, and for local communities—is to wander into your local shop and purchase one in person. He doesn’t even think Bookshop is the second-best way. That would be buying directly from these local bookshops’ own online stores, if they have them. Hunter sees Bookshop as the third-best option, the Good Samaritan middleman. And this third-best way happens to be critical because of the most popular way people *actually* buy books: They click “Purchase” on Amazon.

Amazon controls more than half the US book market, according to Peter Hildick-Smith, president of book audience research firm Codex-Group. Jeff Bezos’ company sells approximately \$4 billion to \$5 billion in new books each year. By comparison, Hunter says that Bookshop sells around 1 percent of Amazon’s share. Between Bookshop and Amazon, it’s not apples and oranges so much as a single heirloom apple tree versus the world’s largest commercial citrus grove.

But Hunter wants to grow. Approximately 2,200 stores in the US and UK participate in Bookshop’s profit-sharing. Someday, Hunter wants to take the Bookshop model beyond books to help small businesses like hardware stores or toy stores with their own affiliate platforms—to be another Everything Store of sorts, but one built around preserving small businesses instead of competing with them.

For now, that’s a daydream, but a real expansion is underway. Hunter wanted to compete with Audible, Amazon’s audiobook and podcast service, by helping independent stores offer alternative formats to physical books. In 2020, he set up a partnership with Libro.fm, a startup that sells audiobooks. Like Bookshop, they partner with independent stores and split profits, so teaming up felt natural. Now Bookshop customers are directed to buy audiobooks on Libro.fm.

Last year, after considering a few directions he could take Bookshop, Hunter set his sights on ebooks. He set out to raise \$2 million for the project, but Bookshop doesn’t have a pitch tailored for traditional venture capital. If anything, it has the opposite. Bookshop’s stockholder agreement forbids a sale to Amazon and its ilk (“any retailer then-presently ranked among the top 10 largest retailers”), which means there won’t be any big

acquisitions down the road. Despite the rocky economic climate and his un-VC-friendly pitch, Hunter has raised over \$2.3 million. (I can attest to how persuasive he sounds when he waxes poetic about the importance of alternative ebook platforms.) The largest investor is, as was the case the first time around, William Randolph Hearst III.

At the start of the pandemic, Bookshop was the sourdough of ecommerce. It rose with surprising velocity, taking even its teensy staff by surprise.

People will be able to read Bookshop's ebooks in their browser, or on apps that will work on Apple and Android devices (but not, as of yet, on Kindles or through Kindle apps). This arrangement will make for a difficult business proposition and a clunky experience for readers. For starters, Apple takes a 30 percent cut of all revenue made through its app store. Hunter is hoping people will take the extra steps of buying Bookshop ebooks through their browsers rather than Apple's app store and then reading them on Bookshop's app, which would circumvent the Apple tax.

One ebook startup has already attempted this kind of project and failed, unable to woo customers away from the Kindle world. Hummingbird Digital Media, which also allowed indie stores to set up their own storefronts and take a portion of the profits, has since been purchased and rebranded—it's now called Booksio—pivoting to donating to charities instead of bookstores.

Hunter is optimistic he can succeed by building on Bookshop's preexisting customer base. Part of his plan is to connect ebooks to the social web, to "make them more of the online conversation." He wants to make it easier for people to share links to ebooks, the way they share snippets and links to paywalled content from *The New York Times* or *The Washington Post*. He has hired one engineer so far and is bringing more on board. "We're using a lot of open source technology that has been built to support an alternative ebook system already," Hunter says. "But up until this point, it's pretty much been libraries using the technology." He aims to have the platform in beta by the end of the year.

Photograph: Yael Malka

There's more. This fall, Bookshop will publish a collection of short stories by Lydia Davis—a partnership about as glam as having Miuccia Prada design a capsule collection for some tiny boutique.

It was all Davis' idea, too. When she published her last book, she realized how much she disliked the idea of Amazon profiting off her work. "I made up my mind. For the next book, I would do everything I could to avoid Amazon," she said. Her agent supported the decision; her longtime publisher, Farrar, Straus and Giroux, however, nixed it. ("Contracts and repercussions," Davis offers by way of vague explanation.) Davis' agent suggested asking Hunter for advice on publishers who might be willing to alienate the Everything Store. "It was a surprise to both of us when he said he wanted to publish it himself," Davis says. She's been delighted by the process. "He's been very fast, very efficient, very resourceful." Davis knows her sales will suffer, but she doesn't care.

It's the debut of a project called Bookshop Editions, to be sold exclusively through Bookshop and independent stores. Hunter isn't planning to turn it into a full-fledged imprint, but Davis, for her part, hopes her actions might inspire other authors. "I'm just really happy I'm doing it," she says. "I have no regrets whatsoever."

When I caught up with Danielle Mullen of Semicolon on a gloomy Chicago afternoon, the sun hadn't been out in days. It was the kind of weather that compels you to Google SAD lamps—or move to Florida. Mullen had been jubilant the last time we talked, brimming with her own expansion plans. Independent bookstores were on an upswing. More than 300 new shops had opened in the past few years. There are people—just enough of them, it seemed—who simply prefer physical stores like Semicolon, so I was expecting a happy update from Mullen. Had she opened her Miami outpost yet?

"No," she said. "Actually, everything has changed."

Her beautiful Wicker Park shop had flooded repeatedly, and the landlord was no help. It got so bad that Mullen decided to move the store back to its original location, a smaller spot on the ground floor of a 130-year-old

apartment building in River West, a bustling neighborhood with trendy Italian restaurants and luxury condos.

She is putting in an offer to buy the whole building, with hopes of having a permanent presence in Chicago. Exciting stuff—but expensive. So expensive that Mullen has once again found the money Semicolon generates from Bookshop crucial: “Kind of like how it got us through the pandemic.”

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

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Apr 6, 2023 6:00 AM

The Arctic's Permafrost-Obsessed Methane Detectives

The Far North is thawing, unleashing clouds of planet-heating gas. Scientists rely on an arsenal of tech to sniff out just how nasty the problem is.

Covered in netting to deflect stray balls, these instruments gather methane data on the seventh hole of Midnight Sun Golf Course. Permafrost is rapidly thawing across the far north, deforming fairways here and releasing the highly potent greenhouse gas, which leads to more warming. Photograph: Frankie Carino

at the midnight Sun Golf Course in Fairbanks, Alaska, they say you never get the same shot twice. That's because the Arctic is warming much faster than the rest of the planet, and as the underground permafrost thaws, it deforms the course's fairways. This express defrost unlocks ancient organic matter—a lot of it. (The world's permafrost holds twice as much carbon as is currently in the atmosphere.) Microbes feed on that liberated matter and fart out plumes of [methane](#), a gas that's 80 times more potent than carbon dioxide at warming the planet. And as thawing permafrost releases more methane, it raises global temperatures—which thaws more permafrost, which releases more methane. It's the dreaded climate feedback loop, and scientists are using an array of tech to better understand it.

“We know the future of the Arctic is [all about warming](#),” says Tyler R. Jones, a geochemist at the University of Colorado, Boulder. “To be prepared, we want to understand permafrost environments better—to model them better. We want to know what’s possible.”

This article appears in the May 2023 issue. [Subscribe to WIRED](#). Illustration: Alvaro Dominguez

Fairways happen to be perfect locations for the scientists to land their specially designed drone. The aircraft, which carries instruments for sampling greenhouse gases, has a wingspan of 10 feet. But it lacks wheels, so the team has to belly-land it. “You can just make laps around a feature of interest and get a profile of a methane plume,” Jones says. “The golfers let us play through for a minute and land our drone. And then they hit their shots.”

Nearby lurks a site of particular interest—or dread, depending on how you look at it. Big Trail Lake is the product of a violent [thermokarst event](#), in which permafrost thaws so rapidly that the ground collapses. The resulting craters, filled with water, represent ideal conditions for microbes to produce methane. Indeed, Big Trail Lake may be one of the highest-emitting lakes in Alaska, so the team collects methane data from a floating instrument tower there. “This is probably one of the most sophisticated science experiments happening in the Arctic, because of the different types of instruments,” says Nicholas Hasson, a geophysicist at the University of Alaska Fairbanks. “We’re kind of like methane detectives.”

Unlike an array of sensors stuck in one place on the ground, a drone can take samples at varying altitudes and across whole landscapes, providing researchers with a highly detailed map of aerial methane concentrations.

Photograph: Frankie Carino

An ice arch on Alaska’s Castner Glacier. The Arctic is losing ice not just from its many glaciers but also from thawing permafrost.

Photograph: Frankie Carino

Sandia National Laboratories scientist Chuck Smallwood watches Hasson take a core sample. While Hasson is interested in the characteristics of the permafrost itself, Smallwood studies the microbes in the lab. By controlling growing conditions, he can better understand how the microbes might produce methane as Alaska warms.

Photograph: Frankie Carino

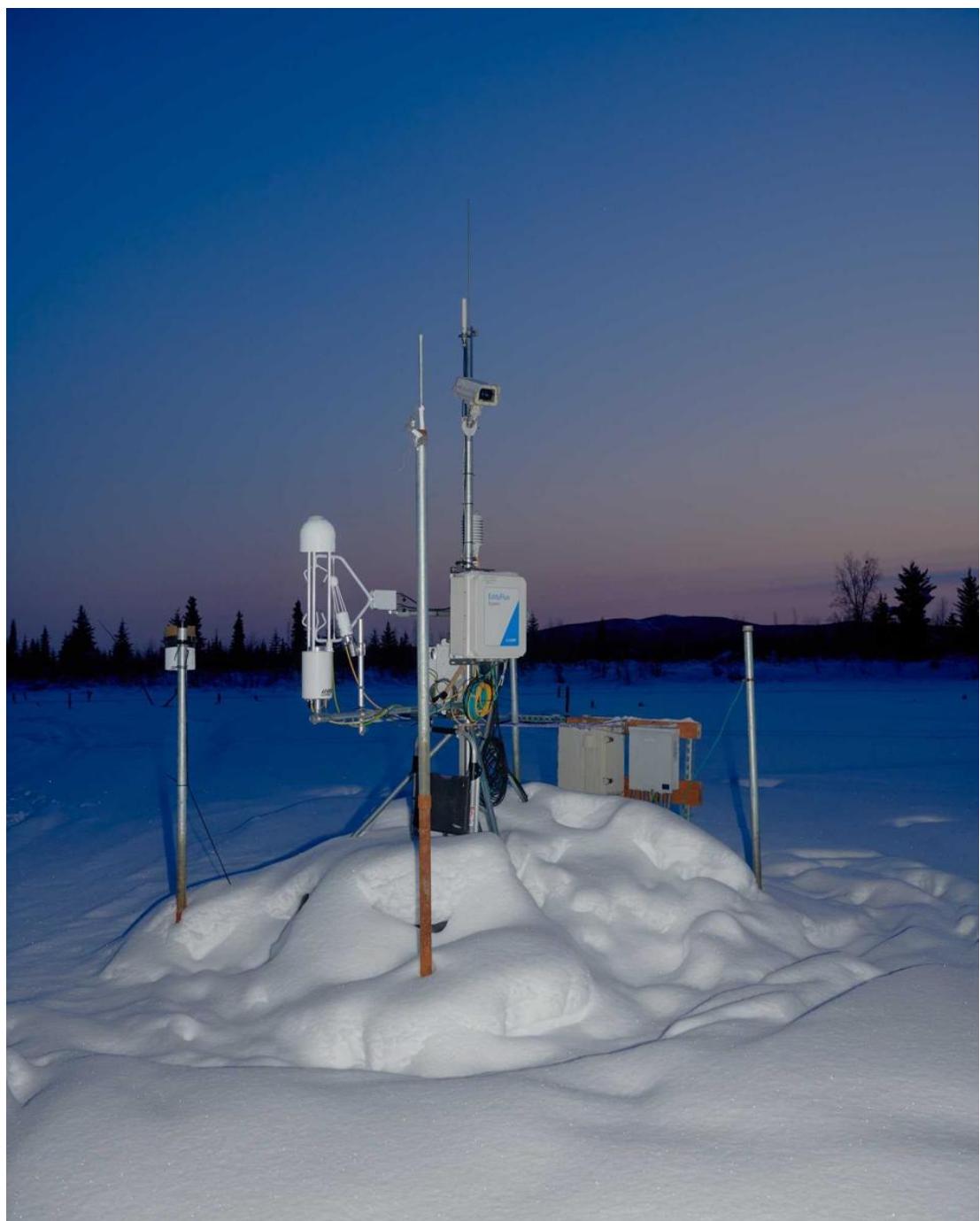
This thermokarst crater, north of Fairbanks, was drained because the pooled water was threatening a tunnel underneath. The researchers took advantage of the situation to measure methane emission of a thermokarst that's not filled with water.

Photograph: Frankie Carino

Hasson examines a cross-section of permafrost. The blue mass is an ice wedge, which is surrounded by carbon-rich silt. As permafrost thaws, the ice melts into pools of water where methane-emitting microbes munch on ancient plant material.

Photograph: Frankie Carino







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Photograph: Frankie Carino

Permafrost can vary significantly in its ratio of ice to organic matter. Better understanding the interaction between the two is critical to determining how much methane a warming landscape will release.

This article appears in the May 2023 issue. [Subscribe now.](#)

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By [Amos Zeeberg](#)

[Backchannel](#)

Apr 4, 2023 6:00 AM

A Tiny Blog Took on Big Surveillance in China—and Won

Digging through manuals for security cameras, a group of gearheads found sinister details and ignited a new battle in the US-China tech war.

Photograph: Makoto Oono

At a location he keeps secret, John Honovich was on his laptop, methodically scouring every link on a website for a conference half a world away. Hikvision, the world's largest [security camera](#) manufacturer, was hosting the event—the 2018 AI Cloud World Summit—in its hometown of Hangzhou, a city of about 10 million people not far from Shanghai. Honovich, the founder of a small trade publication that covered video [surveillance](#) technology, wanted to find out what the latest Hikvision gear could do.

He zeroed in on one section of the conference agenda titled “Eco-Friendly, Peaceful, Relaxed” and found a description of an AI-powered system installed around Mount Tai, a historically sacred mountain in Shandong. A video showed Hikvision cameras pointed at tourists climbing the thousands of stone steps leading to the famous peak. Piano music played as a narrator explained, in Mandarin with English subtitles, that the cameras were there “to identify all visitors to ensure the safety of all.” The video cut to a shot of a computer screen, and Honovich hit pause. He saw a zoomed-in view of one visitor’s face. Below it was data that the camera’s AI had inferred. Honovich downloaded the video and took screenshots of the computer screen, for safekeeping.

This article appears in the May 2023 issue. [Subscribe to WIRED](#). Illustration: Alvaro Dominguez

Later, with the help of a translator, he scrutinized every bit of text on that screen. One set of characters, the translator explained, suggested each visitor was automatically sorted into categories: age, sex, wearing glasses, smiling. When Honovich pointed at the fifth category and asked, “What’s this?” the translator replied, “minority.” Honovich pressed: “Are you sure?” The translator confirmed there was no other way to read it.

Honovich was shocked. In his many years in the industry, he’d never seen a surveillance company set out to automatically detect racial minorities. The feature seemed completely unethical to him, and he immediately wondered how China might use it against the Uyghur people, a mostly Muslim ethnic minority group, in the province of Xinjiang. Honovich had seen reports trickling out in the West of Uyghurs being subjected to constrictive surveillance and mass detentions. Clicking through the AI Summit website, Honovich couldn’t tell whether Chinese authorities were using this technology to [oppress minorities](#), but he saw that danger coalescing. He quickly wrote up an article about Hikvision’s ethnicity-detection technology, including the video, screenshots, and a no-comment from the company, and [posted it](#) on the website of IPVM, the trade publication he had founded.

He talked about the discovery with one of IPVM’s reporters, Charles Rollet, a Frenchman who lives outside the US and also keeps his location secret. Rollet had written about how Hikvision and Dahua, the second-largest video surveillance manufacturer in China, were reaping huge profits from government work in Xinjiang. Rollet had a newspaper background and, though he was 25, talked like an ink-stained newsie twice his age, all “scoops” and “calling out abuses” and “hard-hitting news.” By trawling through publicly available materials online, Rollet had learned that Hikvision had landed a deal to build a mass [face-recognition](#) system to cover one Xinjiang county—including a “reeducation” center and some of its mosques—and a contract to install videoconferencing systems in mosques, presumably so attendees could watch sermons broadcast by the government. Dahua won the bigger contract: \$686 million to build camera-

equipped police stations in another part of Xinjiang. The deals specified that the companies would install these systems, run them for a number of years, and then pass them off to the government. In many aspects of the government's video surveillance in Xinjiang, [Rollet reported](#), the two companies were "deeply involved."

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Hikvision and Dahua cameras also happened to hang on houses, businesses, and public buildings in the US and much of the world. Security system installers eagerly sold huge numbers of the cheap cameras. Global financial institutions, such as Fidelity International and Norway's sovereign wealth fund, were enthusiastic investors in the profitable, fast-growing Chinese companies. American chip giants Intel and Nvidia sold them silicon to power their face recognition.

That would all soon change. Over the next few years, IPVM's writers unearthed one damning detail after another on [Chinese surveillance gear](#). Their scoops would end up influencing national policy, changing those companies' fortunes, and placing the reporters themselves squarely on the front lines of the US–China cold war.

I first met Honovich on a summer day in New York, in Brooklyn's Marine Park, not far from where he grew up. There are no pictures of him on IPVM's site or on his LinkedIn, a decision I would later understand. He is a small-framed man, with glasses over close-set eyes and a boyish face. We sat at a small table with an inlaid chessboard, and Honovich, dressed in shorts and a T-shirt, started telling me about the surveillance industry in rapid-fire sentences.

Early in his life, he says, he developed a zeal for calling out dishonesty. Coming of age on the streets of New York in the '80s and '90s, he encountered plenty of fast-talkers, which he says attuned him to deception and taught him to stand up for himself. "In Brooklyn, you sort of learn that people will try to take advantage of you, so you're gonna have to either fold or push back," he told me.

Honovich was living in Honolulu and studying philosophy in grad school when he decided he needed a different career. He dropped out and went looking for a tech job. He made his way to a security startup in Silicon Valley called 3VR, where he became the director of product management. During his time in the security business, when coworkers went on sales calls, Honovich sometimes came along to answer technical questions. But he says he grew uncomfortable when he saw salespeople exaggerating or lying to win over customers. In 2007 he quit. He decided he would rather write about the industry. But the existing trade publications depended heavily on advertising and sponsorship from the same companies they covered. He'd have to build his own publication and find another business model.

In his many years in the industry, Honovich had never seen a surveillance company set out to automatically detect racial minorities

He coded up a quickie website, and he called it IPvideo-market.info. The “IP” stood for internet protocol, mundane-sounding verbiage that in fact spoke to a technological revolution. Security cameras were rapidly changing from analog, low-definition video tape recorders to what were essentially little internet-connected computers. The new cameras used digital sensors and processors to produce better images, and since they communicated through IP, they could plug right into a user’s local network and the internet. Honovich declared independence from marketing—the site would never accept advertising or sponsorships—and started to write.

Free to say what he wanted about the industry, he was forthright, verging on combative. In an early series of posts, he took aim at one camera company, which [he described](#) as “the Worst By a Massive Margin.” He criticized it for overselling its cameras’ capabilities and called it out for allegedly lying in an advertisement. “The industry needs to fight back,” he wrote, against “malicious manufacturer marketing,” betraying his tendency to sound like a comic book superhero.

Probing for ways to make money, he wrote an ebook about video surveillance, posted a link to buy it online, and emailed everyone he could think of. The next morning, he was euphoric to find that more than a dozen people had bought the ebook, bringing in several hundred dollars. It wasn’t

much, but Honovich took it as a sign: There were people who would pay for his insights. Honovich started charging \$99 for annual access to the site.

Within a few years, he had amassed enough subscribers to move IPVM out of his house and into a bare-bones office—a 100-square-foot storage unit in Honolulu—and hire a few more writers, including Ethan Ace.

Ace, who lived in Pennsylvania, was an experienced security system installer and frequent commenter on IPVM's posts. With a big red beard and shaggy hair, he sometimes thought about living off the hilly Pennsylvania land near where he grew up, making omelets from eggs laid up the road. In 2013, Ace wrote one of the publication's first posts testing Hikvision cameras, comparing four of them against models from other manufacturers. He was impressed to find that they were as good as the other brands while costing much less.

Those early posts established not just a voice and market for IPVM but also an ethical framework based on uncompromising integrity. If IPVM gave a product a positive review, Honovich would bar its maker from using the site's words as a promotional tool and threaten to cancel the subscription of any company that broke this rule. Honovich also felt that the term "Chinese company" could be interpreted as having racist overtones, so he had writers use the idiosyncratic term "PRC company" instead. Whatever the term, those companies were about to dominate the IPVMers' world.

Photograph: Makoto Oono

In 2015, ace flew to Shenzhen to attend the China Public Security Expo at a colossal convention center. Throngs of people stood outside in hour-long lines waiting to get in. Ace saw people selling their entrance badges as they left. A few entrepreneurial folks were hawking packets of company brochures they had collected from booths. Once inside, Ace walked over to the large Hikvision exhibit. It was mobbed by people gawking at demonstrations of face recognition cameras, biometric doors, and other products that hadn't yet made it to the US. Once in a while, a drone would pop into the air. It struck him that the well-known Western and Japanese brands that had long dominated the market were afterthoughts here; Panasonic's booth was sparsely attended. Ace could see that surveillance wasn't a niche business in China—it was part of popular tech culture, and

Hikvision was leading the pack. Within two years, Hikvision would become the number two seller of security cameras in the US.

But as Honovich kept an eye on the emerging powerhouse, he began to notice problems. In its English-language materials, Hikvision portrayed itself as an ordinary company, separate from China's government. But Honovich wrote a series of posts showing that it had spun out of a government-owned firm, which remained its largest and controlling shareholder, and that it had received billions of dollars in government loans. Hikvision's dazzling growth, he argued, was mostly fueled by government contracts. By Honovich's reckoning, Hikvision wasn't functionally separate from the Chinese government.

China's other surveillance giant, Dahua, also came under IPVM scrutiny. In March 2017, a security researcher going by the name Bashis published a post in the subscriber area of IPVM.com. "I'm speechless, and almost don't know what I should write," he began. Bashis described a security vulnerability in numerous Dahua products that revealed the devices' usernames and inadequately obscured versions of the passwords. Bashis wrote, "This is like a damn Hollywood hack, click on one button and you are in," and he said it seemed like a "backdoor" left intentionally by the creator. Anyone who exploited the vulnerability could potentially watch the camera's videostream and—since IP cameras are networked computers—also use the camera to access the rest of the victim's internal network or as a bot to launch online attacks. A well-known security writer covered the leak in a blog post and called it "an embarrassingly simple flaw." In Bashis' post, he included a short section of code to show how easy it was to exploit the vulnerability. Honovich quickly took down the code, but it spread on email lists and other sites. Dahua scrambled to distribute patches over the next few days.

IPVM was becoming a hub for people who worried about these companies' security. Andrew Elvish had seen the problems up close and spoke about some of his concerns to IPVM reporters. Elvish was the vice president of marketing at Genetec, a maker of software for video surveillance systems. In one incident, a Genetec client was using a Hikvision camera and needed some help. When the client opened a customer support case with Hikvision,

the company sent back images from the client's camera without asking for the login information, according to Genetec security chief Christian Morin. It seemed clear to Morin that Hikvision and Dahua had "magic keys" to access their cameras whenever they wanted. "These devices can serve as beachheads," Morin says, through which nefarious actors "can take down the rest of your network." Genetec eventually stopped using Hikvision and Dahua gear. IPVM "played an instrumental role" in exposing these "very suspicious cybersecurity flaws," Elvish says.

Dahua and Hikvision deny leaving intentional backdoors, saying such security problems are normal for any major tech manufacturer and that they patched them appropriately. "There is no evidence anywhere in the world indicating that Hikvision's products are used for unauthorized collection and transit of information or data of end users. Hikvision would never compromise or harm our customers' interests," Hikvision told me in a statement. Dahua put out a statement saying, "We have provided remedies to correct those issues with our customers. We take cybersecurity very seriously."

In May and June of 2017, Hikvision lashed out at Honovich in four posts on its own blog. "Does the online blogger devote 100 percent of his time to writing tabloid-style headlines and sensationalist anti-China rhetoric?" asked one post. "Hiding behind a keyboard, the tabloid's staff takes unfounded potshots at our entire industry, bullying one company at a time. It is cyberbullying, and it is a cyberattack on hard-working people." One post suggested that the default name given to anonymous commenters on IPVM posts—"Undisclosed"—might be a Honovich sock puppet.

A few days after the sock puppet post, Jeffrey He, the president of Hikvision USA, emailed Honovich to invite him to an off-the-record meeting at a hotel at New Jersey's Newark Liberty International Airport. Honovich had talked with He a number of times in the course of reporting, and he figured Hikvision leadership wanted to clear the air. Honovich showed up at a small conference room in the hotel, where He and two other senior Hikvision employees were waiting. They faced each other across a conference table. One of the Hikvision people held a clipboard, Honovich recalls, and began asking him questions from a written list: Why did he

write the things he posted on IPVM? How did the company really make money? What did he have against Hikvision? Honovich was taken aback and tried to explain that he had no hidden agenda or revenue source beyond subscribers. To him, the meeting felt like a criminal interrogation—“Where were you on the 4th of May?”—type stuff. (A Hikvision representative said that Honovich and He had agreed the meeting would be off the record and declined to comment further.)

After about 15 minutes of grilling, Honovich went to the bathroom to catch a breath. He was surprised to take that much heat in person, but he saw himself as someone who could handle it. As he told me during our meeting in Marine Park, “I get satisfaction out of standing up.”

Soon, IPVM’s coverage caught the attention of policymakers in Washington, DC. Intelligence agencies and news outlets in the US and other Western countries were already sounding alarms about networking equipment made by Chinese companies—particularly Huawei, one of the world’s tech giants. Now parts of the US government were concerned about Hikvision and Dahua, too, and began imposing sanctions on them. In August 2018, Congress passed a law barring the federal government from buying gear from Huawei, Hikvision, and Dahua, among other Chinese tech companies. The Congressional Executive Commission on China, a bipartisan group that monitors human rights and the rule of law in the country, cited Rollet’s coverage in its 2019 annual report, writing that “IPVM provided evidence that the video surveillance company Hangzhou Hikvision Digital Technology was directly involved in the construction, operation, and ongoing maintenance” of the Xinjiang surveillance system.

The devices were giving customers a false sense of comfort, the testers concluded, while pulling in hundreds of millions of dollars for their makers.

As IPVM waded deeper into big policy questions, Honovich decided to hire someone to deal with government officials and research how surveillance affected the public. Conor Healy, just out of college and trying to figure out what to do with his life, came across IPVM’s posting on a job board and was intrigued: It didn’t say much about qualifications, instead emphasizing that the company needed someone with a strong sense of ethics. Healy saw himself as principled and eager to stand up for his beliefs, and in an

interview he convinced Honovich of the same. Healy started working for IPVM in the middle of 2020 and soon joined an investigation into “fever scanners” that many venues bought during the pandemic. IPVM’s engineers were skeptical of the scanners’ abilities to detect fevers under real-life conditions and wanted to test them at the company’s new headquarters in Bethlehem, Pennsylvania. Healy was brought in to help with the research.

The HQ was a big step up from the storage facility in Honolulu. Inside the century-old, 12,000-square-foot former silk mill, in two cavernous, concrete-floored rooms, IPVM employees tinkered with piles of security gear. Ethan Ace rigged a bunch of fever scanners to a rolling cart and began probing them. In one extreme test, an engineer rode by the rig on a skateboard to see how the scanner behaved when given little time to register his temperature. In another, he held a hot bag of water on his forehead until he couldn’t stand it anymore, then walked by.

The scanners, they learned, were measuring people’s skin temperatures from afar, then using an algorithm to try to divine their internal temperatures. When Ace compared the raw readings with the algorithm’s interpretations, he could see that the software was squeezing nearly all of the measurements—no matter how high or low—into the small range of normal human body temperatures. The fever scanners, Ace said, were in fact “rigged” to almost never show fevers. The devices were giving customers a false sense of comfort, the testers concluded, while pulling in hundreds of millions of dollars for their makers.

As Healy looked at the graphs and their meaning became clear, he was astonished by the companies’ greed. He took a walk with Honovich and confessed to having some doubts—what if they’d made a mistake? Honovich, having spent 20 years fighting mendacity in the security industry, told Healy to follow the data and not be swayed by corporate claims. “That’s one of the founding premises of IPVM: Being dishonest and unethical is a competitive advantage,” Honovich told me. Negating that advantage was IPVM’s *raison d’être*.

Healy and Ace pulled the data together, wrote up an academic article, and got it published in the *Journal of Biomedical Optics*. Within days, the US Food and Drug Administration warned the public that fever scanners could

be inaccurate and sent warning letters to some manufacturers. Healy's first leap into a policy argument had gone well. Soon, he would be helping IPVM wage much bigger wars, with much bigger opponents.

In December 2020, an IPVM employee made a blockbuster discovery. The reporter, who keeps his identity secret because of the harassment some IPVMeers get for their controversial work, discovered that Huawei and a Chinese AI unicorn called Megvii had tested a literal "Uyghur alarm": The system used [AI to analyze people's faces](#), and if it determined that a passerby was Uyghur, it could send an alert to authorities. At the time, Huawei wasn't publicly known to be participating in China's racial surveillance system. IPVM partnered with two *Washington Post* tech reporters to [get the information out](#).

The *Post* published an article on the same day as IPVM and credited the security outfit with the discovery. Dozens of publications picked up the story. For the first time, an IPVM report was national news. Reacting to the *Post* report, US senator Ben Sasse from Nebraska said, "While Huawei sells contracts with fancy talk about connecting people around the world, they're working to send Uyghurs to torture camps in China." Senator Marco Rubio from Florida tweeted, "The sick people at @Huawei developing software to recognize the faces of #Uighur Muslims & alert the communist government of #China." Antoine Griezmann, a French soccer star who had appeared in prominent ad campaigns for Huawei, canceled his sponsorship deal. Huawei released a statement saying it wasn't involved in ethnicity detection, yet the *Post* reporters promptly found other documents on a Huawei website showing it had worked on race-detecting systems with at least four other partners besides Megvii.

Spurred by his colleague's discoveries, Rollet, the former newspaper reporter, began turning up more evidence of racial surveillance in China. He found product support documents for Dahua cameras that provided "real-time Uyghur warnings" to police. Another document showed that Dahua cameras could track people in the illegal sex business, thieves, and "Uyghurs with hidden terrorist inclinations." Sitting at a café and goggling at the file on his laptop screen, Rollet felt that he was face-to-face with "the banality of evil"—bland technical manuals for an automated system of

brutality. Thinking of movies he had seen about historical genocides, he started to cry. IPVM provided the documents to the *Los Angeles Times*, and the paper published its own investigation in February 2021.

IPVM's reporters went on a tear, digging up more damning evidence and providing it to bigger publications to disseminate. The BBC published a report on Huawei's patent filings for AI race detection in China; Reuters wrote that Hikvision and Dahua had helped draft technical standards for mass face recognition systems; *The Wall Street Journal* revealed that Hikvision had deep, long-standing ties to the Chinese military. And so on. Each time, the companies involved insisted that the project was a one-off test, an unimportant slipup, or regular corporate behavior.

Concerns about the companies' security and human rights issues finally erupted. In November 2021, President Biden signed a law that blocked the introduction of new video surveillance equipment from Hikvision and Dahua and communications equipment from Huawei in US telecom networks. Models that the companies had already sold in the US would become obsolete over time, gradually consigning them to irrelevance. IPVM played a crucial role in "exposing the Chinese government's gross human rights abuses perpetrated with the help of its video security and surveillance systems," US representative Claudia Tenney from New York, a cosponsor of the law, told me. "IPVM's work is key to unearthing the full extent of the security risks posed by the CCP and state-controlled or - directed technology companies."

Even the security industry—much of which had continued to support Chinese manufacturers because of their cheap and popular gear—largely turned against them. The Security Industry Association trade group expelled Dahua, and Hikvision quit soon after, leaving no doubt about who it blamed for its departure. "It has been disappointing and frustrating to witness the cynical, anti-competitive, unscrupulous, and disingenuous efforts of IPVM to target member companies and undermine the mission of SIA with its invective and opaque financial motives," Hikvision wrote in a resignation letter obtained by the website Security Info Watch.

Honovich banged out a feisty response: "We are only 'opaque' to Hikvision because they cannot understand putting ethics over profits," he wrote in a

post on IPVM. “A PRC government organization with 40,000+ employees, Hikvision cannot control IPVM, an American small business with just 25.”

The fight for the US market was over, and Hikvision began a slow retreat. But IPVM wasn’t done with China.

Photograph: Makoto Oono

In September 2021, Conor Healy, IPVM’s government liaison, flew to London to participate in a people’s tribunal chaired by the lead prosecutor of the war criminal Slobodan Milošević. The goal of the trial was to determine whether the Xinjiang crisis amounted to genocide, and Healy was there to testify on IPVM’s scoops in the region. At a reception for participants, a human rights researcher told Healy about an ethnic minority family that was in trouble. The father, Ovalbek Turdakun, an ethnic Kyrgyz and citizen of China, had spent a year in a “reeducation” center in Xinjiang. He, his wife, and their son had fled to Kyrgyzstan, but they were at risk of being deported back.

Healy reached out to some of his contacts. A US State Department official suggested the family try to get to a neutral country such as Turkey and from there petition the US government to let them in. A Christian organization agreed to pay for the family’s exit, but Healy was having trouble finding someone who could shepherd them to Turkey. He decided to do it himself.

In December, Healy flew to Bishkek, Kyrgyzstan, and found himself in a child’s bedroom sitting across from Turdakun. The Kyrgyz man sat in silence, drawing on his palm with a pen. His wife sat beside him, a calm and determined look on her face, while their 11-year-old son smiled happily, unaware of what was about to unfold.

Healy was going to try to escort them across the border that day. A Russian man who transported kids for a local school pulled up in a small bus, and they filled it with seven suitcases stuffed with almost everything they owned. As the group left the city and drove down dark roads, Healy bought plane tickets on his phone, having left it until the last minute to keep Chinese authorities from tracking them. He couldn’t shake what he’d heard

from a human rights contact: If the Chinese government was going to kill them, it would likely be in the car on their way out of the city.

They made it to the airport, and Healy and the family nervously approached border control. Healy took their passports and, along with his own, handed them in a stack to a customs officer. The officer flicked through Healy's, looked at the other passports, frowned, and walked off. A few minutes later, he returned with a more senior officer whose uniform was covered with ribbons and medals. The two officers argued with each other in Kyrgyz for a few minutes. Then the senior officer turned to Healy and asked whether he loved Kyrgyzstan. Healy nervously blurted out something about the beauty of the mountains before realizing he sounded ridiculous, since the city was blanketed in thick smog. The officer paused for a minute, then let them through. The clang of the stamp on the passports was the sweetest sound Healy had ever heard. As Turdakun, who didn't speak much English, walked through, he smiled at Healy and said, "Nice."

In Istanbul, Healy interviewed the parents for three days in a hotel room, over glasses of Turkish tea, to find material for their application to immigrate to the US. Turdakun described in detail how he was shocked with electric batons, injected with noxious chemicals, and tied to a steel interrogation chair in a room by himself for over 24 hours at a time. The ever present masters in his cell were three security cameras. If he talked to another inmate, a guard watching the video feed would bellow at him through a loudspeaker to stop. When he wanted to use the rudimentary toilet, he would look at a camera and ask for permission. Even outside the camp, Turdakun said he was watched by face recognition cameras hanging all over Xinjiang, and when he went out, police often quickly appeared and interrogated him. Healy showed Turdakun an image of the Hikvision logo on his phone and he recognized it. "Ah, that's a brand of video camera. They're everywhere," he said. The same logo, he said, was on the cameras in his cell.

Healy flew back home after the interviews but continued to help the family with their application, as did other advocates. A human rights lawyer who wants to call Turdakun as a witness at the International Criminal Court in The Hague wrote a letter to the US government on the family's behalf. "It is

vital that his evidence is available for the ICC and for the international community,” he wrote in the letter, as quoted in *The Guardian*. “It is crucial to keep them safe and secure.” After three months in Istanbul, the family got a special type of immigration visa for people called to testify in court, and in April 2022 they flew to the US. As they exited security at Washington Dulles International Airport, Healy was there to welcome them to the United States. He and Turdakun hugged. Now that the family was safely in the US, Healy wrote a post on IPVM about Turdakun’s experiences: the first direct evidence of Hikvision cameras being used in detention cells in Xinjiang.

as a reporter, I was never going to get as involved in the story as Healy did. Still, I wondered whether I might be able to peek inside the dark world of Chinese surveillance myself. Using what I’d learned of IPVM’s reporting techniques, I made a short list of search terms, starting with “minority” in Chinese, and began scouring the internet.

When I got a result that looked promising, I copied the text into a translation tab. It didn’t seem like much, so I went back and tried different searches, sometimes incorporating new terms I came across. Within half an hour, I found a Chinese page on Hikvision’s Indonesian website describing a server that analyzed surveillance video. One of the facial attributes that the server’s software was supposed to detect: “Minority: unknown, yes, no.” The translation was stilted, but in the context of everything IPVM had reported, clear enough.

I’d stumbled on what appeared to be another tiny part of China’s racial-persecution system. I thought of something Honovich had told me: “If the Nazis were here, they would probably design user manuals for everything they built.” A sickening feeling came over me. This wasn’t evidence filtered through someone else’s description, subject to interpretation—it was a vile secret the internet had whispered just to me.

When I went back to the page a few weeks later, it had all been translated to English, the bit about detecting minorities scrubbed. I scrambled through documents on my hard drive and realized I’d made the rookie mistake of failing to archive the page: no screenshots, no PDFs, no proof. I copied and pasted the URL as fast as I could into the Wayback Machine, an archive of

websites, and found an old version of the page. It was as I'd remembered it, touting the server's minority detection. I quickly saved it in three formats.

Even as our faces are increasingly tracked and analyzed by computers, and distant sirens of dystopia ring louder, the US has largely declined to regulate video surveillance and face recognition. In the absence of restrictions, Honovich says he's watching for trouble. "AI can do magically positive things for society, but you can do terrible things as well," he says. "There's a risk of police using it, there's a risk of companies using it, there's a risk of people using it."

By now, I understood why Honovich was so careful to limit his own exposure to face recognition. "They can start mining all these videos and figuring out where you are," he says. "I try to keep basically a low profile on the internet. It's not gonna 100 percent stop it, but I'm not sure why I want to give them more shots to identify me all over the place."

"Who's them?" I ask.

"The *them*. Could be the US, could be China. Could be whoever."

With a prick of anxiety, I wondered what "the them" might know about me and whether I should take down public pictures of myself. I concluded there was no point. My face was already out there in the cloud, available for anyone to analyze. That loss of privacy was forever.

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[Katherine Alejandra Cross](#)

[Ideas](#)

Apr 2, 2023 7:00 AM

No, You Can't 'Have This'

It's so tempting to cry "just let me have this" when faced with a delicious story. But the easy gratification of viral lies is costing us more than it's worth.

Photograph: Shawn Michael Jones

"Please, just let me have this." It's what we cry when a too-good-to-be-true viral story is threatened by the too-true-to-be-ignored reality. When we say it (or, more likely, tweet it), we know something's wrong. It's like that uncanny moment when we realize we're about to awake from a wonderful dream.

It comes up a lot: during the plane bae saga , for instance, when a comedian nonconsensually filmed a young man and woman in the row in front of her and created a fictional narrative that they were in a romantic relationship—to the delight of thousands, who then demanded that the poor young woman live up to that fantasy. Or, more recently, when accused sex trafficker Andrew Tate was arrested in Romania and people wrongly believed that a pizza box, seen in a video where he was beefing with [Greta Thunberg](#), had tipped the police off to his location. They're fun stories, to be sure. The memes that came out of the Tate arrest were priceless little gems scattered across the desolation of Elon Musk's [Twitter](#). But these nuggets of entertainment may come at too dear a price.

When someone says "just let me have this," it's worth asking why they need it in the first place—and the answer should prompt some sympathy. Even the most cursory glance at the world reminds us what a sorrowful and joyless place it can be at this moment, when we seem to be reliving the 20th

century's greatest hits all at once. In addition to providing the cozy fire of a feel-good story to warm your soul, these viral internet fictions can lull you into believing there's some justice in the world.

Whatever else may be said about Thunberg, Tate, and the Jerry's Pizza box, it's a cracking good tale: Young climate activist tricks misogynist influencer into beefing with her so hard that he gets himself arrested. What's the harm in thinking a self-parodically macho self-help guru accused of heinous sex crimes was undone by such a trivial mistake, egged on by a progressive young woman?

In one sense, there's ample justice in the likelihood that this little lie will hound Tate for the rest of his days. But clinging to these viral white lies can also inflict serious harm. "Just let me have this" is the apotheosis of the internet as entertainment, with no tragedy great enough to banish irony and memeification. Tate's alleged crimes are no joke, after all; the Romanian police charged him with the sex trafficking and rape of at least six women over a period of years. There's something ghoulish about mining a bit of fan fiction from this situation for personal pleasure.

That sort of behavior is all part of the Extremely Online problem, where virality alchemizes everything into the 21st-century version of must-see TV, bleeding it dry of the need for reverence, grief, contemplation, or any emotion that isn't some kissing cousin of an especially joyless hedonism.

What is "this" that we so dearly want to have? Sometimes it's the catharsis of rage, other times the gleeful delusion that the world is fundamentally just.

But what is "this" that we so dearly want to have? Sometimes it's the catharsis of omnidirectional rage, other times the gleeful delusion that the world is fundamentally just. And there is no room for other emotions in the void between those fantasies. All the while, people who scoff at others for falling prey to disinformation widely retweeted the fable about Tate's pizza box.

Those same users may decry online harassment, fearing for the loss of their own privacy, while eagerly sharing threads or stories that invade the privacy

of others. One especially egregious example was [TikTok](#)'s Couch Guy saga, where a video of a tired young man greeting his girlfriend was dissected for evidence that he was cheating. He wasn't a celebrity—just some guy—but the whims of virality turned his sleepy hug into a crime that justified turning his life upside down. People had a blast making their own semi-ironic, true-crime-esque, investigative TikToks while neglecting the fact that the young man they were comparing to a serial killer because of the way he hugged his girlfriend is a real human being.

We can just let people enjoy things, yes. But it crosses a line when the “thing” in question is another human being who never consented to ascend into the zeitgeist—or when the *descent* of a monster like Tate into #content obscures their evil in a fog of irony. After all, in the case of the meme-optimized fable of Tate's demise, it is his victims' trauma being used to fuel the schadenfreude.

It's understandable that the horrors of late capitalism have left us in dire need of empty calories of post-processed joy. But when we're surrounded by fictional entertainment created for the sole purpose of riveting us to positive emotions we're otherwise alienated from, it feels especially churlish to demand the right to enjoy nonconsensually strip-mined content on social media. Especially when that content is straight-up misinformation.

Perhaps the biggest danger, however, lies in feeding one of the most terrible delusions of all: that we can shitpost our way to a better world. This, more than anything else, is why people need to “have this” when it comes to happy fictions like the telltale pizza box. It reinforces the myth that what's good for #content can be good for society. But it almost never is. Content is its own alpha and omega. In this strange and perilous political moment, when we are just beginning to think the unthinkable about platforms—asking whether we even need them—it's worth facing up to the fact that this kind of pseudo-justice needs us far more than we need it.

So many social media hoaxes have traded on the idea of justice-in-a-can, like the disclaimer people were appending to their [Instagram](#) photos in hopes that it would keep the platform from misusing them. People didn't perpetuate it because they were stupid but because it fit a preexisting narrative about the perfidy of companies like [Meta](#), and because it offered

social media itself as the solution. Click, copy, paste, share—the day is saved. As it does with just about everything, social media accelerates the process by which capitalism co-opts any resistance to it.

This is why the Tate pizza box fable was so popular: It asked nothing of the people who believed it *beyond* their belief. It continued the worrying deification of a world-famous young woman on whom such impossible expectations are already heaped, casting her as an avenging superheroine. All that was needed was for us to like and retweet. How tempting to believe that it requires nothing more to tear patriarchy or death-cult capitalism asunder.

Here's what I can let you have: mountains of consensually produced entertainment to soothe your soul after a long day and, more importantly, faith in your ability to do so much more than doomscroll and shitpost through the latest apocalypse.

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[Megan Farokhmanesh](#)

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Apr 1, 2023 7:00 AM

The Internet Is Ruined. The Metaverse Can Still Be Saved

In this nascent stage, there are opportunities for virtual worlds to avoid the mistakes of the past.

Photograph: Nuclear_lily/Getty Images

The future of the [metaverse](#) looks shakier than anyone can imagine. Tech companies that have bought into the concept fully—like Facebook-turned-Meta and [Disney](#)—are facing the realities of building out a concept that ostensibly already exists but has failed to achieve any real popularity. Even members of the video game industry, which has been exploring the field through virtual worlds like Second Life for years, [have doubts](#) that it will ever live up to its promise. But in this nascent stage, there is also potential: If the metaverse does take off, people building it now could avoid repeating the mistakes of the past.

As it stands, the metaverse is “not yet set,” says [Micaela Mantegna](#), an affiliate at the Berkman Klein Center at Harvard. Because of this, it might still be possible to limit the rampant toxicity that has infiltrated the web and social media. The metaverse is still connected to its more organic roots, and if those populating it—be they people or corporations—can remember the lessons learned about online safety and moderation, the metaverse could be a less horrible place. Put another way, “we already ruined one internet,” Mantegna said during a recent panel at the Game Developer Conference, but there’s hope for the one to come.

Video Games

[CEOs Are Hyped on the Metaverse. Game Developers Aren't Impressed](#)

Megan Farokhmanesh

Whateververse

[What Is the Metaverse, Exactly?](#)

Eric Ravenscraft

Zuckerverse

[Big Tech Needs to Stop Trying to Make Their Metaverse Happen](#)

Gian M. Volpicelli

Early metaverse experiences, like Linden Lab's [Second Life](#), allow users to explore identities and build new worlds. These ideas became the backbone for platforms like Roblox and VRChat, which turn devices into fulcrums for social interaction and [community creation](#). More recently, as companies like Meta have moved to transform virtual spaces like Horizon Worlds into mega-platforms, those smaller communities have felt pushed aside. There is less onus on a user to craft their own world; instead, they navigate the clunky, [no-legged future](#) put before them by corporations.

Harassment and other issues have inevitably crept into these spaces. Technology will be misused, Mantegna says, and it's crucial to start thinking early on about ways it might be abused. Right now, there's a huge lack of transparency around how the metaverse will work. Any system using algorithms, for example, is [vulnerable to bias](#), whether it impacts economically disadvantaged users, people of color, marginalized communities, or others. It's also still unclear what the metaverse's true ecological impact will be. And then there are the sticky questions about surveillance and data privacy. "How are we going to ensure we are not being manipulated in these spaces?" Mantegna says.

Some of these issues could be addressed with robust—and enforceable—laws and ethical guidelines. Regulation probably shouldn't be left up to the corporations behind metaverse endeavors. But as other platforms have demonstrated, laws cannot match the speed of the internet. You don't have

to look far for examples; earlier this year, streamers [who'd been deepfaked](#) found their options for justice to be severely limited.

Most legislation seeking to address these issues attempts to apply “meatspace laws” to web problems, says Ryan Black, a lawyer with a focus on the video game industry who appeared on the GDC panel alongside Mantegna. Furthermore, Black tells WIRED, they’re too “territorial” to meaningfully affect any given platform. “To the extent that there aren’t regulations and laws, we’ve essentially ceded control and authority to the operator via their terms and conditions,” he says. The relationship people have to the modern internet is “very much a provider-to-user” one, he says.

The metaverse is unlikely to be a great equalizer. As of now, there is no one set metaverse, but rather a variety, spanning multiple platforms and interests. People also have access to different levels of tech. And without the robust infrastructure needed to access the metaverse—steady internet, for starters—that inequity gap is poised to grow. Companies are likely to build services for people they stand to profit from. “The evolution of the product is driven by the ability to monetize, to further the business purpose,” says Black. Questions and solutions therefore follow what works for a company’s business, “and not a lot of what works for our users/society.”

But the metaverse is not starting from scratch. Creators already have avenues to work from. “Video games have always led the way in these technologies,” says Mantegna, “I think maybe we can start this conversation here and start creating solutions for this.” Lessons learned from combating harassment in spaces like *Fortnite* and Second Life can be applied to new platforms like Horizon Worlds. [Artificial intelligence](#), another fast-rising technology, may offer relevant guidance. “We need to think about all the experiences we already have thinking about AI ethics,” she says.

Achieving a true metaverse is not just about providing a virtual playground for people to yell in. It requires connection beyond the business of organizations, says Black, as well as governments working to facilitate a “true public interest/set of rights.” Without those safeguards, control will remain in the hands of those operating it.

“The ethical shift would need to be one that recognizes that the metaverse/virtual reality we are creating (or that will emerge from whatever we create) is a place where people will exist, and they have rights here that transcend any organization’s business needs,” says Black. It’s a high bar that only begins to touch on privacy, the right to organize, protest, and be free of discrimination—and so much more.

“That will be very complicated to do when we still have municipal, county, state/province, and country borders,” Black says. These might not exist in the metaverse itself, “but that will very much govern the meatspace humans that build it.” Creating a better online space will mean monitoring who gains control of the metaverse—and who gets left behind.

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Mar 30, 2023 8:00 AM

Your Next Landlord Could Be 100 Random People

Startups are buying properties and wooing first-time real estate investors to buy shares. The model could have real repercussions for renters.

Illustration: Andriy Onufriyenko/Getty Images

The three-bedroom, two-bath, split-level house in Fayetteville, Arkansas, looks like a perfect family home. It's got a charming brick exterior, a lush, green front lawn, and a fenced-in backyard perfect for hosting cookouts. It's on a quiet street with two schools and a Boys and Girls Club nearby. But this perfect family home has an unusual owner—or *owners*.

The property, which these days is known as the [Soapstone](#), is “owned,” in a roundabout way, by 102 investors who have collectively purchased just over \$100,000 in shares through a company called Arrived Homes. The property is managed and rented out for \$1,600 a month, a bit below the city’s average rent of \$1,795. Investors, who can buy in for as little as \$100, get a cut of the profits.

And it’s not just the Soapstone. Arrived, alongside a handful of other so-called fractional investment startups, are adding yet more noise to an already-crowded real estate market. Investors can buy into hundreds of similar properties on the company’s website, where each listing has an Airbnb-style profile that breaks down the neighborhood, costs, number of bedrooms and bathrooms—and return on investment.

In addition to Arrived, there's Lofty AI, which uses a token model for people to buy in and lets them collect rent later that same day. Another company, reAlpha, sells shares in homes that serve as Airbnbs—including a treehouse resort in the works. Landa lets people invest in shares valued as low as \$5 in houses around Atlanta or \$20 in Brooklyn apartment buildings. Daniella Lang, a product marketer at the firm, says investors “see this as an American dream opportunity” that lets them build wealth in real estate. Anyone can click a button to invest—but that doesn’t really make them homeowners.

Fractional investment startups claim that they lower the barrier to investing in property—and make it as easy as booking an Airbnb. At Arrived, 40 percent of investors are renters themselves, according to Ryan Frazier, the company’s CEO. The idea is that people locked out from the housing market can profit without taking on mortgage debt. But they also add small investors to the real estate feeding frenzy at a time when housing shortages continue to push up prices, leaving many Americans [stuck](#) in expensive rental properties.

“Maybe some people will benefit from it, maybe they will make money,” says Amee Chew, a senior research analyst at the Center for Popular Democracy, a progressive advocacy group. But, Chew adds, more real estate investments may come “at the cost of housing stability” and risk worsening a system where [for-profit investors](#) can “[wreak havoc](#) on low-income residents.”

Right now, fractional investing startups represent a tiny niche in the real estate market, but the idea is “growing faster than it’s ever grown,” says Casey Berman, managing partner at venture capital firm Camber Creek, which has invested in Fundrise, another real estate investing company that allows people to buy in for as little as \$10.

The concept first appeared a decade ago with a Fundrise. The firm made it easier for people to invest in real estate portfolios with less money, says founder and CEO Ben Miller. Today, Fundrise has more than 387,000 active investors and a real estate portfolio worth \$7 billion that includes apartments, industrial properties, and single-family rentals. Newer fractional startups play off that small investing concept, but let investors

pick specific, individual properties that are more often single-family homes. And that's a hit, too: Arrived has listed new homes on its website and watched their shares [sell out](#) in less than a day.

As more players join the real estate investment frenzy, technology is playing an increasingly important role. Big investors thrive on tech that sources the best properties and streamlines investing, making it harder for human buyers to compete. Algorithms search for the best properties for investors to buy—although recent rapid changes in the real estate market left even companies like [Zillow](#) and [Opendoor](#) struggling. There's also tech to help automate rent collection and lease signing, putting distance between landlords from tenants. Sites like Airbnb and Vrbo carve things up further, and help real estate investors profit from lucrative short-term rentals.

But tech advances across the real estate industry are harming renters, too. The explosion of short-term rentals has [priced out](#) local residents in some cities. Automated background checks have become common, though they often [reject](#) prospective tenants based on incorrect reports. Landlords can automate eviction filings, creating higher turnover and maximizing profits.

The fractional model plays into concerns about larger investments in real estate that show “housing really is being used for profit and an investment tool” first, says Katie Goldstein, the director of housing and healthcare campaigns at the Center for Popular Democracy. That’s because, like institutional investors, they’re backed by venture capital, utilize tech to scoop up properties, and keep a distance between renters and landlords through management companies.

Several have drawn dollars from big capital. In 2021, Goldman Sachs gave [\\$300 million](#) in credit for Fundrise to build new homes that would become rentals. In 2022, venture firm Forerunner Ventures led a [\\$25 million](#) Series A investment in Arrived. Other investors in the company include Amazon founder Jeff Bezos and Uber CEO Dara Khosrowshahi. Landa has raised more than \$90 million in equity and debt in three funding rounds led by venture firms 83North, NFX, and Viola Ventures, according to [Crunchbase](#).

But rather than exacerbating existing problems in the real estate market, these companies argue that they are opening up investing to more people. Frazier says Arrived gives regular people access to home equity sooner in life by lowering barriers. But the hunger for the model reflects a shift in priorities, Frazier says, as younger people are “looking for more flexibility” and want to be “less tied down by debt [and] less tied down by assets.”

Harsh economic conditions have demanded younger people adjust. The average age of first-time home buyers in the US has risen to 36, according to the National Association of Realtors. People are marrying later, are more likely to have student loan payments, and have more stagnant wages. All the while, property prices are rising. In Phoenix, Arizona, the median home price in 2004 was [\\$174,815](#). In 2023, it’s [\\$450,000](#). Average [salaries](#) from 2004 to 2021 increased 70 percent, lagging behind explosive housing prices.

That’s part of what drew Emanette Peniche to the Soapstone. Peniche, who lives and rents her home in Los Angeles—1,500 miles from the little brick house in Fayetteville—says she regrets not investing more when she first started, and now has a handful of properties in her Arrived portfolio. “I was just immediately captured by the accessibility to investing in real estate,” says Peniche, a 33-year-old who works in product marketing at Meta. She was so drawn to the model, in fact, that she gave marketing expertise as an unpaid advisor to Arrived in 2021.

The Soapstone is similar to other investment properties advertised by Arrived, like the [Sheezy](#) in Chattanooga, Tennessee, or the [Mimosa](#) in Tuscaloosa, Alabama. The first homes to be advertised on the platform likely won’t be sold for two to three years, giving them time to appreciate, says Frazier, Arrived’s CEO. Then investors can cash out.

The average investor spends around \$3,500 on five or six properties, Frazier says. But investments can top \$25,000 and include accredited investors, says Bret Neuman, head of brand and content at Arrived. Still, most people invest less than \$1,000. And, according to Arrived, it [delivered](#) \$1.2 million in dividends for investors in 2022. Its portfolio of properties appreciated a total of \$1.4 million over the same year, the company says.

Other fractional ownership startups take different approaches to the same idea. reAlpha, the vacation-rental company, sells shares in investment properties to be used as Airbnbs. The company says it uses AI to analyze properties and predict their viability as vacation rentals. Then it buys, renovates, and manages the properties. Y Combinator-backed Lofty AI lets people buy tokens for \$50 in homes. People can then use their tokens to vote on management decisions about their properties, like how repairs should be done and whether a tenant should be evicted.

Landa is selling shares in at least a dozen townhouses in Douglasville, Georgia, a city just west of Atlanta, and more homes in Atlanta and its other suburbs. It's a region that has seen an influx of investors, thanks in part to controversial legislation that favors landlords—including a law that bans rent control. But major investor activity in Atlanta dwarfs this space of listings—[four](#) big real estate investors in the area own an estimated 27,000 properties.

The affinity for Sunbelt and Mountain states that stretch across the southern US should come as no surprise—fractional investment startups are simply following trends set by other real estate investors. That's largely been the case since the Great Recession, which began in 2007, reshaped the real estate market in the US. Large investors, backed by venture capital and bolstered by new proptech, swooped in and bought not just apartment buildings, but single-family homes in historically more affordable suburbs, like those around Atlanta, Charlotte, North Carolina, and Phoenix.

The move may have helped some areas recover financially more quickly, according to [research](#) from the US Federal Reserve. But it brought big investors to the single-family home market for the first time. Their presence has [nudged home prices up](#), and they're also more likely to [buy in neighborhoods](#) where Black people live, as opposed to predominantly white areas. And in the rush to profit, foreign investors have [become more common](#) in single-family homes in the US, too.

But big and fractional investors aren't the only competitors for home buyers. The real giants of American real estate? Your mom and dad. Smaller investors, or mom-and-pop landlords, own 70 percent of rental properties in the US and the majority of all rental properties with four units

or fewer, according to the latest [US Census](#) data. Institutional investors own a small share of single-family homes, but their presence is [growing](#).

And if the fractional trend continues, it could shake up the market, particularly affecting the dominance of mom-and-pop landlords. “The barriers to entry [in real estate investing] have really come down,” says Jay Parsons, chief economist at RealPage, a property management software company. “There are a lot of different players in the single-family rental market.”

Those players now include people like Peniche. She doesn’t hold the deed to the Soapstone or field complaints from its tenants, but her investment is making money. Even if she could afford to buy the whole property, she might not want to do so. Peniche says high mortgage rates and rising home prices have made her rethink whether she wants to own her own home at all. And she’s happy with the returns she’s seeing from her more passive investments. “I’m not sure [home ownership] is a goal of mine anymore—at least for the foreseeable future.”

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[Charles Platt](#)

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Mar 30, 2023 6:00 AM

The Unbelievable Zombie Comeback of Analog Computing

Computers have been digital for half a century. Why would anyone want to resurrect the clunkers of yesteryear?

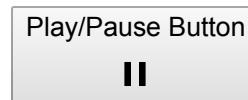


Illustration: Khyati Trehan

When old tech dies, it usually stays dead. No one expects rotary phones or adding machines to come crawling back from oblivion. Floppy diskettes, VHS tapes, cathode-ray tubes—they shall rest in peace. Likewise, we won't see old analog computers in data centers anytime soon. They were monstrous beasts: difficult to program, expensive to maintain, and limited in accuracy.

Or so I thought. Then I came across this confounding statement:

Bringing back analog computers in much more advanced forms than their historic ancestors will change the world of computing drastically and forever.

Seriously?

I found the prediction in the preface of a handsome illustrated book titled, simply, *Analog Computing*. Reissued in 2022, it was written by the German mathematician Bernd Ullmann—who seemed very serious indeed.

This article appears in the May 2023 issue. [Subscribe to WIRED](#). Illustration: Alvaro Dominguez

I've been writing about future tech since before WIRED existed and have written six books explaining electronics. I used to develop my own software, and some of my friends design hardware. I'd never heard anyone say anything about [analog](#), so why would Ulmann imagine that this very dead paradigm could be resurrected? And with such far-reaching and permanent consequences?

I felt compelled to investigate further.

For an example of how digital has displaced analog, look at photography. In a pre-digital camera, continuous variations in light created chemical reactions on a piece of film, where an image appeared as a representation—an *analogue*—of reality. In a modern camera, by contrast, the light variations are converted to digital values. These are processed by the camera's CPU before being saved as a stream of 1s and 0s—with digital compression, if you wish.

Engineers began using the word *analog* in the [1940s](#) (shortened from *analogue*; they like compression) to refer to computers that simulated real-world conditions. But mechanical devices had been doing much the same thing for centuries.

The Antikythera mechanism was an astonishingly complex piece of machinery used thousands of years ago in ancient Greece. Containing at least 30 bronze gears, it displayed the everyday movements of the moon, sun, and five planets while also predicting solar and lunar eclipses. Because its mechanical workings simulated real-world celestial events, it is regarded as one of the earliest analog computers.

As the centuries passed, mechanical analog devices were fabricated for earthlier purposes. In the 1800s, an invention called the planimeter consisted of a little wheel, a shaft, and a linkage. You traced a pointer around the edge of a shape on a piece of paper, and the area of the shape was displayed on a scale. The tool became an indispensable item in real-

estate offices when buyers wanted to know the acreage of an irregularly shaped piece of land.

Other gadgets served military needs. If you were on a battleship trying to aim a 16-inch gun at a target beyond the horizon, you needed to assess the orientation of your ship, its motion, its position, and the direction and speed of the wind; clever mechanical components allowed the operator to input these factors and adjust the gun appropriately. Gears, linkages, pulleys, and levers could also predict tides or calculate distances on a map.

In the 1940s, electronic components such as vacuum tubes and resistors were added, because a fluctuating current flowing through them could be analogous to the behavior of fluids, gases, and other phenomena in the physical world. A varying voltage could represent the velocity of a Nazi V2 missile fired at London, for example, or the orientation of a Gemini space capsule in a 1963 flight simulator.

But by then, analog had become a dying art. Instead of using a voltage to represent the velocity of a missile and electrical resistance to represent the air resistance slowing it down, a digital computer could convert variables to binary code—streams of 1s and 0s that were suitable for processing. Early digital computers were massive mainframes full of vacuum tubes, but then integrated circuit chips made digital processing cheaper, more reliable, and more versatile. By the 1970s, the analog-digital difference could be summarized like this:

The last factor was a big deal, as the accuracy of analog computers was always limited by their components. Whether you used gear wheels or vacuum tubes or chemical film, precision was limited by manufacturing tolerances and deteriorated with age. Analog was always modeled on the real world, and the world was never absolutely precise.

When I was a nerdy British schoolboy with a mild case of OCD, inaccuracy bothered me a lot. I revered Pythagoras, who told me that a triangle with sides of 3 centimeters and 4 centimeters adjacent to a 90-degree angle would have a diagonal side of 5 centimeters, *precisely*. Alas, my pleasure diminished when I realized that his proof only applied in a theoretical realm where lines were of zero thickness.

In my everyday realm, precision was limited by my ability to sharpen a pencil, and when I tried to make measurements, I ran into another bothersome feature of reality. Using a magnifying glass, I compared the ruler that I'd bought at a stationery store with a ruler in our school's physics lab, and discovered that they were *not exactly the same length*.

How could this be? Seeking enlightenment, I checked the history of the metric system. The meter was the fundamental unit, but it had been birthed from a bizarre combination of nationalism and whimsy. After the French Revolution, the new government instituted the meter to get away from the imprecision of the ancien régime. The French Academy of Sciences defined it as the longitudinal distance from the equator, through Paris, to the North Pole, divided by 10 million. In 1799, the meter was solemnified like a religious totem in the form of a platinum bar at the French National Archives. Copies were made and distributed across Europe and to the Americas, and then copies were made of the copies' copies. This process introduced transcription errors, which eventually led to my traumatic discovery that rulers from different sources might be visibly unequal.

Similar problems impeded any definitive measurement of time, temperature, and mass. The conclusion was inescapable to my adolescent mind: If you were hoping for absolute precision in the physical realm, you couldn't have it.

My personal term for the inexact nature of the messy, fuzzy world was *muzzy*. But then, in 1980, I acquired an Ohio Scientific desktop computer and found prompt, lasting relief. All its operations were built on a foundation of binary arithmetic, in which a 1 was always exactly a 1 and a 0 was a genuine 0, with no fractional quibbling. The 1 of existence, and the 0 of nothingness! I fell in love with the purity of digital and learned to write code, which became a lifelong refuge from muzzy math.

Of course, digital values still had to be stored in fallible physical components, but margins of error took care of that. In a modern 5-volt digital chip, 1.5 volts or lower would represent the number 0 while 3.5 volts or greater would represent the number 1. Components on a decently engineered motherboard would stay within those limits, so there shouldn't have been any misunderstandings.

Consequently, when Bernd Ullmann predicted that analog computers were due for a zombie comeback, I wasn't just skeptical. I found the idea a bit ... disturbing.

Hoping for a reality check, I consulted Lyle Bickley, a founding member of the Computer History Museum in Mountain View, California. Having served for years as an expert witness in patent suits, Bickley maintains an encyclopedic knowledge of everything that has been done and is still being done in data processing.

"A lot of Silicon Valley companies have secret projects doing analog chips," he told me.

Really? But why?

"Because they take so little power."

Bickley explained that when, say, brute-force natural-language AI systems distill millions of words from the internet, the process is insanely power hungry. The human brain runs on a small amount of electricity, he said, about 20 watts. (That's the same as a light bulb.) "Yet if we try to do the same thing with digital computers, it takes megawatts." For that kind of application, digital is "not going to work. It's not a smart way to do it."

Bickley said he would be violating confidentiality to tell me specifics, so I went looking for startups. Quickly I found a San Francisco Bay Area company called Mythic, which claimed to be marketing the "industry-first AI analog matrix processor."

Mike Henry cofounded Mythic at the University of Michigan in 2013. He's an energetic guy with a neat haircut and a well-ironed shirt, like an old-time IBM salesman. He expanded on Bickley's point, citing the brain-like neural network that powers GPT-3. "It has 175 billion synapses," Henry said, comparing processing elements with connections between neurons in the brain. "So every time you run that model to do one thing, you have to load 175 billion values. Very large data-center systems can barely keep up."

That's because, Henry said, they are digital. Modern AI systems use a type of memory called static RAM, or SRAM, which requires constant power to store data. Its circuitry must remain switched on even when it's not performing a task. Engineers have done a lot to improve the efficiency of SRAM, but there's a limit. "Tricks like lowering the supply voltage are running out," Henry said.

Mythic's analog chip uses less power by storing neural weights not in SRAM but in flash memory, which doesn't consume power to retain its state. And the flash memory is embedded in a processing chip, a configuration Mythic calls "compute-in-memory." Instead of consuming a lot of power moving millions of bytes back and forth between memory and a CPU (as a digital computer does), some processing is done locally.

What bothered me was that Mythic seemed to be reintroducing the accuracy problems of analog. The flash memory was not storing a 1 or 0 with comfortable margins of error, like old-school logic chips. It was holding intermediate voltages (as many as 256 of them!) to simulate the varying states of neurons in the brain, and I had to wonder whether those voltages would drift over time. Henry didn't seem to think they would.

I had another problem with his chip: The way it worked was hard to explain. Henry laughed. "Welcome to my life," he said. "Try explaining it to venture capitalists." Mythic's success on that front has been variable: Shortly after I spoke to Henry, the company ran out of cash. (More recently it raised \$13 million in new funding and appointed a new CEO.)

I next went to IBM. Its corporate PR department connected me with Vijay Narayanan, a researcher in the company's physics-of-AI department. He preferred to interact via company-sanctioned email statements.

For the moment, Narayanan wrote, "our analog research is about customizing AI hardware, particularly for energy efficiency." So, the same goal as Mythic. However, Narayanan seemed rather circumspect on the details, so I did some more reading and found an IBM paper that referred to "no appreciable accuracy loss" in its memory systems. No *appreciable* loss? Did that mean there was *some* loss? Then there was the durability issue. Another paper mentioned "an accuracy above 93.5 percent retained

over a one-day period.” So it had lost 6.5 percent in just one day? Was that bad? What should it be compared to?

So many unanswered questions, but the biggest letdown was this: Both Mythic and IBM seemed interested in analog computing only insofar as specific analog processes could reduce the energy and storage requirements of AI—not perform the fundamental bit-based calculations. (The digital components would still do that.) As far as I could tell, this wasn’t anything close to the second coming of analog as predicted by Ulmann. The computers of yesteryear may have been room-sized behemoths, but they could simulate everything from liquid flowing through a pipe to nuclear reactions. Their applications shared one attribute. They were dynamic. They involved the concept of change.

Engineers began using the word *analog* in the 1940s to refer to computers that simulated real-world conditions.

Illustration: Khyati Trehan

Another childhood conundrum: If I held a ball and dropped it, the force of gravity made it move at an increasing speed. How could you figure out the total distance the ball traveled if the speed was changing continuously over time? You could break its journey down into seconds or milliseconds or microseconds, work out the speed at each step, and add up the distances. But if time actually flowed in tiny steps, the speed would have to jump instantaneously between one step and the next. How could that be true?

Later I learned that these questions had been addressed by Isaac Newton and Gottfried Leibniz centuries ago. They’d said that velocity does change in increments, but the increments are infinitely small.

So there were steps, but they weren’t really steps? It sounded like an evasion to me, but on this iffy premise, Newton and Leibniz developed calculus, enabling everyone to calculate the behavior of countless naturally changing aspects of the world. Calculus is a way of mathematically modeling something that’s continuously changing, like the distance traversed by a falling ball, as a sequence of infinitely small differences: a differential equation.

That math could be used as the input to old-school analog electronic computers—often called, for this reason, differential analyzers. You could plug components together to represent operations in an equation, set some values using potentiometers, and the answer could be shown almost immediately as a trace on an oscilloscope screen. It might not have been ideally accurate, but in the muzzy world, as I had learned to my discontent, nothing was ideally accurate.

To be competitive, a true analog computer that could emulate such versatile behavior would have to be suitable for low-cost mass production—on the scale of a silicon chip. Had such a thing been developed? I went back to Ulmann’s book and found the answer on the penultimate page. A researcher named Glenn Cowan had created a genuine VLSI (very large-scale integrated circuit) analog chip back in 2003. Ulmann complained that it was “limited in capabilities,” but it sounded like the real deal.

Glenn Cowan is a studious, methodical, amiable man and a professor in electrical engineering at Montreal’s Concordia University. As a grad student at Columbia back in 1999, he had a choice between two research topics: One would entail optimizing a single transistor, while the other would be to develop an entirely new analog computer. The latter was the pet project of an adviser named Yannis Tsividis. “Yannis sort of convinced me,” Cowan told me, sounding as if he wasn’t quite sure how it happened.

Initially, there were no specifications, because no one had ever built an analog computer on a chip. Cowan didn’t know how accurate it could be and was basically making it up as he went along. He had to take other courses at Columbia to fill the gaps in his knowledge. Two years later, he had a test chip that, he told me modestly, was “full of graduate-student naivete. It looked like a breadboarding nightmare.” Still, it worked, so he decided to stick around and make a better version. That took another two years.

A key innovation of Cowan’s was making the chip reconfigurable—or programmable. Old-school analog computers had used clunky patch cords on plug boards. Cowan did the same thing in miniature, between areas on the chip itself, using a preexisting technology known as transmission gates. These can work as solid-state switches to connect the output from

processing block A to the input of block B, or block C, or any other block you choose.

His second innovation was to make his analog chip compatible with an off-the-shelf digital computer, which could help to circumvent limits on precision. “You could get an approximate analog solution as a starting point,” Cowan explained, “and feed that into the digital computer as a guess, because iterative routines converge faster from a good guess.” The end result of his great labor was etched onto a silicon wafer measuring a very respectable 10 millimeters by 10 millimeters. “Remarkably,” he told me, “it did work.”

When I asked Cowan about real-world uses, inevitably he mentioned AI. But I’d had some time to think about neural nets and was beginning to feel skeptical. In a standard neural net setup, known as a crossbar configuration, each cell in the net connects with four other cells. They may be layered to allow for extra connections, but even so, they’re far less complex than the frontal cortex of the brain, in which each individual neuron can be connected with 10,000 others. Moreover, the brain is not a static network. During the first year of life, new neural connections form at a rate of 1 million per second. I saw no way for a neural network to emulate processes like that.

Glenn Cowan’s second analog chip wasn’t the end of the story at Columbia. Additional refinements were necessary, but Yannis Tsividis had to wait for another graduate student who would continue the work.

In 2011 a soft-spoken young man named Ning Guo turned out to be willing. Like Cowan, he had never designed a chip before. “I found it, um, pretty challenging,” he told me. He laughed at the memory and shook his head. “We were too optimistic,” he recalled ruefully. He laughed again. “Like we thought we could get it done by the summer.”

In fact, it took more than a year to complete the chip design. Guo said Tsividis had required a “90 percent confidence level” that the chip would work before he would proceed with the expensive process of fabrication. Guo took a chance, and the result he named the HCDC, meaning hybrid continuous discrete computer. Guo’s prototype was then incorporated on a

board that could interface with an off-the-shelf digital computer. From the outside, it looked like an accessory circuit board for a PC.

When I asked Guo about possible applications, he had to think for a bit. Instead of mentioning AI, he suggested tasks such as simulating a lot of moving mechanical joints that would be rigidly connected to each other in robotics. Then, unlike many engineers, he allowed himself to speculate.

There are diminishing returns on the digital model, he said, yet it still dominates the industry. “If we applied as many people and as much money to the analog domain, I think we could have some kind of analog coprocessing happening to accelerate the existing algorithms. Digital computers are very good at scalability. Analog is very good at complex interactions between variables. In the future, we may combine these advantages.”

The HCDC was fully functional, but it had a problem: It was not easy to use. Fortunately, a talented programmer at MIT named Sara Achour read about the project and saw it as an ideal target for her skills. She was a specialist in compilers—programs that convert a high-level programming language into machine language—and could add a more user-friendly front end in Python to help people program the chip. She reached out to Tsividis, and he sent her one of the few precious boards that had been fabricated.

When I spoke with Achour, she was entertaining and engaging, delivering terminology at a manic pace. She told me she had originally intended to be a doctor but switched to computer science after having pursued programming as a hobby since middle school. “I had specialized in math modeling of biological systems,” she said. “We did macroscopic modeling of gene protein hormonal dynamics.” Seeing my blank look, she added: “We were trying to predict things like hormonal changes when you inject someone with a particular drug.”

Changes was the key word. She was fully acquainted with the math to describe change, and after two years she finished her compiler for the analog chip. “I didn’t build, like, an entry-level product,” she said. “But I made it easier to find resilient implementations of the computation you

want to run. You see, even the people who design this type of hardware have difficulty programming it. It's still extremely painful."

I liked the idea of a former medical student alleviating the pain of chip designers who had difficulty using their own hardware. But what was her take on applications? Are there any?

"Yes, whenever you're sensing the environment," she said. "And reconfigurability lets you reuse the same piece of hardware for multiple computations. So I don't think this is going to be relegated to a niche model. Analog computation makes a lot of sense when you're interfacing with something that is inherently analog." Like the real world, with all its fuzziness.

Going back to the concept of dropping a ball, and my interest in finding out how far it travels during a period of time: Calculus solves that problem easily, with a differential equation—if you ignore air resistance. The proper term for this is "integrating velocity with respect to time."

But what if you don't ignore air resistance? The faster the ball falls, the more air resistance it encounters. But gravity remains constant, so the ball's speed doesn't increase at a steady rate but tails off until it reaches terminal velocity. You can express this in a differential equation too, but it adds another layer of complexity. I won't get into the mathematical notation (I prefer to avoid the *pain* of it, to use Sara Achour's memorable term), because the take-home message is all that matters. Every time you introduce another factor, the scenario gets more complicated. If there's a crosswind, or the ball collides with other balls, or it falls down a hole to the center of the Earth, where gravity is zero—the situation can get discouragingly complicated.

Now suppose you want to simulate the scenario using a digital computer. It'll need a lot of data points to generate a smooth curve, and it'll have to continually recalculate all the values for each point. Those calculations will add up, especially if multiple objects become involved. If you have billions of objects—as in a nuclear chain reaction, or synapse states in an AI engine—you'll need a digital processor containing maybe 100 billion transistors to crunch the data at billions of cycles per second. And in each cycle, the

switching operation of each transistor will generate heat. Waste heat becomes a serious issue.

Using a new-age analog chip, you just express all the factors in a differential equation and type it into Achour's compiler, which converts the equation into machine language that the chip understands. The brute force of binary code is minimized, and so is the power consumption and the heat. The HCDC is like an efficient little helper residing secretly amid the modern hardware, and it's chip-sized, unlike the room-sized behemoths of yesteryear.

Now I should update the basic analog attributes:

You can see how the designs by Tsividis and his grad students have addressed the historic disadvantages in my previous list. And yet, despite all this, Tsividis—the prophet of modern analog computing—still has difficulty getting people to take him seriously.

Born in Greece in 1946, Tsividis developed an early dislike for geography, history, and chemistry. “I felt as if there were more facts to memorize than I had synapses in my brain,” he told me. He loved math and physics but ran into a different problem when a teacher assured him that the perimeter of any circle was three times the diameter plus 14 centimeters. Of course, it should be (approximately) 3.14 times the diameter of the circle, but when Tsividis said so, the teacher told him to be quiet. This, he has said, “suggested rather strongly that authority figures are not always right.”

He taught himself English, started learning electronics, designed and built devices like radio transmitters, and eventually fled from the Greek college system that had compelled him to learn organic chemistry. In 1972 he began graduate studies in the United States, and over the years became known for challenging orthodoxy in the field of computer science. One well-known circuit designer referred to him as “the analog MOS freak,” after he designed and fabricated an amplifier chip in 1975 using metal-oxide semiconductor technology, which absolutely no one believed was suitable for the task.

These days, Tsividis is polite and down to earth, with no interest in wasting words. His attempt to bring back analog in the form of integrated chips began in earnest in the late '90s. When I talked to him, he told me he had 18 boards with analog chips mounted on them, a couple more having been loaned out to researchers such as Achour. "But the project is on hold now," he said, "because the funding ended from the National Science Foundation. And then we had two years of Covid."

I asked what he would do if he got new funding.

"I would need to know, if you put together many chips to model a large system, then what happens? So we will try to put together many of those chips and eventually, with the help of silicon foundries, make a large computer on a single chip."

I pointed out that development so far has already taken almost 20 years.

"Yes, but there were several years of breaks in between. Whenever there is appropriate funding, I revive the process."

I asked him whether the state of analog computing today could be compared to that of quantum computing 25 years ago. Could it follow a similar path of development, from fringe consideration to common (and well-funded) acceptance?

It would take a fraction of the time, he said. "We have our experimental results. It has proven itself. If there is a group that wants to make it user-friendly, within a year we could have it." And at this point he is willing to provide analog computer boards to interested researchers, who can use them with Achour's compiler.

What sort of people would qualify?

"The background you need is not just computers. You really need the math background to know what differential equations are."

I asked him whether he felt that his idea was, in a way, obvious. Why hadn't it resonated yet with more people?

“People do wonder why we are doing this when everything is digital. They say digital is the future, digital is the future—and of course it’s the future. But the physical world is analog, and in between you have a big interface. That’s where this fits.”

In a digital processor crunching data at billions of cycles per second, the switching operation of each transistor generates heat.

Illustration: Khyati Trehan

When Tsividis mentioned offhandedly that people applying analog computation would need an appropriate math background, I started to wonder. Developing algorithms for digital computers can be a strenuous mental exercise, but calculus is seldom required. When I mentioned this to Achour, she laughed and said that when she submits papers to reviewers, “Some of them say they haven’t seen differential equations in years. Some of them have never seen differential equations.”

And no doubt a lot of them won’t want to. But financial incentives have a way of overcoming resistance to change. Imagine a future where software engineers can command an extra \$100K per annum by adding a new bullet point to a résumé: “Fluent in differential equations.” If that happens, I’m thinking Python developers will soon be signing up for remedial online calculus classes.

Likewise, in business, the determining factor will be financial. There’s going to be a lot of money in AI—and in smarter drug molecules, and in agile robots, and in a dozen other applications that model the muzzy complexity of the physical world. If power consumption and heat dissipation become really expensive problems, and shunting some of the digital load into miniaturized analog coprocessors is significantly cheaper, then no one will care that analog computation used to be done by your math-genius grandfather using a big steel box full of vacuum tubes.

Reality really is imprecise, no matter how much I would prefer otherwise, and when you want to model it with truly exquisite fidelity, digitizing it may not be the most sensible method. Therefore, I must conclude:

Analog is dead.

Long live analog.

This article appears in the May issue. [Subscribe now.](#)

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Mar 28, 2023 11:00 AM

North Korea Is Now Mining Crypto to Launder Its Stolen Loot

A spy group working for the Kim regime has been feeding stolen coins into crypto mining services in an effort to throw tracers off their trail.

Photograph: Mark Torkington/Getty Images

In the cryptocurrency ecosystem, coins have a story, tracked in the unchangeable blockchains underpinning their economy. The only exception, in some sense, is cryptocurrency that's been freshly generated by its owner's computational power. So it figures that North Korean hackers have begun adopting a new trick to launder the coins they steal from victims around the world: pay their dirty, stolen coins into services that allow them to mine innocent new ones.

Today, cybersecurity firm Mandiant published a report on a prolific North Korean state-sponsored hacking group it's now calling APT43, sometimes known by the names Kimsuky and Thallium. The group, whose activities suggest its members work in the service of North Korea's Reconnaissance General Bureau spy agency, has been primarily focused on espionage, hacking think tanks, academics, and private industry from the US to Europe, South Korea, and Japan since at least 2018, mostly with phishing campaigns designed to harvest credentials from victims and plant malware on their machines.

Like many North Korean hacker groups, APT43 also maintains a sideline in profit-focused cybercrime, according to Mandiant, stealing any cryptocurrency that can enrich the North Korean regime or even just fund

the hackers' own operations. And as regulators worldwide have tightened their grip on exchanges and laundering services that thieves and hackers use to cash out criminally tainted coins, APT43 appears to be trying out a new method to cash out the funds it steals while preventing them from being seized or frozen: It pays that stolen cryptocurrency into "hashing services" that allow anyone to rent time on computers used to mine cryptocurrency, harvesting newly mined coins that have no apparent ties to criminal activity.

That mining trick allows APT43 to take advantage of the fact that cryptocurrency is relatively easy to steal while avoiding the forensic trail of evidence that it leaves on blockchains, which can make it difficult for thieves to cash out. "It breaks the chain," says Joe Dobson, a Mandiant threat intelligence analyst. "This is like a bank robber stealing silver from a bank vault and then going to a gold miner and paying the miner in stolen silver. Everyone's looking for the silver while the bank robber's walking around with fresh, newly mined gold."

Mandiant says it first began seeing signs of APT43's mining-based laundry technique in August of 2022. It's since seen tens of thousands of dollars worth of crypto flow into hashing services—services like NiceHash and Hashing24, which allow anyone to buy and sell computing power to calculate the mathematical strings known as "hashes" that are necessary to mine most cryptocurrencies—from what it believes are APT43 crypto wallets. Mandiant says it has also seen similar amounts flow to APT43 wallets from mining "pools," services that allow miners to contribute their hashing resources to a group that pays out a share of any cryptocurrency the group collectively mines. (Mandiant declined to name either the hashing services or the mining pools that APT43 participated in.)

In theory, the payouts from those pools should be clean, with no ties to APT43's hackers—that seems, after all, to be the point of the group's laundering exercise. But in some cases of operational sloppiness, Mandiant says it found that the funds were nonetheless commingled with crypto in wallets it had previously identified from its years-long tracking of APT43 hacking campaigns.

The five-figure sums Mandiant saw laundered through this mining process, the company's analysts concede, are nowhere near the size of the massive

crypto heists North Korean hackers have pulled off in recent years, stealing hundreds of millions of dollars in cases like the breaches of the [Harmony Bridge](#) or [Ronin Bridge](#) services. That may be because only a small fraction of North Korea's mining-based laundering has been detected.

But it may also be because APT43 isn't primarily tasked with stealing cryptocurrency, says Mandiant analyst Michael Barnhart. Instead, the group appears to have been ordered to generate enough profits through cybercrime to fund its espionage work. As a result, it has sought to steal smaller sums of crypto from a broad number of victims, he says, with the goal of subsisting independently. "They're not going for a cash grab," says Barnhart. "They're trying just to make ends meet."

Cryptocurrency tracing firms, including Chainalysis and Elliptic, say they've seen criminal actors seek freshly mined cryptocurrency to fund their activities or dilute and obfuscate their profits. Elliptic says, for instance, that it's seen a group affiliated with the militant organization Hamas mine cryptocurrency as a means of what it describes as terrorist financing. But Arda Akartuna, a threat analyst at Elliptic, says paying dirty cryptocurrency into a hashing service to mine clean crypto is a particularly troubling phenomenon.

Akartuna points out that mining pools are not as regulated and scrutinized as other crypto players that are sometimes used for money laundering, such as cryptocurrency exchanges, "mixing" services designed to obfuscate the trail of users' coins, and NFT marketplaces. "But they probably should be," he says.

"It's quite concerning that a lot of mining pools don't actually screen who participates in them," says Akartuna. "So you could potentially have illicit actors that are contributing computing power to the mining pools, and those mining pools don't have the tools to identify them."

That suggests government authorities seeking money launderers and criminal financiers may have to shift some of their focus away from the intermediaries of the crypto economy toward the miners that serve as the original wellspring. Not all of that fresh digital cash is quite as innocent as it might seem.

Update 2 pm ET, March 28, 2023: Clarified the views of Eliptic's Arda Akartuna regarding APT23's crypto-laundering tactics.

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Mar 28, 2023 8:00 AM

Be Your Own Tab Manager

WIRED's spiritual advice columnist on the tendency to keep tabs open and the desire to reduce the infinite possibilities of the internet.

Illustration: Derek Abella

“I've read for years about why people keep so many tabs open on their [browsers](#)—digital distraction, FOMO, boredom—and I've tried to pare down my own overpopulated browsers, but nothing sticks. Why can't I become a closer?”

—Open Tab

Dear Open,

Before reading your question, I was actually not aware that there is a corpus of commentary about browser tab clutter. I have not perused the literature myself, though I imagine it's like any content niche—a blend of prescriptive common sense and insular self-reference.

[CLOUD SUPPORT](#)

Spiritual Troubleshooting for the Digital Age

For philosophical guidance on encounters with technology, open a [support ticket](#) via email; or [register](#) and post a comment below.

Beneath the broad digital highways of news, shopping, and social media, there exist endless grottoes of discourse, accessible via search queries,

where cloisters of experts have already discussed any question or problem that has ever occurred to you to the point of Talmudic exhaustion. Sorry for the convoluted metaphor—it's very difficult to visualize our experiences online.

In fact, a decade and a half ago, Kevin Kelly, a cofounder of this magazine, asked hundreds of people to draw a picture of the internet. It was an attempt to crowdsource the “unconscious layout” of the virtual world we spend so much of our lives navigating, to concretize the ephemeral flow of data in spatial terms. Most of the drawings were crude and idiosyncratic, and revealed, if anything, the impossibility of arriving at any shared vision of a realm that is basically empyrean. “The internet is intangible, like spirits and angels,” Kelly wrote. “The web is an immense ghost land of disembodied places. Who knows if you are even there, there.”

I could ask you, Open, by way of turning to your question, where precisely you are reading this column—which is to say, where these words exist in relation to the other content you have encountered or will encounter over the course of your day. If you are reading this in print, the answer is simple: The words exist in a magazine, an object that has precise and measurable spatial relationships to other physical things that are visible when you look up from the page. If you are reading this online, the question becomes more difficult to answer, though I imagine you have a sense—implicit and largely subliminal—that the article is located somewhere specific, one point on a map made up of all the other sites you have recently visited or hope to visit later. Most likely, that map resembles the tabs you have open on your browser.

Like most graphical widgets, tabs are metaphors whose referent has been largely forgotten. They grew out of the more expansive “desktop” trope that has dominated personal computing (which imagines incorporeal data organized into “files” and “folders”) and are modeled after the card tabs inserted into drawers of paper files. They are, in other words, “markers,” a term borrowed from cartography: objects used to indicate a position, place, or route.

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Just as maps are fictional interfaces designed to spatially orient the traveler, tabs are imaginary objects that allow users to navigate the contourless chaos of the dataplasm. It's worth noting that the earliest known maps, like those painted in the caves of Lascaux, were not of the earth but of the heavens—the original spiritual realm—and were, essentially, attempts to visualize individual data points (stars) constellated into familiar objects (bulls, antelopes, warriors). Incidentally, some of the oldest sky maps in the Library of Congress look remarkably like visual representations of the internet.

Although I haven't read the articles about tab overuse (and don't plan to), I assume they point out its irrationality—having too many open slows down your browser—and recommend organizational strategies, like tab managers, that allow you to more easily access information. But to my mind, tab accumulation has, like most compulsive habits, a subliminal purpose that eludes our crude attempts to rationalize it out of existence. Your open tabs are essentially your personalized map of the internet, a method of visualizing where you have been and where you hope to go next. Taken together, they form a perimeter that annexes a galaxy of idiosyncratic content within the seemingly infinite cosmos of information.

It's unclear from your question just how many tabs you have open on a given day. The information available on the maximum limits of popular browsers is mixed and possibly apocryphal—a rumored 500 in Safari for iPhone (though there are ways to hack this limit) and 9,000 tabs in Chrome. In any case, most browsers allow for practically limitless tab use, which can become problematic for users inclined to hoarding. It seems to me that once there are enough to warrant a tab manager (which allows you to group and search your open tabs the way Google helps you search the internet), the situation has grown perilously close to the absurd scenarios imagined by Borges or Lewis Carroll, who wrote of maps that are the same scale as the landscape they represent. Despite the farcical nature of those stories, they aptly dramatize the human tendency to confuse abstraction with the thing itself, which ultimately stems from a desire for control.

Maps and metaphors allow us to manipulate the world, but they are not the world itself. The person who insists on investing more and more detail into the map, like the user who tries to tile over the gaping void of the internet with endless tabs, is in danger of creating a hall of mirrors, cloistering themselves in a reflection of their own image and forgetting the living, breathing territory that lies beyond it.

What I'm trying to say, I suppose, is that the accumulation of tabs often stems from a desire to make the digital realm more static and familiar—and to reduce the infinite possibilities it holds. The internet, after all, is in a constant state of flux. The location of information is always changing, and our memory of what we have encountered is hazier all the time. It is, indeed, a land of spirits and ghosts.

But the same could be said about the world itself. When Heraclitus observed (apocryphally) that it's impossible to step into the same river twice, he was making a point about the illusory nature of abstractions. Just as the term "river" imposes a false conceptual stability on a process whose very nature is fluid, so a robust tab collection allows you to envision the infinite datastream as a series of fixed images that will always be there, precisely where you left them.

"Here be dragons," medieval cartographers wrote on the perimeters of their maps, to discourage explorers from venturing beyond the edges of the known world—though some intrepid souls clearly chose to disregard the warnings. The same choice confronts you each time your browser crashes, and you are asked whether you want to restore your previous session or start over from scratch. In truth, the choice is always available to you. At any moment you can elect, with a single click, to make all your open tabs vanish, erasing the map of your personal cosmos and venturing out, through a new window, into terra incognita.

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Mar 28, 2023 7:00 AM

Now That ChatGPT Is Plugged In, Things Could Get Weird

Letting the chatbot interact with the live internet will make it more useful—and more problematic, too.

Photograph: Daniel Sambraus/Getty Images

ChatGPT has dazzled with its [poetry](#), [prose](#), and [academic test scores](#). Now prepare for the precocious chatbot to find your next flight, recommend a restaurant with good seating, and fetch you a sandwich, too.

Last week, [OpenAI](#), the company behind ChatGPT, announced that a slew of companies including [Expedia](#), [OpenTable](#), and [Instacart](#) have created plugins to let the chatbot access their services. Once a user activates a plugin, they will be able to ask ChatGPT to perform tasks that would normally require using the web or opening an app, and hopefully see the dutiful bot scurry off to do it.

The move potentially heralds a big shift in how people use computers, apps, and the web, with clever AI programs completing chores on their behalf. Until now, ChatGPT has been cut off from the live internet, unable to look up recent information or interact with websites. Changing that may also help cement OpenAI's position at the center of what could rapidly become a new era for AI and personal computing.

“I think it’s a genius move,” says [Linxi “Jim” Fan](#), an AI scientist at Nvidia who works on autonomous agents. Fan says ChatGPT’s ability to read documentation and interpret code should make the process of integrating

new plugins remarkably smooth. He believes it may help OpenAI take on Apple and Google, which use their app stores to operate as gatekeepers. “The next generation of ChatGPT will be like a meta-app—an app that uses other apps,” Fan says.

But some are concerned by the prospect of ChatGPT—and OpenAI—gaining increasing dominance through its AI. If other businesses come to rely too heavily on OpenAI’s technology, the company could reap huge financial rewards and wield enormous influence over the technology industry. And if ChatGPT becomes a foundational layer of the tech industry, OpenAI will have an outsize responsibility for ensuring that a fast-moving technology is used carefully and responsibly.

“There’s some distress in the startup ecosystem among companies that were picking up pennies in front of the OpenAI steamroller,” says [Sarah Guo](#), cofounder of [Conviction VC](#), an investment group, in reference to businesses trying to make money by building technology similar to ChatGPT. Guo says that OpenAI’s latest maneuver “improves the staying power and strategic position” of the company’s consumer business.

OpenAI has captured the public’s imagination with ChatGPT, which is far more capable, coherent, and creative than previous chatbots, and it has also [lured dozens of startups into building on top of its AI](#). Microsoft, which has also invested \$10 billion in OpenAI, has [added ChatGPT to the search engine Bing](#), and is rushing to fold it into other products, including its Office suite.

ChatGPT is built on top of an algorithm called GPT that OpenAI began developing several years ago. GPT predicts the words that should follow a prompt based on a statistical analysis of trillions of lines of text harvested from web pages, books, and other sources. Although GPT is, at heart, little more than an autocomplete program, the latest version, called [GPT-4](#), is [capable of some remarkable features of question-answering](#), including scoring highly on many academic tests.

A number of open source projects such as [LangChain](#) and [LLamaIndex](#) are also exploring ways of building applications using the capabilities provided

by large language models. The launch of OpenAI's plugins threatens to torpedo these efforts, Guo says.

Plugins might also introduce risks that plague complex AI models. ChatGPT's own plugin red team members found they could "send fraudulent or spam emails, bypass safety restrictions, or misuse information sent to the plugin," according to Emily Bender, a linguistics professor at the University of Washington. "Letting automated systems take action in the world is a choice that we make," Bender adds.

Dan Hendrycks, director of the Center for AI Safety, a non-profit, believes plugins make language models more risky at a time when companies like Google, Microsoft, and OpenAI are [aggressively lobbying](#) to limit liability via the AI Act. He calls the release of ChatGPT plugins a bad precedent and suspects it could lead other makers of large language models to take a similar route.

And while there might be a limited selection of plugins today, competition could push OpenAI to expand its selection. Hendrycks sees a distinction between ChatGPT plugins and previous efforts by tech companies to grow developer ecosystems around conversational AI—such as Amazon's Alexa voice assistant.

GPT-4 can, for example, execute Linux commands, and the GPT-4 red-teaming process found that the model can explain how to make bioweapons, synthesize bombs, or buy ransomware on the dark web. Hendrycks suspects extensions inspired by ChatGPT plugins could make tasks like spear phishing or phishing emails a lot easier.

Going from text generation to taking actions on a person's behalf erodes an air gap that has so far prevented language models from taking actions. "We know that the models can be jailbroken and now we're hooking them up to the internet so that it can potentially take actions," says Hendrycks. "That isn't to say that by its own volition ChatGPT is going to build bombs or something, but it makes it a lot easier to do these sorts of things."

Part of the problem with plugins for language models is that they could make it easier to jailbreak such systems, says Ali Alkhatib, acting director

of the Center for Applied Data Ethics at the University of San Francisco. Since you interact with the AI using natural language, there are potentially millions of undiscovered vulnerabilities. Alkhatib believes plugins carry far-reaching implications at a time when companies like Microsoft and OpenAI are muddling public perception with recent claims of advances toward artificial general intelligence.

“Things are moving fast enough to be not just dangerous, but actually harmful to a lot of people,” he says, while voicing concern that companies excited to use new AI systems may rush plugins into sensitive contexts like counseling services.

Adding new capabilities to AI programs like ChatGPT could have unintended consequences, too, says Kanjun Qiu, CEO of [Generally Intelligent](#), an AI company working on AI-powered agents. A chatbot might, for instance, book an overly expensive flight or be used to distribute spam, and Qiu says we will have to work out who would be responsible for such misbehavior.

But Qiu also adds that the usefulness of AI programs connected to the internet means the technology is unstoppable. “Over the next few months and years, we can expect much of the internet to get connected to large language models,” Qiu says.

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‘You Must Believe You Can Repair It’

Six years ago, I moved my family into a 50-year-old RV—not just to see America, but to test my belief that anything worth fixing can be fixed.

Photograph: Briana Vargas

There's no temperature gauge. That broke several thousand desert miles ago. But you can smell trouble coming, whiffs of radiator fluid slipping in the draft at the front of the engine doghouse. That's when you know it's time to stop. This doesn't happen often. The 318 likes to run hot, but climbing mountains with a 12,000-pound RV on your back will eventually make any small-block engine overheat.

I start looking for a place to pull over. There's nothing. The left side of the road is a sheer cut of rock, quartzite, phyllite, and limestone laid bare by dynamite. To the east, as far as I can see, the barren rocky foothills of the White Mountains bubble and scrape their way toward a desert valley floor, dust-swept and brown. Dotted here and there are clumps of creosote and sagebrush, interrupted occasionally by splashes of yellow rabbitbrush. It's a stark but beautiful landscape. Without a pullout. But it doesn't matter, we haven't seen another car in at least an hour of driving. We are on Highway 168 somewhere in Eastern California, between the [Nevada](#) ghost town where we camped last night and the top of the White Mountains.

So I stop right in the middle of the road.

The author behind the wheel of his 1969 Dodge Travco.

Photograph: Briana Vargas

When the engine shuts off a quiet descends. No wind. No birds. No talking. We—my wife, three children, and me—just listen to the faint hissing of steam escaping the radiator cap, and then a gentle gurgle of coolant in the engine. It's October, but I'm glad I had the presence of mind to stop in the shade; the desert sun casts a harsh light on the road. After a minute my wife turns to the kids and says, "You want to walk around and see if we can find some fossils?"

As a child of the '70s, I've spent a fair amount of time on the side of the road next to broken-down vehicles. This is what vehicles of those days did. The 1967 Volkswagen fastback, which managed to get us home safely from the hospital after I was born, was replaced by a 1976 mustard-yellow VW Dasher that routinely overheated near Yuma, Arizona, on its way from my childhood home in Los Angeles to my grandparents' house in Tucson. To this day my father curses that car. There was also a 1969 Ford F-150 pickup that was reliable until you stuck a camper on its back and tried to climb over the Sierra Nevada. It used to be more of a necessity to know how to fix a car. These days it is often, if not a luxury, a labor of love.

This article appears in the May 2023 issue. [Subscribe to WIRED](#). Illustration: Alvaro Dominguez

My father handed that F-150 down to me. I wanted to work on it, but the truth is I was intimidated. What if I broke something irreparable? What if I just couldn't hack it? I was a computer programmer then. In principle, fixing code is not so different from fixing an engine. But a computer will tell you what is wrong with your code. An engine—at least an older one—doesn't do that. When you work on an older vehicle, *you* are the computer. And I was one with no software.

That made it hard to know where to start, and so I didn't. Instead I helped more knowledgeable friends with their cars. In the process I discovered that, for me, solving mechanical problems brought a kind of satisfaction that digital ones did not. One weekend I was helping a friend bleed the brakes on his car, pumping the pedal while he was under the chassis turning the bleeder screws. As we worked I could feel the resistance building, a

tactile feedback that I loved. I was hooked. I wanted to learn how to repair engines, but to do that I knew I needed a project of my own—one with higher stakes than the F-150.

In June 2015, my wife and I bought a 1969 Dodge Travco, a motor home that, at the time, was just shy of its 50th birthday. My kids called it the bus. Which was apt. When you say “[motor home](#),” most people picture something that looks nothing like our old Dodge. To call it an RV is to say a Stradivarius is a violin. The Travco is a 27-foot-long fiberglass container of beauty and joy. It’s bright 1960s turquoise and white with sweeping curves and rounded windows. It is bold in a sea of [beige modern RVs](#). The Travco was cool enough that it was once featured in Playboy magazine, back when that was a marker of cool. Johnny Cash had one. So did John Wayne.

We didn’t buy it solely so I would have a project. We bought it to make it our full-time home. We were tired of the suburbs, and we wanted our kids to see the United States, to have a better sense of the place they were born. I didn’t want them to read about the deserts and mountains and forests, I wanted them to be in them. I wanted them to know the difference between the South, where they were born, the Midwest, the West, the Northeast. I wanted them to also know the frustration and the joy of continuing down the road by your own sweat and effort. Out of a muddled sense of self-reliance born of stubbornness and ideals, I wanted them to know that anything worth fixing can be fixed, and anything that can’t be fixed isn’t worth having. But sitting there in the heat of the California sun on Highway 168 that afternoon, the bus felt more like a giant check my ego had written that my fumbling fingers and tools could not cash.

In truth, I didn’t have much experience with cars, but I did grow up around repair and restoration. My grandfather worked for the telephone company and had a shed full of tools behind his house in Tucson. When he retired, he spent his weekends buying broken things at the swap meet and his weekdays fixing them to resell the next weekend. In the summer it was blazing hot in Grandpa’s shed, but my cousins and I didn’t notice. We were too excited watching him tear things apart—phones, televisions, radios, blenders—and breathe life back into them.

My dad had a garage full of tools as well. I was playing with hammers and tape measures from the time I could walk, building model airplanes in grade school. As I got older, I started taking more and more things apart and trying to put them back together. I sketched bookshelves, tables, chairs, and then built them as best I could. I came out of childhood with a few carpentry skills and, more importantly, perhaps misguidedly, a belief that with the right tools and a good mentor, anything was fixable.

Photograph: Briana Vargas

Years later, a line in Matthew Crawford's best-selling manifesto of the manual arts, *Shop Class as Soulcraft*, echoed the feeling my mentors had instilled in me. There is a type of person, he writes, who "hates the feeling of dependence, especially when it is a direct result of his not understanding something. So he goes home and starts taking the valve covers off his engine to investigate for himself. Maybe he has no idea what he is doing, but he trusts that whatever the problem is, he ought to be able to figure it out by his own efforts. Then again, maybe not—he may never get his valve train back together again. But he intends to go down swinging."

Going down swinging is central to the culture of repair. You have to be willing to try. Yet in these days of high technology, products are often covered with stickers warning you that even undoing a screw will void the warranty or risk injury. Companies like [John Deere](#) have even restricted the owners of their machines from repairing them themselves or through a third party. Those stickers aren't an accident. Manufacturers know that the best way to stop people from repairing things is to convince them that they can't.

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But to be more than a consumer of stuff, to not be dependent, you must first believe that you can repair it. That willingness to try—in spite of, or to spite, the stickers—is where it starts, whether you're trying to fix your laptop or replace your head gasket.

There aren't many Travcos left in the world, but in June 2015, after a few months of haunting Craigslist, I found one for sale in the mountains of North Carolina, in the sleepy college town of Mars Hill. A couple who restored vintage trailers found the bus somewhere in Tennessee and tried their hand at fixing it up. Then they changed their mind and put it up for sale. A few days later I was standing there in the hills, looking over the bus. There was some obvious water damage, but nothing I didn't think I could fix.

I was blissfully ignorant about the engine. It was hard to start, but once it got running it seemed good enough to my untrained ear. I handed over the money and climbed into the cockpit.

That first drive was nerve-racking. Strapping yourself into a 27-foot-long monstrosity is nothing like driving a car, especially when the monstrosity is in unknown condition and pointing downhill. A prudent man would have done a test drive. A couple of hairpin turns had my palms sweating—I made a note to myself to buy my next vehicle in Kansas—but I finally managed to get her out on a four-lane road where she felt more manageable. After I had been driving, tensely, for a couple of hours I pulled over at a rest area to take a break.

I'd barely come to a stop when two people came up to the bus to take pictures and ask about it: *What year is it? Where did you get it?* Then they asked the question everyone who loves old cars wanted to know: What engine is in it?

The Travco is driven by a Chrysler 318 LA, a 5.2L small-block V-8 engine. The LA stands for lightweight A-series engine. This is the same engine type you could find in most things Dodge made in 1969, from the Dart to the D100 truck. Larger V-8s like the 440 are more sought after in vintage racing circles, but the 318, as most enthusiasts call it, is the unsung hero of the muscle car era. Some people claim the cylinder bore size in my 318 is bigger than what you'd find in a Dart, which would give the bus's 318 more power. (I've done a little research and still can't confirm or deny this. On the side of a long mountain climb in the desert hills of Nevada, it can certainly *feel* like I have the power of a Dodge Dart, with 8,000 extra pounds of weight on top.) On that first drive with the Travco, when I

stopped at that rest area to collect my wits, all I knew was the engine's name and that it lacked the sensors, computer chips, automation, and complexity of modern vehicles. It was something I felt I could take a swing at.

Going down swinging is central to the culture of repair. You have to be willing to try.

The first year with the Travco, I spent most of my free time rebuilding the interior. For the bulk of 2016 it sat in our driveway with me inside, sweating through the Southern summer, freezing through the winter. Our neighbors begin to give directions based on it: "We're two houses after the big blue bus."

I gutted the inside. I wanted to understand how all the systems worked, and to design and build out everything so I could fix it if I needed to. There are no backup cameras, no motorized awnings, no automated systems at all. I had to go out of my way to find a water heater with a nonelectric pilot light system. Every time we reach camp, I have to get out and light it by hand—but the system will never fail.

A friend of mine joked that I had become like Captain Adama from *Battlestar Galactica*, who famously wouldn't let networked computers on his ship because they introduced a vulnerability he considered unacceptable. It wasn't that he was opposed to technology—his character commands a spaceship after all—but that he distrusted a particular kind of technology. In his case, networked systems opened the door to murderous robots bent on destroying humanity. Our case was a little less dramatic. We just didn't want to have something break far away from the nearest place that could fix it. Every technology you use should be something you choose for a known benefit, with trade-offs you can accept.

No one is perfect though, and the bus does include one complex, fragile system: our solar panels and batteries. I think Adama would approve of the solar panels—they have been our primary source of power for years. But he wouldn't approve of the Bluetooth network the solar charge controller uses; it's an unnecessary potential point of failure. Sure, it's nice to be able to check our solar and battery status from my phone, but we don't have to. To

mitigate that vulnerability, I installed a shunt with a hardwired gauge. Should the Bluetooth fail (or, more likely, should I lose my phone), I can just look at the gauge. Like Adama, I am not opposed to technology. I'm opposed to unnecessary technology and single points of failure.

The late comedian Mitch Hedberg had a joke about how an escalator can never break, it can only become stairs. In web design this is referred to as graceful degradation. How good your technology is depends on how elegantly it handles failures. A lot of modern design has taken exactly the opposite approach. In the name of convenience, complex systems are hidden behind deceptively simple user interfaces. But no matter how simple these things might seem when you use them, the complexity behind them is inherently fragile.

Sometimes inconvenience can even be a benefit. It has a way of forcing you off autopilot and getting you to pay attention. With an engine as old as the Travco's, I found out I need to pay attention. It's part of the cost of admission.

Modern user interfaces have hidden this fact from you, but the first time you start your car every morning, the engine is cold, which makes it hard to start. There are three important components in an internal combustion engine: air, fuel, and spark. The spark is a constant, but when your engine is cold it needs more fuel than air. A computer chip controls this mixture in modern cars, but in older, aspirated engines like the 318, the carburetor controls this mixture with a flap that opens and closes. In our 318 this flap is controlled by the driver via the choke cable—a steel wire attached to the carburetor flap at one end, and a knob on the dashboard at the other. Pull out the knob and the flap in the carburetor closes, limiting the air coming in and allowing the cold engine to start up.

Manual choke is archaic. But since ours was broken when we got it, I went even more archaic. Every time I start the engine, I lift up the engine cover, unscrew the air filter, and close the carburetor flap with my finger. At first this was just expedient. Fixing the choke was on my list of things to do, but finding a long enough choke cable, with a period-correct Dodge dashboard knob, took years of scouring eBay. By the time I found one I was simply

used to doing it myself, literally by hand. The eBay choke cable has been sitting in a storage hatch under the back bed for more than a year.

The truth is, I like opening the engine, I like making sure everything looks right, I like watching it come to life. If something is wrong, I know right away. Once a wire came off the ignition coil, and instead of wondering why the engine wasn't starting—which it wasn't—I was startled to watch electricity arcing out of the ignition coil. That's not right. But it was also very simple to fix. I found the wire and plugged it back in. The engine started right up.

Every morning before we head out on the road, I open the engine cover and spend some time studying the 318, connecting with it. It's a ritual, somewhere between making coffee and invoking the gods, a small part of my morning that's dedicated to making sure the rest of our day goes smoothly. For a long time I really was looking over the engine before every drive; these days I am often just spending time with it.

Car enthusiasts often get this way. It might seem irrational to be attached to a particular set of nuts and bolts and cast iron, but it happens. Now, driving around the country, when I see broken-down cars in someone's yard I don't see junk, I see failed relationships.

The bus is very much a relationship. The five of us moved in and hit the road on April 1, 2017. My wife said that if it didn't work out, we'd just pass it off as a bad April Fools joke. It worked out. Though, as in any relationship, the bus and I have had some rocky moments.

Photograph: Briana Vargas

On April 2, less than 100 miles from home, we had our first problem. I had just finished backing into a campsite at Raysville campground, still in Georgia, when I smelled a strange scent, something like burnt grapefruit. I lay down in the dirt and slid myself under the engine. A thin, warm red liquid splashed onto my forehead. Transmission fluid was leaking out of the bottom of the radiator. There are two transmission lines running into the bottom of the radiator where fluid is cooled before being sent back to the transmission.

I didn't know exactly how to fix it, but I knew just enough about engines to recognize that this wasn't too serious. As long as I kept the fluid level topped off, it wouldn't be too much of a problem. I didn't want to disrupt our new life on the road by taking the bus in for repairs on our third day out. Instead, I added a transmission fluid refill to my morning ritual.

I went through a lot of transmission fluid those first three weeks. I topped it off every morning before we hit the road and every time we stopped for gas. Treating symptoms works for a while, but inevitably the underlying cause gets worse. We made it down to the South Carolina coast and then swung south, through the windswept marshes of the Georgia coast. Then we headed inland, across the swampy pine flats of south Georgia and into the Florida panhandle.

I put off dealing with the leak in part because state and national parks frown on people working on their rigs in campgrounds. And we were heading to a friend's beach house on St. George Island. Friends' driveways are much more conducive to repairs. But the day we arrived, the leak got dramatically worse. I pulled into the driveway with barely any transmission fluid left. At this point, I felt overwhelmed by the problem; it seemed like too big of a task, but I also wasn't sure I wanted to go down so soon. So I spent an hour on the phone searching for a mechanic willing to work on such an old, huge vehicle. I finally found one who was game. A few days later, my wallet lighter, the problem was solved. Yet every time I went to a mechanic I felt inadequate. Why didn't I try to fix it myself? I made excuses (there wasn't time, I wanted to play with my kids), but the truth is I was afraid I would fail.

We got back in the bus and on our way, tracing a route along the white sand beaches of the Gulf Coast, west through Alabama, Mississippi, Louisiana, into New Orleans, where people cheered the bus from the sidewalks. For two months it ran perfectly. But as we headed into the June heat of Texas, the temperature gauge began to climb. And climb. All the way into the red. We took to driving in the early mornings, which helped, but something needed to be done.

We stopped to visit relatives in Dallas, and at yet another mechanic, we had the radiator re-cored. That eliminated it as the source of the problem.

(Again, I chastised myself for taking it to a mechanic, but I had a good excuse—even experienced mechanics rarely re-core their own radiators.) Not an hour outside of Dallas, the temperature gauge shot right back up to the red. We stopped at another repair shop. They replaced the water pump and thermostat. We headed out of town early again, before it got too hot. That worked. Until it got hot. The temperature gauge climbed again.

Our temperature problem, and the brutal West Texas heat, was getting to us. I punted. In Amarillo we got a hotel for the night and I called my uncle. He listened to me for a while and then told me to go get a temperature gun and take readings around the engine when it was running. That night, I paid way too much for a temperature gun at a local hardware store, and we hit the road again early the next morning. Every half hour, I stopped, got out, and took readings on the top and bottom of the engine. Everything was within the operating parameters. We drove on into the midday heat and watched the temperature gauge climb again, but the readings done with the gun remained fine. I called my uncle back. “If I were you,” he said, “I’d pull the temperature sensor out of your engine and chuck it out in the desert somewhere.” I hung up feeling that the main problem with the bus was me. I didn’t know how to find the problems, let alone fix them. I don’t know when my uncle started working on cars, but he’s 35 years older than me. Thirty-five years chasing the spirit of inquiry teaches you a lot.

Photograph: Briana Vargas

I took his advice. I unhooked the temperature gauge from the engine sensor. I was happy to realize there was nothing wrong. I wasn’t happy thinking about the thousands of dollars I’d spent trying to fix what turned out to be a faulty \$15 sensor. I also wasn’t happy now that I could see the learning curve I faced. It felt insurmountably steep.

Two months later, near the end of a summer spent in cool pine forests in the Rocky Mountains, we decided to attempt a 10,000-foot pass near Ridgway, Colorado. We’d managed to get the bus over 9,600 feet before, and the pass we were headed toward was not a steep climb as Rocky Mountain passes go. We started early, but we didn’t get more than a mile into the climb before I smelled that familiar grapefruit smell of transmission fluid. I pulled

over and crawled under the bus—and saw the transmission cooler line leaking again.

We turned around, limped back to Ridgway, and found a side street to park on. I got under the bus again. This time I knew what I was looking for, and sure enough, once I got the nut off the end of the transmission line I could see that the metal pipe, which flares out to wrap over a metal fitting on the radiator, was not just cracked but missing a whole chunk. Instead of forming a tight seal over the metal fitting, fluid was shooting out the side. The transmission cooler lines are fitted tightly along the side of the engine. There is no slack. I couldn't just cut them off, put in a new flare, and reattach them. Even if I could have made it work, they would have been nearly touching the exhaust, which would heat them far more than the transmission cooler ever cooled them.

I was forced to reach out for help, again. I called around for a shop that had big enough bays to work on the bus and eventually found one in Montrose, 30 miles away down the mountain. I put the existing line back on as best I could and limped back to the Ridgway State Park campground. We started repacking and gathering up what we'd need for a few days of tent camping.

That evening, I was sitting outside the laundry room in the campground, watching the famous golden light of the Rockies play across the Cimarron Range, when a fellow camper came to do his laundry. He stuffed his laundry in the machine, and we started talking. The conversation came around to the bus, as most conversations I have in campgrounds do. After he asked about the engine, he asked me something no one ever had, something that caught me off guard. Something that has haunted me since: “Do you turn your own wrenches?” I said I did as much as I could, but that sometimes I had to get professional help. “You have to turn your own wrenches,” he said, shaking his head. “You can't have a vehicle like that if you don't turn your own wrenches.”

I already knew that—I'd been feeling it for months—but it didn't really hit home until someone else said it to me. You can't have a vehicle like this if you don't turn your own wrenches. You'll go crazy or broke or both. I vowed that this would be the last time I would resort to a mechanic. I took the bus to that mechanic in Montrose. We spent a couple weeks in a tent

while the shop found new transmission cooler lines and installed them. A couple weeks later, coming down through western Utah, bound for Zion National Park, I stopped for gas—and guess what I saw pooling under the bus?

It was a Sunday in Utah. We pulled over on a back street, across from a mechanic's shop that was, like everything else on a Sunday in Utah, closed. I crawled under the bus and started poking around. Sure enough, the flare on the transmission line was cracked again. I knew what to do, but I didn't have the tools, and the hardware stores weren't open.

I climbed out from under and sat down on the Travco's step, wiping the grease from my hands. My wife was just asking me what we were going to do, when the rolling metal door of the shop across the street rattled and opened with a clang. A man about my age came walking over and asked if I needed help. I told him my problem. It turned out it was his shop. He didn't work Sundays, but he was there working on his own projects. Together we pulled off the transmission line, took it inside, cut off the cracked flare, and re-flared it. Then he showed me where the last mechanic had gone wrong. He'd overtightened the nut, crushing the metal onto the fitting until it cracked. We tightened it. Gently. The mechanic wouldn't take any money. Help someone else out someday, he told me.

We were almost two years into our family odyssey with the Travco when we found ourselves beached in the middle of the road on that desert mountain pass in Eastern California. By then, I knew that an engine's tendency to overheat isn't really a thing that can be fixed. It's what happens when a small engine tries to climb a big hill. Eventually old cars will teach you so much, including patience.

Photograph: Briana Vargas

I walked up the road to see what was beyond the next bend. Maybe the blacktop crested a ridge and dropped into a cool, lush valley with a river running through it. But the curve didn't end. I kept walking but could never see more than the next few hundred yards; the road just kept climbing. I gave up and headed back to the bus. My wife and kids were back from their explorations, ready to go. The engine had cooled some, so we clamored in

and decided to make another push up the mountain. But now we were starting from zero. On this kind of incline, I gave us a mile before we'd overheat again. (I'd never know exactly, because the odometer was broken.) After about five minutes I spied a pullout. I hadn't smelled radiator fluid yet, but I decided to take advantage of the ability to get out of the road.

My wife and I talked about turning back. There was a strange college back in the valley behind us called [Deep Springs](#). They had a sign out front that said no phone and not to bother them, but something told me they'd be OK with the bus. We could get a fresh start in the morning. It had been a long day of driving, and the kids were tired and hot.

Then we heard an unmistakable sound that always makes me smile. A loud engine, with the distinctive *thump-thump* heartbeat roar of a Harley Davidson, was rumbling up the hill. In a few minutes the bike appeared and the rider pulled over. He asked if we were OK. We went through the usual talk about the bus. Then he told us we were only about a mile from the top. Suddenly we weren't quite so tired. Making it over the mountains felt possible again. We thanked the rider, and he continued on his way. We gave the engine more time to cool off.

An hour later we tried again. It was a long mile, and we never got above 20 miles an hour, but after a while we crested a ridge and a spectacular view of the Owens Valley in California opened up below. I could see the Sierra Nevada rising up out of the hazy valley. We were at the top. I had just a second to enjoy it before we passed a sign that read "Caution, One-Lane Road Ahead." The Narrows, as this bit of highway is called, came up so fast we didn't have time to plan for it. We were just in it. Thankfully, nothing came the other way.

Coming down the steep grade, we stopped to rest the brakes a few times. After about three hours of descending, we pulled into a campground outside of Big Pine, California. It was empty this time of year, and the road was full of ruts that had the bus lurching and creaking around. About 20 yards from the first campsite we heard a loud clang. My wife and I looked at each other. I pulled in for the night and shut off the engine for the final time with a deep sense of relief.

The next morning we watched the sun light up the high peaks of the eastern Sierra Nevada. We had a leisurely breakfast and sipped our coffee well into the morning. We found a train museum up the road and thought we'd take the kids.

It was around 10 when I started up the engine and made my customary walk around the bus to make sure all the windows and hatches and vents were closed and properly secured while the engine warmed up. Everything looked good until I came around to the driver's side. The rear wheels were oddly far back in the wheel well. Wheels don't just move around ... that would mean the entire axle had moved. Oh shit.

I knelt down and peered under the frame. The rear axle, which supports about 5,000 pounds, is held in place by two mounts, one to the front of the axle, one to the rear of the axle. These hold the leaf springs in place. The mounts are secured by four welded steel pins, one at each corner, which hold the axle mount to the chassis. On the driver's side, the forward axle mount, three of the four pins were gone. The mount was hanging by one pin and had swung down and backward, shifting the entire rear axle about 6 inches backward.

If that pin gave out while we were moving, the axle would come free and likely tear the back end of the bus off before dropping it on the ground. We weren't going anywhere. Suddenly, all the things that had happened until now, all the leaking fluids, excess oil, even overheating, seemed pretty mild compared to this. Then I thought of something my uncle had said to me over and over: "It's all just nuts and bolts."

Nuts and bolts aren't where most of the work is, though. It's in the problem-solving that happens in your head. That skill takes years, even decades, to develop. But there's an infectious thrill when you hold some unknown in your head until you come up with a hypothesis about what might be wrong. This takes me many miles of thinking.

It also requires asking many questions of many people. I've met Travco salesmen who knew the original designer, mechanics who've worked on Travcos, and dozens of people who knew the 318 engine inside and out. All

of them helped me in some way, even if it was just an encouraging word, a congratulations on keeping it on the road.

Yet, as I sat there staring at the axle dangling by a single pin, I had no idea what to do. So I texted my uncle a picture of the problem. A few minutes later my phone rang. My uncle happens to live about two hours from Big Pine, back over the state line in Nevada. Sit tight, he said. He was loading up some tools and would be there that afternoon.

Photograph: Briana Vargas

We took the kids hiking down to a nearby river. (Making the bus “work” for us is as much about making sure the kids have space to run and play as it is turning wrenches.) Around three that afternoon my uncle pulled into our campsite with a truck full of floor lifts, jacks, and tools. He crawled under the bus with me. He didn't say anything, just lay there studying the situation. When he climbed back out he said, “I think we can fix that.” We made a run to a hardware store in Bishop, about an hour up the road, where we bought some grade 8 steel bolts, which are strong enough to hold. We then went to the store and grabbed some steaks and potatoes for dinner. Another lesson I've learned from my uncle: “Relax, and make sure you're having fun while you do this.”

That night after dinner, around the campfire, he told me the plan. We'd use two jacks, one to hold up the bus should that last pin give out, and another to maneuver the axle mount back in place. Once it was close we'd use a flange alignment tool to line up the hole in the axle mount with the hole in the chassis. Then we'd slip in the grade 8 bolts. Once he said it, the plan seemed simple enough, obvious even. But I never would have thought of it on my own. I'd never even heard of a flange alignment tool, and I had no idea there were bolts strong enough to replace forged steel pins.

The next morning we started in, and the work took the better part of the day, but when we were done the axle was back where it should be. My uncle didn't like the sound of the engine though. “Why don't you bring it to my place, and we'll see what we can do about that noise,” he said.

The kids got to see the train museum. We swam in some hot springs. Then, a few days later, we made our way up to my uncle's house and I began to learn exactly how the engine worked.

This is, in part, what I love about living in the bus, part of why we keep doing it six years later. It's all the people I know, all the people I've met, the people who've helped—some professionals, most not. We haven't stopped needing to fix things in the bus. In the course of writing this article I had to rebuild the vacuum booster that powers our brake system. I had to replace a head gasket, several worn belts, a failed alternator, the voltage regulator, and a fuel pump, and I had to do all the routine maintenance, like changing the spark plugs, wires, and oil. No mechanics were consulted, though I still regularly text my uncle for advice.

The bus will never not need fixing. But my relationship with it has changed. I no longer look at the engine in awe and mystery. Nor do I look at it with perfect, go-it-alone mastery. I know what all the parts do. I don't know everything that can go wrong, and I don't always know what to do when it does. But I have the thing I've come to prize the most—the relationship with my fellow shade tree mechanics and car enthusiasts. It isn't just me turning my own wrenches that I rely on; it's everyone who turns their own wrenches.

It isn't just wrenches either. We are in the middle of a repair revival. Other repair gurus are out there helping the next generation. Sewing groups hold "mending days" where you can get your clothing repaired, and learn to do it yourself. A luthier friend of mine has apprenticed under a master and now helps others learn how to build and repair guitars. Another friend who started out buying and repairing bicycles for fun now regularly runs workshops for people to learn how to repair their own bikes. All around the country there are local fixing groups. Check the bulletin boards in your community and you'll likely find someone organizing a repair group.

"The bus will never not need fixing. But my relationship with it has changed. I no longer look at the engine in awe and mystery. Nor do I look at it with perfect, go-it-alone mastery."

Photograph: Briana Vargas

The community of people who repair things is an interesting group, perched on a curious dichotomy. We are, by and large, people who prize self-reliance. Whether that spirit grows out of economic necessity, pure enjoyment, or something else, it is essential to the ethic of repair. At the same time, the community is very hierarchical, which means those of us near the bottom must learn from those above. Self-reliance alone tends to make you isolated and either snobbish (if you think you're good) or intimidated (if you know you're not). The only way out of these predicaments is to connect with other people who know more than you. In the first case they'll quickly put you in your place. In the second, they'll lift you up to where they are.

Updated 4-4-23, 12 pm PST: This story was updated to reflect that James Dean did not own a Travco.

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Mar 23, 2023 6:00 AM

Brandon Sanderson Is Your God

He's the biggest fantasy writer in the world. He's also very Mormon. These things are profoundly related.

Photograph: Michael Friberg

Most years, Brandon Sanderson makes about \$10 million. Last year, he made \$55 million. This is obviously a lot of money for anyone. For a writer of young-adult-ish, never-ending, speed-written fantasy books, it's huge. By Sanderson's estimation, he's the highest-selling author of epic fantasy in the world. On the day of his record-breaking Kickstarter campaign—\$42 million of that \$55 million—I came to the WIRED offices ready to gossip. How'd he do it? Why now? Is Brandon Sanderson even a good writer?

Nobody had the first clue who or what I was talking about.

This article appears in the June 2023 issue. [Subscribe to WIRED](#). Photograph: Dan Winters

On the one hand, who cares. Sanderson has millions upon millions of fans all over the planet; it doesn't matter that some losers at a single magazine (even if it *is* one of the nerdier ones) had never heard of him. On the other, the ignorance goes far beyond WIRED. As far as I can tell, Sanderson, who has been topping bestseller lists for the better part of the 21st century, has not been written about in any depth by any major publication ever. I called his publicist to confirm this. "Well, we have a piece coming up in *LDS Living*," he told me. That's LDS as in Latter-day Saints. It's a magazine for Mormons.

Which makes sense: Sanderson is extremely Mormon. What makes less sense is why there's a hole the size of Utah where the man's literary reputation should be. Is it because he mostly writes fantasy, a—so the snobs sneer—"subliterary" genre? But then, so do J. K. Rowling, [Margaret Atwood](#), and George R. R. Martin, and they're household names. Is it because none of Sanderson's work has been adapted for the screen? Well, he [wrote three](#) of the *Wheel of Time* books, and an adaptation of that series came out on Amazon Prime in 2021. Could it be, finally, *because* he's a weirdo Mormon? But so are Orson Scott Card (*Ender's Game*), Glen A. Larson (the original *Battlestar Galactica*), and Stephenie Meyer (*Twilight*). Mormon, I mean. Only Orson Scott Card is also a weirdo.

Sanderson, when I eventually meet him in person, makes versions of these excuses, plus others, for his writerly obscurity. It's kind of fun to talk about, until it isn't, and that's when I realize, in a panic, that I now have a problem. Sanderson is excited to talk about his reputation. He's excited, really, to talk about anything. But none of his self-analysis is, for my purposes, *exciting*. In fact, at that first dinner, over flopsy Utah Chinese—this being days before I'd meet his extended family, and attend his fan convention, and take his son to a theme park, and cry in his basement—I find Sanderson depressingly, story-killingly lame.

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Yi-Ling Liu

He sits across from me in an empty restaurant, kind of lordly and sure of his insights, in a graphic T-shirt and ill-fitting blazer, which he says he wears because it makes him look professorial. It doesn't. He isn't. Unless the word means only: believing everything you say is worth saying. Sanderson talks a lot, but almost none of it is usable, quotable. I begin to think, *This is what I drove all the way from San Francisco to the suburbs of Salt Lake City in the freezing-cold dead of winter for? For previously frozen dim sum and freeze-dried conversation?* This must be why nobody writes about Brandon Sanderson.

So, recklessly, I say what's on my mind. I have to. His wife is there, his biggest fan, always his first reader, making polite comments; I don't care. *Maybe nobody writes about you*, I say to Sanderson, *because you don't write very well.*

The world unfreezes. He agrees.

It's not that Brandon Sanderson can't write. It's more that he can't *not* write. *Graphomania* is the name of the condition: the constant compulsion to get words out, down, as much and as quickly as possible. The concept of a vacation confuses Sanderson, he once said, because for him the perfect vacation is more time to write—vocation as vacation. His schedule is budgeted down to the minute, months out, to maximize the time he spends, rather counter-ergonomically, on the couch, typing away. Most days, he wakes up at 1 pm, exercises, and writes for four hours. Break for the wife and kids. Then he writes for four more. After that he plays video games or whatever until 5 am. A powerful sleeping pill is all that works, finally, to get him, and the voices in his head, to shut up.

In the five months or so it has taken me to sit down and write this magazine story, which is 4,000 words long, Sanderson has published two books. During the Covid lockdowns, he wrote and/or edited *seven*: two for his regular publisher, a graphic novel, and four more in secret, telling no one but his wife until he surprise-announced a Kickstarter in March 2022 to crowdfund their publication. (Hence the \$42 mil, raised in a month, by far the most successful Kickstarter ever.) Since his debut, *Elantris*, in 2005, Sanderson has published 30-plus books, the biggest ones in excess of 400,000 words; there are far more if you count the novellas and graphic

novels and stuff for kids. I've read 17 of the actual books. Or maybe it's 20. Exactitude is pointless here. As the major books are all set in the same universe, which Sanderson calls the Cosmere, they're all but meant to blur together.

Sanderson makes about half his money selling books through traditional publishers. The other half he makes selling, among other things, leather-bound special editions through his company, Dragonsteel.

Photograph: Michael Friberg

Most will hear this and think: At that rate, none of the words could possibly be any good. They'd be right, in a way, and that's what Sanderson agrees with. At the sentence level, he is no great gift to English prose.

The early books especially. My god. Here's a sample sentence: "It was going to be very bad this time." Another one: "She felt a feeling of dread." There's a penchant for redundant description: A city is "tranquil, quiet, peaceful." Many things, from buildings to beasts, are "enormous." Dark places, more thesaurically, are "caliginous." On almost every page of *Mistborn*, his first and probably most beloved series, a character "sighs," "frowns," "raises an eyebrow," "cocks a head," "shrugs," or "snorts," sometimes at the same time, sometimes *multiple times* a page. I count seven books in which one of the characters frets about their metaphors. "I have trouble with metaphors," one literally says. Of his own work, Sanderson has said: "I detest rewriting," "I write for endings," and "I write to relax." It shows. He writes, by one metric, at a sixth-grade reading level.

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Here's where I'll stop using Sanderson's words, written or spoken, against him. It's not fair. He's simply not, I'll say it again, very quotable. I spent days with the man. I watched his [YouTube videos](#), made a dent in his podcast empire (most of it, incredibly, *about writing*). Like his books, it all blurs together. I typed some 40 pages of notes for this story, and who knows how many pages of transcripts the [AI](#) spat out when I fed it the many hours

of recorded audio. Now that I'm writing, I find I'm referring to none of it. Possibly, this is the influence of Sanderson himself, on me. Graphomaniacally get thoughts down. Have fun. Write for the ending.

So I will. This story has an ending, I promise, and I'm sprinting toward it, as if to a vacation. Like the best of Sanderson's endings, my ending should surprise you. Because, you see, Sanderson actually *did* say one thing to me, *one miraculous thing*, that stuck, that I remember, these five months later, with perfect clarity. Just seven words, but true ones. You're not ready for them just yet. You need more story first. For now, there is only Sanderson, both wordful and wordless, the best-selling writer no writer writes about because writers only know how to talk about words. Sanderson's readers—loving, legion—care about something else.

Ten seconds to go until the launch. The lights are flashing, the music thumping. "This is siiick," someone whispers behind me, as a Cosmere's worth of nerds count down the remaining seconds. At zero, an enormous applause. Then the VP of merchandising and events walks out.

This is Dragonsteel 2022, the second annual convention for Sanderson's worlds and works. At the first one, the year before, 1,200 fans showed up. At this event, a two-dayer in November, attendance is closer to 5,000. Even though the con is being held in the biggest venue in downtown Salt Lake City, the Salt Palace Convention Center, fans are turned away from panels left and right. The first morning, I was panting by the time I reached the end of the line, down multiple city blocks abutting stony Mormon gothica. Some 7,000 people are expected for Dragonsteel 2023, the VP of merch and events tells me later—and in 2024, the year Sanderson plans to release Book Five (of 10) of *The Stormlight Archives*, his biggest franchise, the one with the 400,000-word books, a full 12,000 people. The Dragonsteel planners will need to think bigger.

A proud nerd, Sanderson has piles of Magic: The Gathering cards strewn throughout the house.

Photograph: Michael Friberg

For now, the fans, even the turned-away ones, are in unconquerable spirits. As is typically the case at these things, there's a general air—warmish, body-odored—of unselfconsciousness. By my rough count, some three-quarters of the attendees are men, boys, menboys, blurring together in a mass of pale, fleshy nerdery in Sanderson-appropriate graphic tees. The women, fewer in number, tend to be the better cosplayers. Lots of billowing cloaks, spritely makeups, precious weapons. (There's an arena for referee fights.) If you don't come prepared, never fear, because the sprawl of purchasable Sandersonalia is endless: art, clothes, figurines, games, jewelry, ornaments, special-edition books, a letter opener (not available yet) in the style of a telepathic sword named Nightblood.

I talk to as many of the fans as I can, some in their teens, others in their sixties, from here in Utah and as far away as India, Norway, Australia. They're sweet. Many of them have been reading Sanderson since the beginning, since *Elantris*. A teenage girl announces, "I'm here basically because I'm a huge nerd!" Everyone is smiling, sharing info and panel gossip. One guy from Massachusetts tells me he just spent \$170 on a rubber sword (not Nightblood; this one is called Mayalaran). It's bigger than he is; he won't be able to take it on the plane home. Another guy, 41 years old, tells me he made his sword (Firestorm; they *all* have names) himself. It took more than a year, on and off, to design, and then six weeks to 3D-print. I see a young couple with very young kids. "Are you indoctrinating them into this fantasyland?" I ask, gesturing to the stroller. "Trying to," the dad says.

The one question I ask practically everyone is, *Why Sanderson?* I only need to ask it a few times to realize the answer is always the same. It's a two-parter. First part: Sanderson's characters. "They feel like real people," everyone insists. Multiple parents say they've named their kids after their favorites, usually the princely protagonists who've overcome various depressions and triumphed chivalrically. "I've done some things I'm not proud of," one man tells me. Then he read the first *Stormlight* book, [*The Way of Kings*](#), and now, reformed, he has a 2-year-old son named Kaladin.

The second answer to *Why Sanderson?* is his worlds. This is probably what he's best known for. Worldbuilding, as it's called. Sanderson dreams up far-

off lands—sometimes cities, sometimes whole planets, with rules and systems and politics—and then he populates them with characters whose fates are also the worlds'. So the second answer is just the inverse of the first; you can't have worldbuilding without characterbuilding. Some characters die, some become gods. The good ones, and most of them are good, are very good. Inspiringly good. No one has sex. They only save lives.

What *nobody*, not a single person, complains about, in my two days walking the Palace floors, is Sanderson's writing. If they mention his sentences at all, it's merely to acknowledge that they're easier to read than, say, Tolkien's—whose work they may well graduate to, with Sanderson lighting the way. (Sanderson himself admits he was late to Tolkien, in whose shadow he now happily lives, even as he tries to write beyond it.) Still, I can't help but try to trip them up. *Surely he's not a great writer?* I prod. Polite, embarrassed smiles. They're suspicious of me, I can tell. They probably think I don't know my Kaladin from my Adolin. I do! I even like Kaladin! The scene midway through *Way of Kings* where Kaladin talks to a mysterious stranger (it's Hoid!) on the Shattered Planes? "A story doesn't live until it is imagined in someone's mind," Hoid says. Do I know what that means? Not exactly. And that's exactly why I read science fiction and fantasy, why I've pretty much *only* read science fiction and fantasy my entire life: for those plays at profundity, at the essence of storytelling. Storytelling beyond words.

But what am I saying? Gibberish, most likely. And hypocrisies. Sanderson is a bad writer; I've already said it. Here at the convention, most of the panelists aren't even writers. People don't care about sentences. They care about Sanderson. I sit through multiple panels about the future of his publishing company. Which is called—as is the convention, you'll note—Dragonsteel. Post-Kickstarter campaign, the company is now 50-some-people/Mormons strong. This is the Year of Sanderson, the panelists keep saying. Four new books, with special swag for backers! New toys and sparkly bookmarks! Now they're talking about warehouse expansion efforts. Now they're talking about a possible future bookstore, housed in a castle or something. "When will the Dragonsteel amusement park be built?" someone asks. The audience hoots. All this, I think to myself, is not the

spirit of fantasy. If it's worldbuilding, it's only worldbuilding one thing: the worldbuilder's world.

Three days later, I pull up to Sanderson's built world: his home(s) in a gated community of American Fork, Utah. There are three properties. On the left is the newest one, the subterranean man cave unofficially known as the supervillain lair, officially the Ammonite Club, complete with 28-seat industry-caliber movie theater. The middle structure is the Sanderson family manor, where his three boys play. On the right is the Cosmere House, which serves as Dragonsteel's HQ. Props and merch and books for days. That's where I'm staying, specifically in the Elantris Suite. It has cover art from the book on the walls, gold and silver frilly things everywhere, and the world's best shower.

I already knew about the shower because a few nights earlier I'd gone out for drinks with a friend of Sanderson's I met at the con. After contextualizing Sanderson's success for me—basically, he gives fans exactly what they want—she insisted I stay a night in the Elantris Suite. “And you have to try the shower,” she said. “I’ll text him.” The next morning I woke up to an invitation from his assistant.

Sanderson's assistant is his wife's sister. As I orient myself within the Cosmere House, I keep running into his nearest and dearest. His doppelgänger brother. Multiple siblings-in-law. Neighbors. People's children. Friends Sanderson formed a writers' group with almost 30 years ago, back in college at Brigham Young University, when he was a nobody and worked the graveyard shift at a hotel so he could write the nights away. Dragonsteel is a company, one that's shaking up the book industry. It's also Sanderson's extended family.

The writers' group still meets every Friday, which is what today happens to be. It's the most PG gathering of writer types I've ever been to. There are chips and sodas. Someone's baked an apple crisp. Before the meetup kicks off, I corner some regulars in the kitchen. They're gossiping, cracking jokes. One—Dragonsteel's new “head of narrative”—lets slip that Sanderson feels no pain. *It's true*, Sanderson's sister-in-law says. Even though he writes for eight hours a day on a couch, he has no backaches. The hottest of hot sauces cause scarcely a sweat. At the dentist, he refuses

novocaine for fillings. When I ask Sanderson later to confirm this, he does but asks if I really have to print it. *I'm sorry*, I say. *I really do*.

The writers' group is standard stuff: *What's this character's motivation?* *Can the reader follow that fight sequence?* Sanderson gives feedback with half his brain, the other half occupied with autographing books. It's only afterward that the real talk happens, such as Star Wars debates. When those subside, I bring up the pain thing again. Turns out Sanderson doesn't seem to feel pain of *any* kind, even emotional. On roller coasters, he's dead-faced, while his wife is shrieking. "It's sick and wrong," she says, smiling. She likes to say she married an android. For his part, Sanderson actually, at this moment, looks pained. He might not feel, he says, but his characters do. They agonize and cry and rejoice and love. That's one of the reasons he writes, he says: to feel human.

The conversation eventually turns to a theme park called Evermore, located just down the street. Though unaffiliated with Sanderson, it's Sandersonian to the core: You show up, hang around taverns, and embark on quests. *We have to go*, I say. *But it's falling apart*, everyone groans. Something to do with bad management—there's a four-hour [YouTube video](#) all about it. Still, Sanderson seems tempted. We leave it at that. I go back to the Elantris Suite, where I finally take that shower. There are multiple showerheads. I turn everything on. Water hits me from every angle. I don't cry, but I could.

I do cry the next night, my last in Utah. We're down in Sanderson's below-ground movie theater, in plush red-leather seats that not only recline but also have adjustable headrests. He wants to show the specs off, so he plays the opening scene of *The Greatest Showman*. I don't tell him that, while I like musicals, I hate *The Greatest Showman*, and especially Hugh Jackman. The scene starts. The chair shakes with otherworldly sound. When Hugh, lame Hugh, opens his mouth to sing, I can't help it. I burst into tears.

This sculpture—the centerpiece of Sanderson's underground “supervillain lair”—includes representations of his wife and three kids.

Photograph: Michael Friberg

What's happening to me? This story isn't coming together. To my mind, I still haven't gotten anything *real* from Sanderson, anything true. I'm not the first person he has toured around his lair to politely gawk at his treasures and trophies and his hallway of custom stained-glass renditions of his favorite books (Tolkien, Harry Potter, *The Belgariad*). I'm certainly not the first person he has told about one favorite book in particular, Barbara Hambly's *Dragonsbane*, which an English teacher put in his hands when he was 14, probably the day he became a fantasy writer. Or how he first got published. Or about the phone call he got from Robert Jordan's widow, asking if he might finish the *Wheel of Time* series. These stories are all over the internet, on his website and many others. Sanderson has lived so much of his life and fame openly, self-promotionally. It's a major reason for his success. One woman I talked to at the con made sure to tell me which of Sanderson's *pets* was her favorite. It's Jello, the parrot.

After I recover from Hugh in 4D, Sanderson collects his 15-year-old, and we all drive to dinner. This time the food is better: Utah Japanese. Sanderson and I order ramen. He salts his. Then I watch his son salt his yakisoba. I could cry again. Instead, I ask Sanderson if he's ever so moved by a scene he writes that *he* cries. Sometimes, he says. Though it might not be the scenes people expect.

He won't say more, but it's something. This conversation—from five months ago, remember—I recall fairly clearly. We're heading toward something now, some kind of admission, I can feel it. When Mormons ask God for a sign, they speak of a “burning in the bosom.” Say you’re a kid, wondering if you should be a fantasy writer when you grow up. You might ask God what He thinks. If there’s a burning in your bosom, that’s probably a yes.

So I press Sanderson on the moments he has felt the burning. He says they're too intimate, too special, to talk about. That's fine. Then let's talk about Mormonism in another way. Let's talk about it as it relates to fantasy. Because it's no secret: Mormonism is the fantasy of religion. “The science-fiction edition of Christianity,” I've heard it called, with its angels and alternative histories, embodied gods, visions and plates made of gold. I ask Sanderson if I've got the ultimate promise of the religion right—the

ultimate promise being, as I understand it, that we humans will, if we're good, and marry well, and memorize the passcodes, eventually pass into the highest kingdom and come into our divine inheritance. We'll become gods, in other words, and get our own planets.

Sanderson doesn't balk at the characterization; he agrees that's the gist, and he knows where I'm going. He knows I want to know if what he's doing—writing fantasy books—is fundamentally, in some way, some very central way, Mormon. Of course it is, he says. The worldbuilding. The gods incarnate. The systems of magic. So much of Mormonism is about rules; so are his books, where miracles don't happen unless you put in the work. That's when, between mouthfuls of pork cutlet, Sanderson makes the connection between his work and the work of his Heavenly Father explicit. This is when he speaks the seven words of truth, the only ones I'm certain he has never said, in quite this way, ever before: "As I build books," Sanderson says, as I sit there, for once entirely enraptured, "God builds people."

Sanderson, schedule-obsessed, gets two hours a day of what he calls "discretionary time." During the Covid lockdowns, he used that time to write four secret projects.

Photograph: Michael Friberg

We descend on one final world. After dinner, it's time for Evermore, the rundown theme park. The night is misty and cold—caliginous. I remember one of Sanderson's friends saying the park is only open at night to conceal the decay. I believe it. As we walk around, Sanderson narrates. *Those are bad prosthetics. That's half a costume. Shouldn't there be more skeletons in this dungeon? At least the apple cider is good.*

He gets recognized by everybody. I guess that's inevitable when you go to a fantasy land with a fantasy legend (who has literally just purchased a \$5 million plot of land across the way for who knows what worldbuilding reasons). Sanderson's son and I start keeping a silent tally. Every time a new fan walks over, we hold up fingers behind Sanderson's back. We quickly run out of fingers. One girl says she wants to take Sanderson's writing class at BYU when she grows up. A surprising number of guys ask

for autographs “for my girlfriend.” Lots of people have already finished the latest book, which came out, like, yesterday.

Sanderson shines in these situations. He’s your god, but he’s your friend too. He’s also unafraid to drop hints about future projects. He does this to me at certain points. *Will they ever make a big movie version of one of your books?* I ask him in the fairy garden. Sanderson makes meaningful noises. *Even though your systems of magic seem unfilmably complex?* More meaningful noises. Everything’s been optioned, he says, but then things revert and discussions continue.

I suspect there will be big announcements soon. There have to be. Sanderson is bigger than ever. A good writer? Who knows. What I do know, now, is this: So many of us mistake sentences for story, but story is the thing. Things happening. Characters changing. Surprise endings. As I drive us back to the house, drop off the kid, and then stay in the car with Sanderson a bit longer, talking about life, talking about worlds, my ending takes shape. The surprise is that it was Sanderson’s ending all along, the ending of his best books. A character becomes a god, and the god beholds his planet below. If Sanderson is a writer, that is all he is doing. He is living his fantasy of godhead on Earth.

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Mar 21, 2023 6:00 AM

How to Love Technology Again

At a time when software is consuming us, we crave hardware—the material anchors of our immaterial realities.

We saw it written once that software was eating the world. What really happened, it seems to us, is that software made a world of its own and invited us there to be eaten.

These days, we're lighting out for other worlds—real *places*, rather than ghostly *spaces* conjured by software. Take our local hardware store. The sights, the sounds of actual machines, the advanced tools that still seem built to thrill. We enter to the whirring music of the key duplicator. We seek counsel from people in many-pocketed vestments. We smell the sacred scents of oiled metal, dusty cardboard, evaporated varnish, PVC fumes, and bags of fertilizer with leaky seams. We imagine everything it took to build this world: millennia of trial and error, oceans of brow sweat, megatons of earthly matter mined, refined, and industrially transformed so that we humans might enjoy access to more varieties of self-tapping deck screw than there are stars in the Andromeda Galaxy. *What a species*, we think.

Our definition of “hardware” extends beyond the plumbing department, of course. We apply the word to anything physical that underlies our (increasingly immaterial) realities—any object with the power to transform *techne*, the knowledge of how to do something, into *logos*, its utterance. Hardware moves earth. Hardware shapes molecules. Hardware sends electrons coursing throughout the world and into our fingertips. Software can still create worlds unto itself, even make us believe that the

world of bits is all that matters. But we will always, in the pits of our beings, crave atoms.

In this special WIRED package, we have collected stories to answer that craving—stories that look inside cameras, cars, computers, and ultimately the chips that constitute the foundation of them all. Whether these stories reach you in molecules of ink on processed wood fiber or in layers of light-emitting diodes on a screen or in the electromagnetic pulsing of a speaker coil, we hope you'll fall in love with the beauty and possibilities of hardware all over again.

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Mar 21, 2023 6:00 AM

I Saw the Face of God in a Semiconductor Factory

As the US boosts production of silicon chips, an American journalist goes inside TSMC, the mysterious Taiwanese company at the center of the global industry.

Play/Pause Button



Video: Basile Fournier

I arrive in Taiwan brooding morbidly on the fate of democracy. My luggage is lost. This is my pilgrimage to the Sacred Mountain of Protection. The Sacred Mountain is reckoned to protect the whole island of Taiwan—and even, by the supremely pious, to protect democracy itself, the sprawling experiment in governance that has held moral and actual sway over the would-be free world for the better part of a century. The mountain is in fact an industrial park in Hsinchu, a coastal city southwest of Taipei. Its shrine bears an unassuming name: the Taiwan Semiconductor Manufacturing Company.

By revenue, TSMC is the largest semiconductor company in the world. In 2020 it quietly joined the world's 10 most valuable companies. It's now bigger than Meta and Exxon. The company also has the world's biggest logic chip manufacturing capacity and produces, by one analysis, a staggering 92 percent of the world's most avant-garde chips—the ones inside the nuclear weapons, planes, submarines, and hypersonic missiles on which the international balance of hard power is predicated.

This article appears in the May 2023 issue. [Subscribe to WIRED](#). Illustration: Alvaro Dominguez

Perhaps more to the point, TSMC makes a third of *all* the world's silicon [chips](#), notably the ones in iPhones and Macs. Every six months, just one of TSMC's 13 foundries—the redoubtable Fab 18 in Tainan—carves and etches a quintillion transistors for Apple. In the form of these miniature masterpieces, which sit atop microchips, the semiconductor industry churns out more objects in a year than have ever been produced in all the other factories in all the other industries in the history of the world.

Of course, now that I'm on the bullet train to Hsinchu, I realize that the precise hazard against which the Sacred Mountain offers protection is not to be uttered. The threat from across the 110-mile-wide strait to the west of the foundries menaces Taiwan every second of every day. So as not to mention either country by name—or are they one?—Taiwanese newspapers often euphemize Beijing's bellicosity toward the island as "cross-strait tensions." The language spoken on both sides of the strait—an internal waterway? international waters?—is known only as "Mandarin." The longer the threat is unnamed, the more it comes to seem like an asteroid, irrational and insensate. And, like an asteroid, it could hit anytime and destroy everything.

Semiconductor fabrication plants, known as fabs, are among civilization's great marvels. The silicon microchips fashioned inside them are the sine qua non of the built world, so essential to human life that they're often treated as basic goods, commodities. They're certainly commodities in the medieval sense: amenities, conveniences, comforts. In the late '80s, some investors even experimented in trading them on futures markets.

But unlike copper and alfalfa, chips aren't raw materials. Perhaps they're currency, the coin of the global realm, denominated in units of processing power. Indeed, just as esoteric symbols transform banal cotton-linen patches into dollar bills, cryptic latticework layered onto morsels of common silicon—using printmaking techniques remarkably similar to the ones that mint paper money—turns nearly valueless material into the building blocks of value itself. This is what happens at TSMC.

Like money, silicon chips are both densely material and the engine of nearly all modern abstraction, from laws to concepts to cognition itself. And the power relations and global economy of semiconductor chips can turn as mind-boggling as cryptocurrency markets and derivative securities. Or as certain theologies, ones that feature nano-angels dancing on nano-pins.

As befits a pilgrim, I'm spent. The flight from Kennedy Airport to Taipei nearly laid me to waste—just under 18 hallucinatory hours at the back of a packed 777. I had discharged my insomniac unease by looping through iOS games while perseverating on Putin, Xi, MAGA Republicans, and the rest of the nihilistic flexers with malevolent designs on democracy. At the same time, I had cautioned myself for the millionth time against turning hawkish, the way the right and the rich do when feeling down in the mouth, gunning for a new clash of civilizations, or—more likely still—aiming to subdue Chinese competition so they can make more money.

As passengers learned only upon landing in Taipei, the plane took off without a single economy-class bag. We got two words at baggage claim: “Ukraine war.” My Samsonite wheelie, which contained Chris Miller’s *Chip War* and Albert O. Hirschman’s *The Passions and the Interests*—the book that got me thinking about the etymology of “commodities”—was back in New York. We’d been forced to travel light. Flights from US airports are now required to circumnavigate Russian airspace near Alaska, from which they’re banned, in retaliation for a US ban on *Russian* flights in American airspace, which was of course in response to Russia’s invasion of Ukraine last year.

That invasion, and the courageous defense mounted by Ukrainian citizens, has been followed keenly in Taiwan. Ukraine is a kind of trauma-bonded sister state to Taiwan, another promising democracy extorted by a [neighboring authoritarian](#) hot to annex it. This perception informs the semiconductor business. Last year, the microchip titan Robert Tsao, who founded United Microelectronics Corporation, the first semiconductor company in Taiwan and TSMC’s longtime rival, pledged nearly \$100 million for national defense, an investment that provides for the training of 3 million Taiwanese civilians to confront Chinese invaders in the manner of the Ukrainian patriots.

TSMC, which plays everything cool, seems to view Tsao as a kind of foil. Tsao is a show-off. He's also capricious. Having for years invested heavily in China—his renowned collection of Chinese porcelain once included a 1,000-year-old dish for washing paint brushes, which he sold for \$33 million—he resigned as chair of UMC in 2006 amid allegations that he had illegally invested in Chinese semiconductor technology. But Tsao has since done an about-face. He now rails against the Chinese Communist Party as a crime syndicate. In 2022 he issued a call to arms while wearing rococo tactical gear. He declined to speak to me for this piece unless I could promise television time. I could not.

In 1675, a French merchant named Jacques Savary published *The Perfect Merchant*, a mercantile manual that came to double as a guide for doing commerce around the world. Albert O. Hirschman cites Savary to explain how capitalism, which would have been regarded as little but avarice as recently as the 16th century, became the sanest ambition of humans in the 17th.

Savary strongly believed that international trade would be the antidote to war. Humans can't conduct polyglot commerce across borders without cultivating an understanding of foreign laws, customs, and cultures. Savary also believed the Earth's resources and the fellowship created by commerce were God-given. "It's not God's will that all human necessities be found in the same place," Savary wrote. "Divine Providence has dispersed its gifts so that humans will trade together and find that their mutual need to help each other establishes ties of friendship among them."

TSMC's success is built on its singular comprehension of this dispersion of providential gifts. The firm is merrily known as "pure play," meaning *all* it does is produce bespoke chips for customer companies. These include fabless semiconductor firms like Marvell, AMD, MediaTek, and Broadcom, and fabless consumer-electronics firms like Apple and Nvidia. In turn, TSMC relies on the gifts of other countries. Companies like Sumco, in Japan, process polycrystalline silicon sand, which is quarried for the world's semiconductor companies in places like Brazil, France, and the Appalachian Mountains [in the US](#), to grow hot single-crystal silicon ingots. With diamond wire saws, Sumco's machines slice shimmering wafers that,

polished so smooth they feel like nothing under a fingertip, are the flattest objects in the world. From these wafers, which are up to a foot in diameter, TSMC's automated machines, many of which are built by the Dutch photolithography firm ASML, etch billions of transistors onto each chip-sized portion; the biggest wafers yield hundreds of chips. Each transistor is about 1,000 times smaller than is visible to the naked eye.

I've thus come to see TSMC as both futuristic and a touching throwback: a tribute to Savary's largely expired romance in which liberal democracy, international commerce, and progress in science and art are of a piece, both healthful and unstoppable. More practically, however, the company, with its near monopoly on the best chips, serves as the umbo of the region's so-called Silicon Shield, which is perhaps the sturdiest artifact of 20th-century realpolitik. For an imperial power to seize TSMC, the logic goes, would be to slay the world's goldenest goose.

Like a dutiful valet who exists only to make his aristocrat look good, TSMC supplies the brains of various products but never claims credit. The fabs operate offstage and under an invisibility cloak, silently interceding between the flashy product designers and the even flashier makers and marketers. TSMC seems to relish the mystery, but anyone in the business understands that, were TSMC chips to vanish from this earth, every new iPad, iPhone, and Mac would be instantly bricked. TSMC's simultaneous invisibility and indispensability to the human race is something that Jensen Huang, the CEO of Nvidia, likes to joke about. "Basically, there is air—and TSMC," he said at Stanford in 2014.

"They call Taiwan the porcupine, right? It's like, just try to attack. You may just blow the whole island up, but it will be useless to you," Keith Krach, a former US State Department undersecretary, told me a few weeks before I left for Taiwan. TSMC's chairman and former CEO, Mark Liu, has put it more concretely: "Nobody can control TSMC by force. If you take by military force, or invasion, you will render TSMC inoperative." If a totalitarian regime forcibly occupied TSMC, in other words, its kaiser would never get its partner democracies on the phone. The relevant material suppliers, chip designers, software engineers, 5G networks, augmented-

reality services, artificial-intelligence operators, and product manufacturers would block their calls. The fabs themselves would be bricked.

With democracy reliably considered “under threat” in America by everything from election interference to gerrymandering to violent insurrections, Reaganite Shining Cities on Hills (or sacred mountains) are few. No WIRED journalist has breached the chip world’s sanctum sanctorum and toured a TSMC fab. This is why I want to go inside. I want to know what’s going on atomically in the fabs, and how it might amount to divinity, or at least the human spirit incarnate—which, in the founding insight of humanism, amount to the same thing.

Mark Liu, the chairman of TSMC, dislikes referring to the company as the Sacred Mountain of Protection. “We represent a collaboration of the globalization era,” he says. “That label makes us a sore thumb.”

Photograph: SEAN MARC LEE

Still struggling to contact the airline about my Samsonite, I buy a toothbrush and some shapeless navy-blue separates in a third-story mini mall open after hours. I also learn a meme made famous in the 1920s by the Chinese philosopher Hu Shih: *chabuduo*. The word means something like *whatever*. Or *close enough*. Chabuduo becomes my passion.

Managerial types despise the idea as an attitude of mediocrity, and no doubt it could create disasters in endeavors that demand exactness. But as I stroll around town in my mall clothes, pondering the verities, chabuduo strikes me as a quiet-quitter defiance of everything from jet lag to lost luggage to the saber-rattling from Beijing.

All the same, before I set foot in TSMC’s headquarters, I gird for a hip and socially demanding Googleplex vibe. Free rose lassi and pecan rockfish. Men in Patek Philippe watches. Snobs. But TSMC style, to my delight, is like mine today: cotton, normcore, a shrug. Three stars on Yelp.

TSMC’s headquarters are across the street from a rival UMC fab. That might seem like a setup for melodrama. But at TSMC, discretion is not just the better part of valor; it’s the business model. The company is recessive in every way. If, in spite of its geostrategic brawn, you don’t know its name,

that's by design. No one vamps for selfies outside the main building, as they do at Google, and when unarmed doormen sternly request that I not photograph the facade, they needn't have bothered. The place is glassy and forgettable, with a few half-hearted pops of color, mostly red. It's like a '90s convention center in a small American city, perhaps Charlotte, North Carolina.

Employees at TSMC are paid well by Taiwan's standards. A starting salary for an engineer is the equivalent of some \$5,400 per month, where rent for a Hsinchu one-bedroom is about \$450. But they don't swan around in leather and overbuilt Bezos bodies like American tech hotshots. I ask Michael Kramer, a gracious member of the company's public relations office whose pleasant slept-in style suggests an underpaid math teacher, about company perks. To recruit the world's best engineering talent, huge companies typically lay it on thick. So what's TSMC got? Sabbaticals for self-exploration, aromatherapy rooms? Kramer tells me that employees get a 10 percent discount at Burger King. *Ten percent*. Perhaps people come to work at TSMC just to work at TSMC.

The first time I asked Kramer about visiting the fabs, by phone from New York, he said no. It was like a fairy tale; he had to refuse me three times and I had to persist, proving my sincerity like a knight or a daughter of King Lear. Luckily, my sincerity is in long supply. My interest in the fabs borders on zealotry. TSMC and the principles it expresses have started to appear in my dreams as the last best hope for—well, possibly human civilization. I want to view the Sacred Mountain and its promises with innocent eyes, as if nothing at all in the past three centuries had compromised the fondest fantasies of Locke, Newton, Adam Smith.

The race in semiconductors is to the swift, and to the precise. Because velocity and precision are generally at odds in business—you move fast, you break things—TSMC's workforce is legendary. If you see the manufacture of semiconductors as nothing but factory work, you might slag the project as monotonous or, more callously, "on the spectrum." But the nanoscale work of chipmaking is monotone only if your ears aren't sharp enough to hear the symphony.

Two qualities, Mark Liu tells me, set the TSMC scientists apart: curiosity and stamina. Religion, to my surprise, is also common. “Every scientist must believe in God,” Liu says.

I’m sitting across from the chairman in a conference room filled with trophies. A scale model of a full-rigged Japanese treasure ship, a gift from Yamaha, is magnificent. To our interview Liu has brought a model of his own: a Lego model of TSMC’s showstopping fin field-effect transistor, which controls the flow of current in a semiconductor using an electric field, a narrow fin, a system of gates, and very little voltage. “We are doing atomic constructions,” Liu tells me. “I tell my engineers, ‘Think like an atomic-sized person.’” He also cites a passage from Proverbs, the one sometimes used to ennable mining: “It’s the glory of God to conceal matter. But to search out the matter is the glory of men.”

Understood. But the Earth doesn’t exactly hide its sand, the source of silicon. Liu’s doctoral research at UC Berkeley in the 1970s was on the serendipitous ways that ions behave when shot into silicon; he means it’s *atoms* that God has secreted away. These indestructible treasures have always been buried in matter, awaiting the invention of scanning electron microscopes and scientists with enough assiduity to spend decades on end peering into their atomic eyes. “There’s no way out,” Liu tells me. “You always feel you are scratching the surface. Until, one day, it’s revealed to you.” His guileless manner and expansive sense of wonder must be unique among CEOs of global megacompanies. Nothing about him comes off as shady or cheap like Elon Musk or the Overstock person. I remember a phrase from the liturgy of my childhood church: gladness and singleness of heart. That is Liu.

Is curiosity adaptive? Certainly it’s unique to some nervous systems, and it prompts an eccentric cadre among us—research scientists—to approach the material world as a never-ending onion-skin problem. “With unrelaxed and breathless eagerness, I pursued nature to her hiding-places,” said Victor Frankenstein. At Liu’s TSMC, this pursuit can seem like a form of athleticism or even erotics, in which select GOATs penetrate ever deeper into atomic spaces.

Stamina, meanwhile, allows the TSMC scientists to push this game of atoms forward without flagging, without losing patience, through trial and error after error. How one *stays* interested, curious, consumed with an unrelaxed and breathless craving to *know*: This emerges as one of the central mysteries of the nano-engineering mind. Weaker minds shatter at the first touch of boredom. Distraction. Some in Taiwan call these American minds.

The transubstantiation happening inside the fabs goes something like this. First comes the silicon wafer. A projector, its lens covered by a crystal plate inscribed with distinctive patterns, is craned over the wafer. Extreme ultraviolet light is then beamed through the plate and onto the wafer, printing a design on it before it's bathed in chemicals to etch along the pattern. This happens again and again until dozens of latticed layers are printed on the silicon. Finally the chips are cut out of the wafer. Each chip, with billions of transistors stacked on it, amounts to an atomic multidimensional chessboard with billions of squares. The potential combinations of ons and offs can only be considered endless.

During the pandemic lockdown, TSMC started to use intensive augmented reality for meetings to coordinate these processes, rounding up its far-flung partners in a virtual shared space. Their avatars worked symbolically shoulder to shoulder, all of them wearing commercially produced AR goggles that allowed each participant to see what the others saw and troubleshoot in real time. TSMC was so pleased with the efficiency of AR for this purpose that it has stepped up its use since 2020. I've never heard anyone except Mark Zuckerberg so excited about the metaverse.

But this is important: Artificial intelligence and AR still can't do it all. Though Liu is enthusiastic about the imminence of fabs run entirely by software, there is no "lights-out" fab yet, no fab that functions without human eyes and their dependence on light in the visible range. For now, 20,000 technicians, the rank and file at TSMC who make up one-third of the workforce, monitor every step of the atomic construction cycle. Systems engineers and materials researchers, on a bruising round-the-clock schedule, are roused from bed to fix infinitesimal glitches in chips. Some percentage of chips still don't make it, and, though AI does most of the

rescue, it's still up to humans to foresee and solve the hardest problems in the quest to expand the yield. Liu tells me that spotting nano-defects on a chip is like spotting a half-dollar on the moon from your backyard.

Beginning in 2021, hundreds of American engineers came to train at TSMC, in anticipation of having to run a TSMC subsidiary fab in Arizona that is slated to start production next year. The group apprenticeship was evidently rocky. Competing rumors about the culture clash now circulate on social media and Glassdoor. American engineers have called TSMC a “sweatshop,” while TSMC engineers retort that Americans are “babies” who are mentally unequipped to run a state-of-the-art fab. Others have even proposed, absent evidence, that Americans will steal TSMC secrets and give them to Intel, which is also opening a vast run of new fabs in the US.

In spite of the fact that he himself trained as an engineer at MIT and Stanford, Morris Chang, who founded TSMC in 1987, has long maintained that American engineers are less curious and fierce than their counterparts in Taiwan. At a think-tank forum in Taipei in 2021, Chang shrugged off competition from Intel, declaring, "No one in the United States is as dedicated to their work as in Taiwan."

Black coffee at 7-Eleven is perfectly potable, especially when Kramer treats me to a cup. He gets the company discount there too. Kramer is a good hang. I like that he teases me about my fascination with TSMC; I get the sense that he's used to brooking destabilizing questions about cross-strait tensions and maybe fewer about the sacredness of the fabs. As we wait for word about my tour, I try more grand theories on him.

For a company to substantially sustain not just a vast economic sector but also the world's democratic alliances would seem to be a heroic enterprise, no?

But it seems possible that even those feats are not the most spectacular of TSMC's accomplishments. Last spring, on an episode of *The Ezra Klein Show*, Adam Tooze, the Cambridge-trained economic historian, rejected the idea that the fabs are *merely* formidable commercial and geopolitical forces. “If you think about conflicts around Taiwan,” Tooze told Klein, “the global semiconductor industry isn’t just the supply chain. It’s one of humanity’s

great technological scientific achievements. Our ability to do this stuff at nanoscale is us up against the face of God, in a sense.”

Up against the face of God. In Tooze’s peerless empire accent. I attempt an impression for Kramer and tell him I’d had to rewind the podcast over and over to confirm Tooze’s phrasing. It now plays in my mind like an Anglican hymn, a necessary counterpoint to my staccato fears for human civilization, born in the Trump era and still banging away at my neurons.

Kramer tells me he’s the son of a Lutheran missionary from the US and a Taiwanese teacher. He went to a Christian school in South Taiwan, and later Taipei American School. Although Christians make up only 6 percent of the population of Taiwan, Sun Yat-sen, the founder of the Republic of China, was a Christian; President Chiang Kai-shek was a Methodist; and President Lee Teng-hui was a Presbyterian.

When, later, I recite Tooze’s words about God’s face to Mark Liu, he quietly agrees, but refines the point. “God means nature. We are describing the face of nature at TSMC.”

Like money, silicon chips are both densely material and the engine of nearly all modern abstraction, from laws to concepts to cognition itself.

Illustration: Basile Fournier

As TSMC scientists describe the face of nature, nation-states compete to make better semiconductors. They’re either building fabs and improving technology to keep up with TSMC, as China is hell-bent on doing, or deepening an alliance with TSMC and Taiwan, which often speak as one. That’s what the US is doing. Although the special relationship between the US and Taiwan is still an ambiguous affair, it may now compete in consequence with the 20th-century alliance between the US and the UK.

The CHIPS and Science Act, which US President Joe Biden signed into law in August 2022, grew out of a \$12 billion deal to bring TSMC fabs to American soil. That deal was brokered in large part by Keith Krach while he served as the US’s chief economic diplomat. Among Krach’s goals was to fortify a dependable supply chain based on TSMC’s broad network of

suppliers. The CHIPS Act now provides roughly \$280 billion to boost American semiconductor research, manufacturing, and security, with the explicit aim of aggressively sidelining China from the sector—and thus from the world economy. “Xi is absolutely obsessed with the semiconductor business,” Krach tells me.

Charming and self-assured, Krach at 65 is a proud graduate of Purdue, the land-grant university in Indiana, where he got a BS in industrial engineering, chaired the board of trustees, and now oversees the Krach Institute for Tech Diplomacy. As a teenager, he trained as a welder, and—though he was the youngest-ever vice president at General Motors, served as CEO of DocuSign, and cofounded the software company Ariba—he still comes across as disarmingly wholesome. Before his stint at the State Department, he’d had no experience in government.

The notion of “decoupling” from China, which would mean closing off trade and shutting Chinese scientists out of projects like green tech and cancer research, struck me as shortsighted. But on the subject of blackballing China from commercial domains where it doesn’t play fair, Krach was persuasive. At DocuSign, he’d started thinking about trust. Specifically, he had turned the electronic-agreements company from a startup to a powerhouse by generating both real security for users and an aura of confidence around the software that would let people submit their most sensitive documents for a digital autograph. “Trust in technology is everything,” Krach says.

The passing good faith required of signatories to online docs is small potatoes compared with the international fellowship required to produce silicon chips. To make a batch of chips for, say, Nvidia, requires a flying leap into dizzying international glasnost involving countries of diverse cultural and ideological stripes. To preserve the finely tuned set of relationships among trading partners in the “rules-based international order,” as Secretary of State Anthony Blinken invariably calls it, any authoritarian nation that can’t be trusted must be consigned to a penalty box. Like many now trying to codify modern ethics in commerce, Krach defines an entity, governmental or private, as trustworthy if it has fair

policies on the environment, national sovereignty, human rights, corporate governance, property rights, and social justice.

While at the State Department, Krach pulled off a masterstroke. In the early days of 5G networks—extremely low-latency broadband that allows even surgeons to work remotely—Krach ventured out on a global round of freestyle diplomacy. During the height of the pandemic, he and a small, masked delegation zipped around the world to more than 30 countries, from Spain to the Dominican Republic to Cyprus to the United Arab Emirates. He aimed to persuade powerful figures in a range of positions that they shouldn't work with the Chinese company Huawei on 5G, however right the price. To do so would be to subject their networks to Chinese infiltration, and “dirty” networks, Krach said, would be banned from America's reindeer games.

The gentlemanly extortion was a risk. But his Midwestern charm worked wonders. When the world's leaders worried that they couldn't afford to participate in Krach's so-called Clean Network Alliance of Democracies, he folksily shamed them about bedding down with a country that spies promiscuously and uses slave labor. Huawei was successfully routed. About 15 percent of the world's chip supply still originates in China, and the Communist Party's new chip czar commands a trillion-dollar budget to expand the business over the next decade. But now the irreplaceable semiconductor sector that relies so heavily on dependable 5G is growing in the rules-based world order, largely without Chinese participation.

Krach is proud of the coinage “trusted technology” to describe DocuSign and 5G networks, and the more I consider the state of play, the more that pride seems mostly warranted. Morris Chang offered TSMC's fabrication services to other companies at a time when most of them were making their own chips. To get those companies to let TSMC take over chipmaking for them, he talked up trust from the start.

But surely trust, like honor, exists in crime syndicates and closed oligopolies too. What makes that trust distinctive, among the parties to the “clean” network, is that it must go hand in hand with pluralism. You can trust more players, after all, if you can tolerate diverse social arrangements and you don't swear off countries just because they have illiberal *or*

progressive streaks: if they employ the death penalty, say, or allow gay marriage. Above all, players who trust each other to trade must be able to trust each other not to cheat. “Think about things like integrity, accountability, transparency, reciprocity, respect for rule of law, respect for the environment, respect for property of all kinds, respect for human rights, respect for sovereign nations, respect for the press,” Krach proposes to me. “These are things that we have in the free world”—the safeguards of mutual trust.

Last December, with both Liu and Biden in attendance, TSMC unveiled its fab in Phoenix. At the ceremony, Gina Raimondo, the Secretary of Commerce, addressed a small crowd. “Right now in the United States, we don’t really make any of the world’s most sophisticated, bleeding-edge, cutting-edge chips,” she said. “That’s a national security issue, a national security vulnerability. Today, we say we’re changing that.” For his part, Liu emphasized that the American fab will be part of “a vibrant semiconductor ecosystem in the United States.”

Liu and Biden were careful not to describe the fab as a move toward semiconductor independence for either country but, rather, as one that locked in their entente. And while Biden focused on the 10,000 jobs the TSMC fab is bringing to Arizona—the largest foreign investment in the state in history—the biggest news in tech was that Tim Cook was in attendance. Weeks before, Cook had disclosed that Apple was going to start using TSMC’s “American-made chips.”

Known but not spoken at the opening event was that these chips would still be Taiwanese-engineered, their specs brought up to the minute—up to the femtosecond—by TSMC’s research team in Hsinchu. Far more than in August, when US House Speaker Nancy Pelosi visited Taiwan (where she met with Liu but was evidently kept out of the fabs), the US and Taiwan may have finally sealed their provocative alliance on this much quieter day in Phoenix.

I hope Kramer can see that I myself am trustworthy. The threat from across the strait, and the threat from anyone who might be even slightly allied with that threat, is ever-present. But I’m no wily Snowden. Yes, I’m told, spies hang around Taipei by the hundreds if not thousands; surely mall clothes

make for superb spycore. But I'm just a tired pilgrim hoping for a glimpse of God.

At the same time—it occurs to me in a rush—I can't let Kramer mistake my indifference to personal style for irreverence. Etching on atoms is no joke. The fabs demand caution, reverence, and of course the hygiene of an abluted priest. A jittery, uninitiated person without an engineering degree could be a menace in the fabs, where she could sneeze like a putz and scatter a heap of glittering electrons like cocaine in *Annie Hall*. I'll banish my chabuduo from the utterly dustless fabs like an errant molecule of neon gas.

Kramer has requested my measurements for a clean-room bunny suit and shoe protectors, which I take as a good sign I'll get inside. Then, suddenly, my tour of Fab 12A—known as a GigaFab because, every month, it processes fully 100,000 of the biggest wafers, the 12-inch ones—is on the calendar. My luggage even arrives.

Spirits buoyed, I head to Starbucks for a meal of mediocre flatbread with Victor Chan, a Taiwanese journalist and historian. I want to understand Taiwan before semiconductors, the Taiwan he grew up in. Chan talks in a steady stream.

Taiwan's commitment to semiconductor technology was born of economic necessity, Chan says, or maybe desperation. In the postwar period, the country barely survived, but it steadily got into light industry, manufacturing spoons, mugs, and, famously, umbrellas. Taiwan excelled at umbrellas. At the height of the boom in the '70s, three out of every four umbrellas worldwide were made on the island.

In that same decade, diplomatic relations between Taiwan and the United States frayed. Nixon had opened trade with China, and now China was making and exporting the goods Taiwan had once been known for. To take just one example, for 20 years, Mattel contracted with Taiwan to manufacture Barbie dolls in suburban Taishan, not far from Taipei; the town was devastated when Mattel eventually moved its Barbie business to China, where labor was cheaper. (Taishan still displays memorabilia of Barbie, the city's shapely plastic patron saint.) The Taiwanese government began to

devise a new way to make itself valuable to the US. Invaluable, rather, so it couldn't be neglected or pushed around.

American semiconductor companies also discovered Taiwan as a place to offshore chip assembly. In 1976, RCA began sharing technology with Taiwanese engineers. Texas Instruments, under the direction of Morris Chang, who was then in charge of its global semiconductor business, opened a facility in Zhonghe, a district near Taipei. Like all the new semiconductor foundries, including the ones in Silicon Valley, the Taiwanese shops were staffed largely with women. Not only did industrialists consider women easier to mistreat and underpay than men (no, really?), but they believed that women were better at working with small objects because we have small hands. (In 1972, Intel hired almost entirely women to staff its facility in Penang, Malaysia, claiming, according to Miller in *Chip War*, “they performed better on dexterity tests.”) Conveniently, men took over the jobs in the fabs when they became well paid and high status.

But through the '70s and '80s chips were made for export, and few in Taiwan knew what the fabs even made. “At first, we really didn’t have a clue about a chip,” Chan tells me. “Chips that come with ketchup? We had no clue.”

To remedy this, the Taiwanese government began to plow money into engineering education, just at the time that expertise was plainly depleted in China and academics had been persecuted and murdered in the Cultural Revolution. Some Chinese industrialists seemed to be losing faith in their country as a land of economic and educational opportunity, and restless Chinese entrepreneurs made common cause with the Taiwanese government.

This is how the Taiwanese government came to approach the American company Wang Laboratories in the 1980s with a koan: How do you make a computer? An Wang, the company’s Shanghai-born founder, took up the challenge to conduct research into computer-making in Taiwan, eventually moving many of Wang’s operations to the island.

"Careful attention to education over the last 30 years has begun to pay dividends," Wang said of Taiwan in 1982. "The output of engineering graduates in relation to the total population is much higher than in the US." Emphasizing that the company had "no plans to set up a manufacturing facility in mainland China, because Communism is not suited to economic growth," Wang planted an R&D facility in the newly built Hsinchu Industrial Park.

Meanwhile, in Dallas, Chang was spinning his wheels at Texas Instruments. He consulted a Song Dynasty poem that advised ambitious young men to climb to the top of a tall tower and survey all possible roads. He didn't see a road for him at TI, so he lit out to build one in Taiwan. First he took a job running the Industrial Technology Research Institute, which the Taiwanese government had established to study industrial engineering, and in particular semiconductors. Then, in 1987, K. T. Li, the minister in charge of tech and science, persuaded Chang to start a private manufacturing company that would export chips and generate more money for research.

TSMC opened its first fab that year and not long after laid the cornerstone for its headquarters in the same Hsinchu park as UMC and Wang. The Taiwanese government and the Dutch electronics company Philips were the first major investors. The Taiwanese–Dutch connection, formed in the early 17th century when the Dutch East India Company set up a trading base on the island, has been a leitmotif in semiconductors. Not only was Philips instrumental in starting TSMC, but TSMC's blood brother in chipmaking is now ASML, the photolithography giant based in Veldhoven.

Chips, the ones without ketchup, would eventually take the place of umbrellas and Barbie dolls in Taiwan's economy. And with its engineers developing the leading-edge chips faster than any place on earth, Taiwan did indeed force the US to rely on it.

"They call Taiwan the porcupine, right?" says Keith Krach. "It's like, just try to attack. You may just blow the whole island up, but it will be useless to you."

Illustration: Basile Fournier

To be truly essential, a global company must situate itself at a crux in the supply chain. Chang, who has said he studies the Battles of Midway and Stalingrad to devise corporate strategy, cannily installed TSMC between design and product. His plan was this: He would concentrate monomaniacally on one key but low-profile component of computers. He would then invite more flamboyant tech companies, the kind that blow their budgets seducing consumers, to close their own fabs and outsource chipmaking to TSMC. Chang gained trust by allaying fears that TSMC would steal designs, as pure-play foundries have no use of them; TSMC stealing from chip designers would be like a printing press stealing plots from novelists. This commitment to quietude has led TSMC to obtain a, let's say, *significant* market share. Some tech companies get Super Bowl ads, adoring fanboys, and rockets for their founders; TSMC gets 92 percent.

Krach now calls Chang “the oracle.” He grew up peripatetic in war-torn China and, in 1949, left for Harvard, where he studied English literature for two semesters. He remembers this period as “the most exciting year of my education.” Copies of Shakespeare’s tragedies and *Dream of the Red Chamber*, the classic Qing Dynasty novel, now sit on his bedside table. But even as the humanities captured his heart, Chang realized that in the US of the 1950s, Chinese men without scientific training, even those with Ivy League degrees, could get stuck working in laundromats and restaurants. Engineering alone offered a shot at the middle class. He reluctantly transferred to MIT. From there he went to Sylvania to work in semiconductors, and thence to TI, which paid for his PhD studies at Stanford.

To Chang, life’s most compelling challenge would turn out to come not from making widgets, networks, or software, but from keeping pace with Moore’s Law. In 1965, Gordon Moore, who would go on to cofound Intel, proposed that the number of transistors in a dense integrated circuit would double roughly every two years. In the early ’60s, four transistors could fit on a thumbnail-sized microchip. Today, on a stupendous chip TSMC makes for the AI company Cerebras, more than 2.6 trillion can. Moore’s Law is, of course, not a law at all. Liu calls it a piece of “shared optimism.” A simple way to put TSMC into ideological perspective is to think of Moore’s Law as hope itself.

In 2012, Chang was named an Engineering Hero at Stanford, a thin-air honor that's also been bestowed on figures like Larry Page and Sergey Brin. But unlike Page and Brin, Chang never seemed to want to make a name for himself (the highest 20th-century American ambition), much less build a brand (the 21st). His obsession at TSMC was with process: incrementally improving the efficiency of semiconductor fabricators. TI's factories had wasted as much as half of their meticulously sanded and latticed silicon in making delicate chips. That was insupportable. At TSMC today, the yield rate is a closely guarded number, but analysts estimate that some 80 percent of its latest chips make it to the finish line.

TSMC's economic strategy, then, is the same as its strategy for corporate architecture and the protection of Taiwan: Be indispensable but invisible. Make Chinese products work but never claim credit. Make Apple's products work but skip all "Intel Inside" preening. Perhaps only China, Apple, and TSMC's other customers know how integral the fabs are, but their absolute devotion, their terror of rocking the boat, is more than enough to secure real-world power for the company. Several people at TSMC told me their work at arguably the most powerful company on the planet is "unsexy." One told me that girls don't fall for TSMC engineers, but their mothers do. Invisible as suitors. Indispensable as husbands.

On go the fabs, then, as Moore's Law chugs like a train: *double the performance, halve the cost*. With profit margins almost unheard-of in manufacturing, Chang has created a research institute passing as a factory. In 2002, TSMC's lavishly funded R&D facilities enabled Burn-Jeng Lin, then the head of lithography research, to find an ingenious way to increase the resolution of patterns on chips. In 2014, Anthony Yen, a senior researcher, invented a method to dial the resolution still higher. The company now holds some 56,000 patents.

The night before my tour of the fabs, I take a Covid test and lay out respectable work clothes alongside two new black N-95s; masking is still mandatory. I hallucinate two red lines from across the room, but no, no Covid. In the morning I'll talk to Lin about how he invented immersion lithography. Later, I'll speak to Yen about how he invented commercial-use

extreme ultraviolet lithography. Making chips is printmaking, and to understand the printing press, I need to understand litho.

Photolithography machines are the specialty of TSMC's partner firms, and above all ASML. It's rumored that the next generation of these machines will cost around \$400 million. Every one of the world's most sophisticated chips uses ASML lithography. But advanced research on lithography is also conducted at TSMC, because it's the litho that must be refined in order to keep the fabs efficient, the transistors small, and the Moore wheels turning.

The word *lithography* means the same thing in the fabs as it does in art studios: the printing process invented in 1796 by Alois Senefelder, a German playwright. Though Senefelder had little effect on theater, he hit the printmaking jackpot when he found he could copy scripts if he transcribed them in greasy crayon on wet limestone and then rolled ink over the wax. Because oil and water don't mix, the oil-based ink stuck to the limestone in some spots and didn't in others. This is the foundational zero-to-one of lithography.

As late as the 1960s, electrical engineers were still dropping black wax onto blocks of germanium and etching away at it. Not a bad way to fit four or eight transistors on a chip, but as the number rose to millions, billions, and now even trillions, the components became first more invisible than wax and then much, much smaller than merely invisible. Along the way, engineers started etching with light.

Etching on these shrinking components required ever more precise light. The wavelength of the beams kept getting narrower until the light finally took leave of the visible spectrum. Then, around 2000, chipmakers confronted one of their periodic panics that Moore's Law had stalled. To get to transistors of 65 nanometers, "it was still possible using the tried system," Lin tells me. "But I foresaw that at the next node, which was 45 nanometers, we were going to have trouble."

People were putting their bets on extreme ultraviolet light, but it would be years before the litho machines in the fabs could muster enough steady source power for that. Another idea was to use what Lin calls a "less aggressive" wavelength, somewhere between deep and extreme ultraviolet.

But because such light couldn't pierce existing lenses, it would need an exotic new lens made of calcium fluoride. Researchers built hundreds of furnaces in which to grow the right crystal, but no method did the trick. Close to a billion dollars went up in smoke.

Around 2002, Lin decided that they were wasting time. He wanted to forget about the new wavelength and the impossible lens and instead use water. With its predictable refraction index, water would give lithographers greater control over the wavelength they already knew. He invented a system for keeping water perfectly homogenous, and then he shot the light through it onto the wafer. Bingo. He could etch transistors as small as 28 nanometers, eventually with zero defects. "Water is a miracle," Lin says. "Not only for TSMC. It's a miracle for the whole of mankind. God is kind to the fish. And also to us."

Lin is another devout Christian at TSMC. His face is lively and expressive, and he looks and moves like a young Gene Kelly, though he's 80. I ask him if he, like Liu, sees God in atoms. "I see God in any scale," he says. "Look at a dog or a tiger—and then look at the food that we eat. It's marvelous. Why? Why is that?" Having been dead set against Christianity as a young student in Vietnam, when he considered it a superstition, and a foreign one at that, Lin was ultimately drawn to the idea that God is "a superintelligent being."

TSMC was now at the forefront of semiconductor research. But it was still under the lash of Moore, and the pressure didn't let up. In 2014, Anthony Yen, who had succeeded Lin as head of research at TSMC, had been developing the next generation of litho for a decade. Yen, who now runs research at ASML, tells me that extreme ultraviolet lithography came together in the fall of that year.

"We always worked late at TSMC," Yen says. On the evening of October 14, he was gearing up for an especially long night. A team from ASML had come to TSMC to test out the new power-source conditions that Yen's team had been working on. With the existing specs, the power source was reliable only at 10 watts; with the new ones, they hoped to hit 250. Yen ate his dinner quickly, gowned up, and went into the fab, where they began

cranking up the power. When it hit 90, that's when he knew. "This was the eureka moment," Yen says.

The movement from 10 to 90 watts meant a rise in power by a factor of nine. That the machine had accomplished this meant to Yen that the jump from 90 to 250, a mere tripling, was more than feasible. It was inevitable. Yen became so excited—"too excited," he says—that he couldn't even stay to watch the power hit 250. He ran out of the fab, flinging off his bunny suit. "I was euphoric. I was on drugs. For the believer, it is quite a religious experience." TSMC had the raw power it needed. The company has continued to refine all of its processes, especially, with ASML, the extreme ultraviolet lithography machines. Today, TSMC's transistors are down to just over 2 nanometers—the smallest in the world. These unseeable gems go into production in 2025.

Back in the university conference room, after reflecting on TSMC's triumphs in litho, Burn-Jeng Lin poses gamely for a photograph. "God is very kind to mankind," he says again. God's kindness, the miracle of water, religious euphoria—it swims in the mind like a school of blessed fish. A line from William Blake seems right: *To see a World in a Grain of Sand*. That's what we're here for.

I put a parting question to Lin: How in the world do you remain undaunted by all these extraordinary problems in nanotechnology? Lin laughs. "Well, we just have to solve them," he says. "That is the TSMC spirit."

Burn-Jeng Lin, TSMC's former head of research and the inventor of immersion litho, still speaks of the company as "us."

Photograph: SEAN MARC LEE

The moment has come. I'm Neo now, or the everyman in Pilgrim's Progress, stepping into my destiny. Kramer, walking with me, once again laughs at my obsession with the fabs. He seems to find them a little dull, and I'm repeatedly told I won't be able to see much.

That doesn't bother me. Even I understand that much about nanos. But to observe and to behold are two different pastures. Observation is for objects

of scientific study. Beholding is for the sublime.

Few precautions are taken at TSMC, I must say, to *prevent* the passage into the foundry from being thrilling. I swish through a turnstile entrance that brings to mind *The Phantom Tollbooth*—allusions are coming fast and furious now—and I’m deposited before a kind of human car wash for dramatic personal ablutions. A single machine washes, rinses, and dries my hands. Two guides appear, likewise cleansed of earthly cares, and lead me into a broad antechamber that could be part of a very, very clean senatorial Roman bath.

Orderlies, in their own pristine jumpsuits, bring out our perfectly sized gowns. They also fit protectors over my shoes. To have a white-clad figure at my feet carefully adjusting the booties feels tender, somehow; I want to be sure to convey my gratitude, but it’s hard with a Covid mask on my face, glasses over my eyes, and a hood covering my hair and most of my forehead. Our bodies are not quite here.

I’ll later learn that even the hand-washing room has extraterrestrially clean air. Ordinary air can have up to 1 million particles of dust per cubic meter. The fabs and cleaning rooms have no more than 100. As I step into the fab at last, I can tell at once it’s the cleanest air I have ever inhaled.

I’m prepared both for a climax and for an anticlimax, but my experience is not on that continuum at all. The vast room is bright and clear. When those who claim they’ve had a near-death experience during surgery speak of a bright light, they surely mean the hospital overheads. That’s what it looks like here in the bleached and antiseptic atmosphere, near death and clinical-heavenly.

Pacing around, though, I start to hope that the last perception of those who die in sickbeds *is* the effort hospitals make to convey paradisal spotlessness in the context of broken flesh and gore. What a wonderfully human folly, to try to create immaculateness. The lamps in the fabs, like those in hospitals, shed egalitarian, unsparing, but also unjudging light, the approximation of sunlight that’s required of physicians and scientists, and also of democracies.

At the sight of the lithography machine, my eyes mist. Oil, salt, water—human emotions are shameful contaminants. But I can't help it. I contemplate, for the millionth time, etched atoms. It's almost too much: the idea of tunneling down into a cluster of atoms and finding art there. It would be like coming upon Laocoön, way, way out, out beyond the Milky Way, out among some unnamed stars, suspended in outer space.

A saying at TSMC is that time flies in the fabs. It's true. We're inside for an hour, but it feels like 20 minutes. I'm soaring, though in a more usual frame of mind this place might strike me as a market obscenity. Why do humans need all these chips? To scroll, to text, to Uber? Or they might seem like an exercise of power—a jingoistic flex like the moon landing. Given the role of TSMC as the Sacred Mountain of Protection, the fabs could be simply terrifying, nuclear warheads in a hanger champing at the bit to destroy worlds.

But greed and power are not what the fabs conjure. Nor democracy. Nor Christianity. I walk very slowly. The white humming machines are featureless, and thick hermetic glass stands between me and the fathomless nano-processes that I couldn't have perceived with my crude pupils anyway.

It dawns on me at once that the machines resemble incubators in a neonatal intensive care unit.

Inside them, something very fragile flickers between existence and whatever comes before existence. Tiny souls that must be protected from less than a nano of gas are surely immunocompromised. I picture the transistors as trembling bodies with translucent skin and fast, shallow breaths. They are utterly dependent on adults who cherish them for their extraordinary smallness and cosmic potential. What's present here is preciousness. To see the fabs is to feel a full-body urge to keep the tiny marvelous creations—newborns—and then humanity as a whole—alive.

Later, I'll take comfort in my TSMC-animated iPhone while I make a call home to my kids. Back in the US, I'll remember that no global corporation deserves veneration. But while I'm in Taiwan, I see "no way out," as Liu might put it, when it comes to the pursuit of Enlightenment ideals. There

exists a physical world of calculable regularity. Math and logic can establish the truths of that world. Humans are capable of both profound goodness and feats of soaring genius. Democracy, individual liberty, and freedom of expression clear a path to wisdom, while closed autocratic hierarchies impede it. Thomas Savary again: “The continuous exchange of commodities makes for all the sweetness, gentleness, and softness of life.”

“I hope the bad guys will get their penalty,” Liu said, when I asked about his hopes for the future. It was the first edgy thing I’d heard the TSMC chairman say. “And I hope the righteous”—he broke off—“human collaboration will continue.”

On the Sacred Mountain, new forms of civic virtue and scientific ambition are taking shape. But even the most rarefied metaphysics at TSMC rest on a tangible substrate: silicon. Silicon is one of the few supremely un-rare objects of desire. It’s the second most abundant element in the Earth’s crust, after oxygen. Its versatility has defined an epochal cultural regime change, in which the passive starting-and-stopping of electric flow—electrical engineering—has given way to modern electronics, the dynamic and imaginative channeling of electrons. “God made silicon for us,” Liu told me.

And so we have invested our labor, treasure, and trust into silicon, and wrested from it new ways of experiencing, and thinking about, nearly everything. While humans have been busy over these six decades with our political anguish, and our wars, we have also created a universe *inside* our universe, one with its own infinite intelligence, composed of cryptic atomic switches, enlightened with ultraviolet and built on sand.

Updated 3-22-2023, 10 am PST: Mark Liu earned his doctorate at UC Berkeley, not MIT.

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Mar 9, 2023 6:00 AM

On the Trail of the Fentanyl King

An Iraqi translator for the US military emigrated to Texas to start a new life. He ended up becoming one of the biggest drug dealers on the dark web.

ILLUSTRATION: MONET ALYSSA

In a nondescript house on a quiet street in a middle-class suburb of Houston, Texas, Alaa Allawi hunched over his black and gold laptop. It was early 2017, and Allawi ranked among the top 10 vendors on [AlphaBay](#), at the time the dark web's biggest bazaar for all manner of illegal wares. Every week he moved dozens of packages of illegal narcotics: cocaine, counterfeit Xanax, and fake OxyContin.

An order came in from a young marine in North Carolina. He wanted Oxy. Allawi went about fulfilling the order, choosing from among the bags of powders and chemicals strewn about his attic and garage. He had precursor chemicals, binding agents, and colored dyes from eBay, as well as fentanyl—a synthetic opioid 50 times more potent than heroin—from China. “Man, you can order anything off the internet,” Allawi once told a friend. It was the secret to his success.

Allawi poured the ingredients into a Ninja blender, pulsed it until the contents seemed pretty well mixed, then went outside to the shed in his backyard. Inside were two steel pill presses, each the size of a small fridge and dusted with chalky residue. He tapped the potent mixture into a hopper atop the press, which came alive with the push of a button. Out shot the pills a few minutes later, stamped to look like their prescription counterparts. Soon, the fake OxyContin was ready to be shipped, sealed first in a bag and then stuffed into a parcel. A member of Allawi’s crew

dropped the order off at the post office, along with a pile of other packages addressed to buyers all over the country.

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If Allawi believed the dark web's anonymity was enough to shield him from the prying eyes of law enforcement, he was wrong. Allawi's work—slipping small amounts of fentanyl into counterfeit pills, making them effective but highly addictive and sometimes lethal—was fueling the latest deadly twist in a national opioid epidemic that has taken more than 230,000 lives since 2017. Allawi's contribution to that crisis had made him a prime target for the US Drug Enforcement Administration, and federal agents were intercepting parcels containing his fentanyl-laced pills from Kansas to California. Allawi didn't know it at the time, but shipping these pills to North Carolina would cement his downfall.

Today, Allawi sits in a federal prison in northern New York, where he's serving a 30-year sentence. His case was the first prosecution for dealing fentanyl using the dark web and cryptocurrency in the American Southwest, and investigators described his operation as a bellwether for the growing counterfeit pill market in the US. Over the course of more than two years of email exchanges, he told me his story: a criminal odyssey whose seeds were planted thousands of miles away, on a US Army base in Iraq.

When the United States invaded Iraq, Allawi was a 13-year-old living in a suburb of Baghdad. On his 18th birthday, he applied to become an interpreter for the US Army. His uncle, a doctor, had encouraged him to learn the language from a young age. Allawi's English wasn't great, but he had been a sharp student, the kind of kid who dreamed of going to medical school himself one day. He got the job.

He was quickly dispatched to Rasheed Airbase near Baghdad, where he bounced from one unit to the next. The job paid well by Iraqi standards at \$1,350 a month, but it was dangerous. Al Qaeda didn't look kindly on Iraqis who collaborated with the US. Allawi says that insurgents tied one of his friends, also an interpreter, to the back of a car and dragged him around the neighborhood until his limbs tore apart. They hung another from an electric

pole and left his corpse up for days as a warning. Allawi took to wearing gloves and masks while on patrol in his neighborhood so he wouldn't be recognized.

The work was also occasionally heart-wrenching. Allawi recalls one house raid where the Americans were searching for someone suspected of cooperating with al Qaeda. After they made an arrest, the soldiers realized their satellite phone was missing. An officer proceeded to question several women who were in the house. When he got to an elderly woman, he ordered Allawi out of the room. Minutes later, the woman ran out after him, tears streaming down her face. All the women there fell to their knees, begging Allawi to stop the search. The officer, they said, had frisked the older woman and reached for her private parts. Allawi was livid, but there wasn't much he could do. "I felt not only enraged but also the feeling of a person that belongs to an invaded country and the humiliation that comes with it," he says. Eventually, the soldiers found the phone on top of a fridge, where one of them had left it.

Most of the time, though, Allawi got along well with the Americans. Thanks to years of watching Hollywood movies, he had a good grasp on their culture and wouldn't say anything when they crossed their legs or exposed their soles, which are considered insults in the Arab world. "Everyone liked Alaa," says Daniel Robinson, who worked with Allawi as a contractor in Iraq. The two men spent a lot of time together on base, sharing meals and swapping stories about their lives and families. Robinson smoked his first hookah on the floor of Allawi's barracks.

"The running joke was, don't let Alaa on your computer."

Daniel Robinson, US contractor

Steroids were prevalent on US bases. "As easy to buy as soda," one military contractor told the *Los Angeles Times* in 2005. Allawi began selling them to American soldiers and was dismissed from the unit he'd been serving with. Within a few months, he got another translation job, this time with AGS-AECOM, a private contractor rebuilding maintenance depots at Camp Taji, near Baghdad.

Now Allawi spent his days sitting behind a computer in a cubicle, translating operation manuals for Humvees that the US was reselling to Iraq. Allawi had always loved being around computers. When he was 14, he'd purchased parts one by one—a hard drive here, a RAM module there—until he had assembled a functioning machine. At Camp Taji, he immediately dove in, probing the company's internal networks like a deep-sea diver exploring an unknown world. "The depot job was a boring one," he says. "Not much was happening, but I used half of my job time to learn coding and hacking."

It was also at Camp Taji that Allawi met Eric Goss, an impish 25-year-old Texan who shared his love of hip hop and would become a friend. Goss recalls one day when the camp's head of operations called a meeting with the translators and contractors on the base. Allawi, he announced, was now cut off from accessing the internet on his computer. According to Goss, Allawi had hacked their boss's email, found messages he was sending to his mistress, and forwarded them to the boss's wife. (Allawi denies that he did this.) But the new restrictions didn't stop Allawi. He found a way to install a password recovery tool on his computer that he could use to crack his way into the company's wireless network. Around Camp Taji, Robinson recalls, "the running joke was, don't let Alaa on your computer."

Allawi put his burgeoning tech skills to use off base, as well. He built a website called Iraqiaa.com, an online dating and chat platform aimed at young Iraqis. At least one guy ended up marrying a woman he met on the site, Allawi says. At Iraqiaa's height, he was earning a cushy \$5,000 a month from subscriptions. People started asking Allawi to design sites for them. He purchased a server from a cloud provider and started his own hosting company. For a time, it looked like he could put together a tech career in Iraq.

Many of Allawi's fellow interpreters had chosen to leave Iraq for the US as part of a special visa program. Goss, who had returned home to Houston, kept probing Allawi on MySpace: "When are you getting your ass to the United States?" For a while, Allawi put him off, but his outlook on life in Iraq was changing. It dawned on him that his options for pursuing a full-

fledged IT career there were limited. “I realized that I couldn’t go further in my country,” he says.

In 2012, Goss received a message from Allawi. He was coming to the US.

For a time, it looked like Allawi could put together a tech career in Iraq.

Illustration: Monet Alyssa

On September 12, Allawi landed in San Antonio.

He was ready to start a new life in Texas. Catholic Charities set him up with a driver’s license, food stamps, a \$200 monthly stipend, and a free place to stay. He received an online high school diploma, then enrolled in a pre-nursing program at San Antonio College. He managed to complete four semesters, but eking out a living soon took priority. The food stamps were valid for only six months, as was the rent-free arrangement. Allawi found a job as a machine operator at a door manufacturer 45 minutes away. The pay barely covered his commute and college expenses.

Allawi moved in with another former translator named Mohamed Al Salihi, who had arrived in Texas more recently and was moonlighting as a bouncer. They had a spare room, which they advertised on Craigslist to earn extra money. Their first renter, Allawi says, was a young woman who liked to party with a group of weed-smoking friends. Soon enough, Allawi was hanging out with them.

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Allawi was spending enough time with American college students to sense a business opportunity. He started selling weed at parties near the University of Texas at San Antonio (UTSA). “It was just for surviving,” he says. He was intent on furthering his education, he insists, and took on a student loan. The plan was simple: pay his bills, sell weed at parties, and go to school. But this new venture put him in contact with other drug dealers

and harder substances. “There is American saying,” Allawi adds. “If you hang around the barber-shop too long, you will end up with haircut.”

In 2014, he was evicted for failing to pay \$590 in rent. For a brief period, he slept in his car. He started selling cocaine on the street. On January 14, 2015, Allawi was arrested while driving with a small-time drug dealer who was known to local law enforcement. An officer searching the vehicle found less than a gram of cocaine, 10 Adderall pills, and about 100 Xanax pills, according to Allawi, who says the tablets belonged to the passenger. Allawi was charged with the manufacture and delivery of a controlled substance, but because he had no criminal record, he was sentenced to community service. His run-in with the law didn’t dissuade him from selling drugs. He was just getting started.

Allawi had reconnected with Goss by then. Sometime in 2015, Goss got him a job designing a website for a business in Austin. One of the employees confided to Allawi that he’d been buying drugs on the dark web. “It’s like an Amazon for drugs,” he said. Intrigued, Allawi did his own research. “I went and asked the wizard of all time, Mr. Google!” he says.

The introduction blew the doors of drugmaking wide open for the Iraqi. Allawi wasn’t content dealing on the street anymore. He was chasing a broader market than San Antonio—hell, a broader market than Texas. He bought a manual pill press on eBay for \$600, eventually upgrading to a \$5,000, 507-pound electric machine capable of spitting out 21,600 pills an hour. He also used eBay to purchase the inactive ingredients found in most oral medications, such as dyes. On May 23, 2015, Allawi created an account on AlphaBay. He named it Dopeboy210, most likely after the San Antonio area code, according to investigators. That fall, Allawi dropped out of school for good.

At the time, AlphaBay was one of a handful of would-be successors to Silk Road, the infamous dark-web market that had been shut down in 2013. If you had a Tor browser and some bitcoins, AlphaBay offered drugs by the kilo, guns, stolen credit card data, and more, all with complete anonymity—or at least that’s what many customers believed. Between 2015 and 2017, the site saw more than \$1 billion in illegal cryptocurrency transactions, according to the FBI.

DopeBoy210 eventually offered no fewer than 80 different products. X50, a package of 50 Xanax pills, was one of Allawi's flagship items and earned enthusiastic reviews. "Good shit," one AlphaBay customer wrote, according to data provided by Carnegie Mellon professor Nicolas Christin. "Kick ass," wrote another. The pills were fake.

At first, Allawi blended chemicals with methamphetamine and used his press to churn out tablets stamped as Adderall and Xanax. Students looking to pull an all-nighter or riddled with anxiety craved this stuff; UTSA made for a lucrative outlet. Allawi then moved on to fake OxyContin pills laced with fentanyl that he ordered from China on the dark web. (Allawi declined to say why he switched to fentanyl, but investigators told me that drug dealers like it because they can make thousands of pills using minute amounts.)

Allawi expanded his operation to a small circle of trusted associates. Some he had met at house parties, like Benjamin Uno, a twentysomething Dallas native whose promising basketball career was cut short by injury, and Trevor Robinson, a mustachioed fan of Malcolm X (with no relation to Daniel Robinson, the contractor). Uno helped Allawi manufacture the pills, and he and Robinson took charge of mailing out the merchandise. (Uno and Robinson didn't respond to requests for comment.) Allawi also recruited Al Salihi, his old roommate, to guard drugs stashed at an apartment 10 minutes from UTSA.

The dark web "is like an Amazon for drugs."

Illustration: Monet Alyssa

Sporting a beard and a tattooed right arm, Hunter Westbrook had come to UTSA after toiling away in the oil fields of West Texas. The patrolman was used to dealing with the occasional marijuana trafficker on campus. But toward the end of 2015, something changed. Adderall pills, not just weed, flowed into dorms and parties. Then the overdoses began. When UTSA analyzed some of the pills in a lab, they were found to be laced with meth.

As a campus cop, Westbrook could do little more than stop cars for traffic violations, so he reached out to the San Antonio Police Department for

help. In the spring of 2016, he sat in a coffee shop and compared notes with Janellen Valle, an SAPD narcotics officer who was on a joint task force with the DEA. The two cops realized that their findings lined up. A Middle Eastern guy was apparently flooding the campus with marijuana and counterfeit pills. Tips from students led to a name: Alaa Allawi.

Soon after, the DEA took over the case. Investigators say that some pills at UTSA contained fentanyl. (Allawi says he never sold fentanyl on campus, only online.) The country was drowning in the opioid, and stanching the flow was a priority for the agency. The number of overdose deaths attributed to it had skyrocketed, from 1,663 in 2011 to 18,335 in 2016, surpassing those from prescription painkillers and heroin.

The DEA's San Antonio office was used to handling street dealers and Mexican cartels. But in July, an informant tipped off the DEA about Allawi's AlphaBay shop and sent the investigation spinning in a whole new direction.

The San Antonio office didn't do cybercrime. Sure, they had heard of Silk Road. But to the DEA agents in Texas, the dark web might as well have been Baghdad—a faraway land “out of sight, out of mind,” in the words of one investigator.

Westbrook became the office's de facto guide, largely because he was one of the few people there to have a vague understanding of what the dark web was. He met with cybersecurity professors at UTSA on how to access Allawi's account. He was by far the youngest member of the task force; around the office, he was known as “the millennial.”

The agents purchased a MacBook and a VPN subscription to access the dark web. They were floored when they saw DopeBoy210's shop. Based on the hundreds of comments left by satisfied customers, Allawi was a massive retailer.

Getting a peek at Allawi's online operations was relatively easy. To arrest him for it, the DEA would need to definitively link Allawi to his AlphaBay account, which meant they'd need to buy drugs from him. And to do that, they'd need bitcoins.

This had daunting implications for a governmental office, Westbrook realized. The task force might buy \$1,000 worth of the volatile currency, only to wake up the next day and find their wallet's value down to \$900 or up to \$1,100. Agency bigwigs didn't love schemes deviating from tradition, investigators say. They certainly were reluctant to become bitcoin speculators. "It was a headache," Westbrook says. (But not unheard of: As part of [a parallel investigation](#) into AlphaBay, DEA agents in 2016 bought drugs using bitcoin. Before that, they purchased crypto as they sought to [shut down Silk Road](#).)

In the meantime, the agents kept pounding away at the work they knew how to do: tailing suspects and working informants. As the new year began, the task force persuaded a judge to authorize the GPS tracking and tapping of Uno's and Allawi's phones, and later Al Salihi's. In March, Westbrook followed Uno from Allawi's house to a post office, where Uno delivered three boxes and a trash bag stuffed with what appeared to be envelopes. After that, postal inspectors would periodically intercept mail and packages intended for Allawi.

When he wasn't tailing members of Allawi's crew, Westbrook worked at a DEA desk that was unofficially assigned to rookies due to its awkward position in the middle of the open room. During the investigation, someone hung a handwritten sign that read MILLENNIAL ISLAND.

Westbrook usually sat alone, but on March 17 the rest of the task force was peering over his shoulder as he logged in to AlphaBay. The team had gotten the green light from DC: They could buy bitcoins and purchase drugs from Allawi. Navigating to the DopeBoy210 page, Westbrook bought 500 Adderall pills for \$1,400 worth of bitcoins, and an ounce of cocaine for \$1,200. He listed a mailbox at UTSA and finished the order.

About a week later, he drove to the campus to retrieve the package. Looking giddy under a beige ball cap, he inserted a key into mailbox number 825. The drugs were inside. There were only 447 pills and no cocaine, so Westbrook initiated a dispute with AlphaBay (which ended in favor of Allawi). But this was a detail. What mattered was that the agents had conducted an undercover buy on the dark web. The San Antonio DEA had entered a world its agents barely knew existed a year before.

Allawi had the money, the cars, the luxury sneakers, the bottle service. He was even in talks to open a local franchise for a juice bar chain.

Illustration: Monet Alyssa

Allawi's profits were rolling in, but they were still in the form of bitcoins, and he needed to convert them to cash. On LocalBitcoins.com, a bitcoin exchange platform, he met Kunal Kalra, a cheerful Californian who favored Mao collar shirts and a gold bitcoin pendant—a sign of his unwavering dedication to cryptocurrency. Kalra ran a bitcoin ATM out of a cigar shop in Los Angeles. Allawi began visiting the shop to exchange his bitcoin earnings for cash, and paid Kalra a fee for his help. By the fall of 2016, the two men moved their arrangement online. They transferred more than half a million dollars in total.

With plenty of cash, Allawi went on a buying spree. He made a \$30,000 down payment for a two-story slab house in a residential San Antonio neighborhood just south of UTSA. “I didn’t know how much money he was making until he came to Houston,” Goss says. The Texas native accompanied his friend on multiple trips to luxury car dealerships in the city that fall. In October 2016, Allawi set his sights on a white 2013 Maserati GranTurismo, which cost \$49,000. He began pulling wads of bills from a Louis Vuitton backpack and handing them to a salesman. Goss worried that paying cash would attract attention, but his friend refused to take a loan and owe interest. “Why am I gonna fucking pay?” Allawi said.

A few months later, Allawi took one of his cars in for an oil change. When mechanics lifted the car on a hoist, they found a curious black box affixed to the undercarriage. It was a tracking device. Allawi had it promptly removed. He was disturbed by the discovery, but not enough to stop. “I needed money, and things had to keep going,” he says.

Otherwise, though, Allawi was on top of the world. By spring of 2017, he had the cars, the luxury sneakers, and the bottle service. He was even in talks to open a local franchise for a juice bar chain. Ever the party guy, on March 23 he flew his crew out on a trip to Las Vegas. Allawi, Uno, Robinson, and Goss walked into Drai’s, a gigantic nightclub known as one of the most expensive in town. Lil Wayne was performing as the group

huddled in the VIP area. Allawi was wearing a \$2,000 suit that he'd nabbed on a whim at Caesars Palace—they all were, courtesy again of the boss. Allawi passed around an enormous bottle of Veuve Clicquot, a flashy move that didn't go unnoticed by the rapper onstage. "I don't know who these n---s is, but I need to be partying with them," Wayne shouted, according to Goss.

The four men snapped selfies, sticking out their tongues like a bunch of eager teenagers. They were having the time of their lives.

While Allawi's crew partied in Vegas, a man in the Midwest named Vincent Jordahl was recovering from a close brush with death. He'd snorted a blue powder—fentanyl—and collapsed on his living room floor. His mother found him and performed CPR before medics revived him with Narcan, a fentanyl antidote. He was taken to a hospital in Grand Forks, North Dakota. On March 25, city medics would rush to the home of another man, named Orlando Flores, who'd also overdosed on fentanyl-laced pills and also survived. The tablets originated in the same package, sent by Allawi sometime in March.

Less than a month later, on the East Coast, two other young men readied for a party of their own. Mark Mambulao and Marcos Villegas were marines stationed at Camp Lejeune, in North Carolina. It was Friday, April 14, and the duo were starting their weekend with some gin and tonics at a friend's house in Richlands, about 32 miles north of the base. Around 9:30 pm, Mambulao sent a girlfriend a photo on Snapchat of a friend's dog chewing his hat.

Then, Villegas pulled some pills out of a small black plastic bag and passed them around. Mambulao had experimented with drugs before, including LSD, mushrooms, ecstasy, and oxycodone, which he would either gobble up or crush and snort. These pills were advertised as OxyContin. Villegas had purchased them directly from an AlphaBay vendor named DopeBoy210. The friends all swallowed the pills at the same time.

About two hours later, Mambulao started to feel sick and passed out on the living room couch, so his friends laid him down in a spare bedroom, making sure he was on his side. When they checked on him later, he wasn't

breathing. The men called 911 and started to perform CPR, but it was too late. In the early hours of April 15, Mambulao died in a Jacksonville hospital. He was just 20 years old.

It turned out that the pill Mambulao ingested contained a lethal dose of fentanyl. The Naval Criminal Investigative Service began looking into his death. Cooperating with the Postal Inspection Service and DEA, the NCIS traced the drugs to Allawi. (Villegas pleaded guilty in 2019 to distributing oxycodone and fentanyl and was sentenced to 10 years in prison; a second marine was also charged in connection with the case.) Why did Mambulao overdose and not the other revelers that night? There was “no real science” informing Allawi’s pill-manufacturing, says Dante Sorianello, then the head of the DEA’s San Antonio office. “Some of these pills probably got very little fentanyl, and some got too much.”

The marine wasn’t breathing. His friends called 911. They started to perform CPR, but it was too late.

Illustration: Monet Alyssa

On May 17, a utility worker in a neon-yellow vest and hard hat walked up the driveway to Allawi’s house in Richmond and knocked on the door. “Sorry, power’s out,” he told the occupants. “We’re going to be working on it for a while.” Anyone who’s been in Houston on the cusp of summer knows what these words mean: Without AC, your home is going to turn into a furnace in no time.

Westbrook and Valle, clad in black bulletproof vests, watched from their cars as Uno and Robinson left the house. The utility guy was a DEA agent, and the whole thing was a ruse so they could raid the house without risking any lives. Law enforcement saw fentanyl as a threat to eliminate at all cost, which meant shutting down the drug manufacturing before moving to arrest Allawi.

At 1:38 pm, men sweating profusely in hazmat suits swarmed the house, lending an otherworldly look to this ordinarily quiet neighborhood. The suits were meant to protect the agents from fentanyl, which they thought

could incapacitate or even kill them if they simply touched it. They knocked on the door and got no response. They went in.

The search was fruitful. The agents placed their bounty in front of the garage in a spot demarcated by yellow cones. Among other drug paraphernalia, there were two pill presses, cardboard boxes from China containing ingredients, and enough drugs to put Allawi away for a long time: 500 grams of fentanyl powder, 500 grams of meth, 500 grams of cocaine, 10 kilos of fake oxycodone tablets laced with fentanyl, 4 kilos of fake Adderall laced with meth, and 5 kilos of counterfeit Xanax tablets. Agents found a Ruger revolver and a Sig Sauer pistol hidden in a couch in the living room. They walked out of Allawi's bedroom carrying an AR-15-style assault rifle and a loaded Glock pistol.

As they drove away one last time, all three men tossed their phones out the car window.

As the agents worked, Uno and Robinson drove by the house and realized what was happening. Far from being scared off by the raid, they returned to the scene with Allawi, Westbrook says. As they drove away one last time, all three men tossed their phones out the car window. Soon after, Allawi called Goss from a new number and asked to meet him at a ritzy house he was renting east of Houston. There, he retrieved a bag stuffed with \$50,000 in cash, Goss says, and asked his friend to drive him to the airport. The ringleader had decided to hole up in LA, where he had a condo—and an extravagant collection of sneakers—in the upscale Westwood neighborhood.

His operation was unraveling fast. "I'm fucked. It's over," he kept repeating in the car. Like any good drug boss, Allawi started planning his escape. He considered hiding in Dallas or California, according to Goss. When things settled, he could go back to Iraq, where the money he'd sent over the years had allowed his family to start a strip mall. He could flee to Mexico and fly out from there.

But for weeks after the raid, there were no cops in sight. Allawi wondered whether he'd dodged a bullet. Eventually he felt secure enough to return to Texas. One evening at the end of June, he and Goss went to a club. The two

men sat in the VIP area, a \$500 bottle of champagne on the table. But Allawi wasn't his usual gregarious self. He remained quiet, his glass untouched. The two men drove back from the club in silence. "I feel like I'm a martyr," Allawi suddenly said. "All my family's taken care of. If I die tomorrow, it wasn't in vain."

Just a few days later, the DEA moved to apprehend Allawi's team in simultaneous takedowns across Dallas, San Antonio, and Houston; Uno, Robinson, Al Salihi, and Goss were all arrested. So was Kalra, Allawi's bitcoin guy. Valle was with a SWAT team at Allawi's gargantuan rental home in the suburbs of Houston. They tried ramming the door down, but Allawi had splurged on a \$10,000 reinforced model, Valle says. The team had to break in through a window.

Inside, they found Allawi clad in black pants and a white polo. He told agents they had nothing on him, even as investigators seized a bitcoin wallet, two money counters, 12 burner phones, four small bags of blue chemical binder, and a .45 Colt.

After the DEA agents made clear that they had more than enough evidence, Allawi quieted down. Sitting on the driveway, handcuffed, cross-legged, and slightly disheveled, he looked more like the young Iraqi who'd smoked hookah alongside US contractors than the leader of a drug ring. He rolled onto his left side, curled into a ball on the pavement, and closed his eyes.

"Allawi was one of the first we saw doing this at large scale."

Dante Sorianello, US Drug Enforcement Administration

In June 2017, a grand jury indicted Allawi for conspiring to distribute fentanyl, meth, and cocaine; possession of a firearm during a drug trafficking crime; and conspiracy to launder monetary instruments, among other charges.

The mountain of evidence against Allawi was overwhelming—so overwhelming, in fact, that Anthony Cantrell, his court-appointed lawyer, said a trial would take months and put a strain on his practice. Instead, Allawi pleaded guilty to conspiracy to possess with intent to distribute 400

grams or more of fentanyl resulting in death or serious bodily injury, and to using a gun during a drug crime. Investigators estimated that Allawi had made at least \$14 million off his criminal activities, and had sold at least 850,000 counterfeit pills in 38 states. Sorianello says that Allawi saw the growing market for pills and capitalized on it with his operation. “He was one of the first we saw doing this at large scale,” he says. “He was a pioneer.”

At his sentencing, Allawi adopted a contrite tone. “I messed up. It was a great mistake.” He concluded by asking for mercy, for the US to give him a second chance. But the court showed no such clemency: As part of his plea deal, Allawi was sentenced to 30 years in a federal prison in northern Louisiana; he has since been transferred to a medium-security facility in New York. After that, he will be deported back to Iraq. Uno, Robinson, Al Salihi, and Kalra, meanwhile, all pleaded guilty and received prison sentences ranging from 18 months to 10 years. The judge was more lenient with Goss, who pleaded guilty to conspiracy to possess with intent to distribute cocaine, and was sentenced to five years’ probation.

Allawi maintained that if the US had been in the throes of a devastating opioid epidemic while he was running his drug ring, he’d never heard about it, “never heard about overdoses or the damage it can cause.” But it was operations like his—dealers selling counterfeit pills laced with illicitly produced fentanyl—that authorities say contributed to so much death and destruction.

Roughly a month after Allawi’s arrest, authorities took down AlphaBay. But it didn’t do much to relieve the opioid epidemic in the US. More than 106,000 people died of a drug overdose in 2021, according to the Centers for Disease Control and Prevention—a record high. Dark-web markets, meanwhile, logged \$3.1 billion in revenue that year, according to Chainalysis, a research firm that tracks cryptocurrency activity. Revenue dropped last year, thanks in large part to the takedown of another major dark-web bazaar called [Hydra](#), but illegal marketplaces still raked in \$1.5 billion.

China provided most of the fentanyl present in the US before 2019, with traffickers shipping the powder through international mail and private

package delivery. But controls that China has since imposed have disrupted the flow. Today, Mexican cartels lead the charge, procuring precursor chemicals from China, which can be legally exported, and churning out enough fentanyl to drown the US. The DEA seized the equivalent of 379 million potentially deadly doses of fentanyl last year, more than the population of the entire country. Distributors are active everywhere. The agency's Rocky Mountain office, for example, which covers Colorado, Montana, Utah, and Wyoming, seized nearly 2 million fentanyl pills.

Sitting in a hip coffee place in Houston last summer, Westbrook pulled out his phone and flipped through pictures of recent fentanyl busts he'd participated in. In mirror images of the takedown of Allawi's drug house, federal agents in flashy hazmat suits prowl the driveways of nondescript homes. Industrial pill presses sit on the suburban concrete. DEA offices across the country are establishing groups focused on fentanyl investigations, he says. "It's weird times," he later told me, reflecting on the destruction that tiny amounts of fentanyl can wreak. "I went from chasing kilos to grams."

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Mar 7, 2023 6:00 AM

This Is a Philosopher on Drugs

I was at the lowest point in my life. I needed a mind-altering jolt. In the end, everything—even the meaning of “everything”—changed.

ILLUSTRATIONS: JAMES MARSHALL; PHOTOGRAPH: ALI CHERKIS

There is something strange in the disinterest philosophers show for experimentation with mind-altering drugs—or at least for talking about their experimentation publicly. At the margins of philosophical writing, we have Walter Benjamin’s record of his dabblings in hashish and Michel Foucault’s casual admission in interviews that he would rather be dropping acid in the Mojave Desert than sipping wine in Paris. Even further out we have philosophy-curious writers like Thomas de Quincey (also a biographer of Immanuel Kant) recounting his own experience of opium addiction. And then we have probabilities and speculation. The natural philosopher Johannes Kepler likely tried some fly agaric before writing his 1608 treatise of lunar astronomy, the *Somnium* (read it and you’ll see what I mean). The third-century Neoplatonist philosopher Plotinus might have availed himself of some herbal or fungal supplements to help him achieve his many out-of-body experiences, which he liked to call *henosis*, or “ecstatic union with the One.”

I’m probably missing a few notable cases. But still, for the most part, to admit to any intention to use chemical substances, whether found in nature or synthesized in laboratories, in the aim of changing one’s apprehension of reality, is to leave the guild of the philosophers behind, with all its constricting norms and shibboleths, and to join the company, over in the deep end of the pool of life, of sundry countercultural weirdos and deviants.

This shows, I think, just how conservative philosophy remains, in some respects, as an academic discipline. At a cultural moment when psychedelics are getting a second wind, and even someone as upstanding as Michael Pollan has moved from counseling us to eat our roughage to praising the benefits of microdosing, philosophers are conducting themselves as though it were still 1950, when we wore skinny ties to colloquia, got funding from the RAND Corporation to work on decision trees and other such narrow and straitlaced endeavors, and all knew that it is the unaltered and wakeful mind that has exclusive access to the forms and qualities of the external world.

But wait a minute. Even in the mid-20th century, perhaps especially in the mid-20th century, years before the postwar generation was turning on, tuning in, and dropping out en masse, perfectly sober grown-up philosophers understood full well that the reports our senses give us of the physical world hardly settle the matter of what reality in itself is like. The problem is ancient but was sharpened in the early work of Bertrand Russell and G. E. Moore, who together articulated a cluster of problems around the concept of “sense-data.”

As Russell would put the point in the 1940s, when we are looking at a table as we walk away from it, what we see shrinks continually; but the table does not shrink; therefore, what we see simply cannot be the table itself. What we see, rather, is only what is given to sense, and the full account will have to involve the physics of light and the physiology of the brain and of the organs of sense as much as it involves the properties, to the extent that these can be known, of any external object. But if we have to take account of what the perceiver brings to the instance of perception in order to make any sense at all of what perception is, then it would seem to follow that perception should also be of interest to philosophers when there is no external object at all—or at most a hallucination of one.

This article appears in the April 2023 issue. [Subscribe to WIRED](#). Photograph: Andria Lo

Of course, philosophers *are* interested in hallucination, even if they prefer to draw their examples from case studies of schizophrenia or Oliver Sacks–style pathologies, or from more mild varieties of optical illusion that happen

even to the mentally sane (heat wave “oases,” straight sticks emerging from water as if bent). But they are generally interested in it only as a challenge, as an obstacle standing between them and what they would ultimately like to establish: that, namely, there is a real and all-important difference between the perception that is anchored in how the external world actually is and the perception that would seem to come from inside of us. There is a difference between waking and dreaming, in other words, and waking for them is incontestably the superior state to dwell in and the only one that is worthy of a philosopher. For philosophers seek the truth, which is something that can be furnished only to a mind not currently subject to the chimeras of psychosis, of dreaming, or of drugs.

But again, the problem is ancient, which is a pretty reliable sign that it is also intractable. For all our efforts, we still are not one step closer to apprehending the things in themselves. It is not that science hasn’t progressed—of course it has—but rather that the problem is conceptual and not empirical. You can’t perceive the thing that lies behind what you are perceiving, since the instant you do perceive it, it no longer lies behind but is front and center. Given what appears to be this logically necessary stalemate between us and the world, it seems inevitable that alternative accounts of the fundamental nature of reality—alternative ontologies, as we say—should keep returning and drawing off at least some philosophers who get fed up with an external world that demands our loyalty yet refuses to show itself.

In at least some of these alternative ontologies, the visions that come to us unbidden, in the liminal states of insobriety, hypnagogia, or theurgic ecstasy, are not to be dismissed out of hand as obstacles to our apprehension of truth, but may in fact be vehicles of truth themselves. Here I am aware I’m pushing up against the limits of respectability dictated by the implicit norms of my discipline, but I’ve gone about as far as I was ever destined to go in the ranks of this guild, and I’ve got nothing, and no one, to be afraid of. So I’m just going to come right out and say it: I am a philosopher who has taken an interest, of late, in psychedelic experimentation, and I find that my experiments have significantly widened the range of accounts of the nature of reality that I am disposed to take seriously. If you think you are in an emotional state to handle it, and in a legal jurisdiction that permits it, and

you think you might benefit from being jolted out of your long-held ontological commitments, then I would recommend that you try some psychotropic drugs as well.

I will not exaggerate the benefits. I still have no clue what this brief crack of light I call “my life” really is, nor how I got here, nor where I’m headed. But I am significantly less cocky now, my cluelessness is more evident to me, a constant that accompanies me in each moment of the day. No one seems more pathetic to me, now, in their own cluelessness, than the self-styled “realists” who prejudicially and without any grounds go on supposing that they have a firm grasp of concepts like “nature,” “matter,” “being,” “thing,” “world,” “self,” that this grasp flows directly from their acceptance of the plain evidence of reason buttressed by empirical discovery, and that the question of how many kinds of being there are, and of the nature of these beings, is one that has been definitively settled over the past few centuries of naturalistic inquiry.

If this new reflection of mine appears too vast, consider the following scene from a time we conventionally call “the scientific revolution.” A missionary finds himself in what is then known as New France, though the truth is there remains next to nothing French about the place. He is living with the Hurons and trying to convince them of the urgency of converting to Christianity. On some days the group’s leader, a sharp and dignified old man, seems disposed to accept the offer; on others he wakes up from dreams that tell him Jesus Christ is a malevolent supernatural being who has sent another such being among his people to bring them to ruin. Each morning the missionary wonders whether the old man’s latest dream vision will spell the death of him. He recalls his earlier life in Europe and the new philosophy of René Descartes, who claims to be able to prove that our waking life is real, while our dreams are only a delusion. It dawns on him that his new hosts see things in more or less the opposite way.

It dawns on him, further, that it is this opposite way, and not the new way of modern philosophy, that is more or less the default setting of all of humanity, while Descartes and the other moderns constitute a small minority of dissenters, who have worked their way, by great effort, into what is ultimately a rather counterintuitive picture of human life, one in

which the great preponderance of what is running through our heads at all times, but especially in dreams and other ecstasies—all the dazzling parade of sights and sounds and spirits, specters, ancestors, anthropomorphic animals, theriomorphic divinities, theomorphic stones, countless other permutations I can't even name, and infinite swarms of fleeting and fugacious beings—all get in the way of our efforts to orient ourselves in this life. The missionary begins to wonder whether he really knows any better how to live than the oneiromancers he has ostensibly come to enlighten. But he has little time to indulge this question, as he fears the old leader may wake up at any moment and pass a death sentence on him. He writes a letter to his Father Superior in France, begging for a transfer out of there and back among the people who know, or think they know, the difference between appearance and reality.

Philosophers today, at least in the English-speaking world, almost all take for granted that the core Cartesian doctrines are theoretical nonstarters. Yet we all remain the children of Descartes, to the extent that we take for granted that the day is more disconcealing of truth than the night. We do catch some small glimpses of alternatives here and there, and from time to time over the past few hundred years a countertendency will emerge—the psychoanalysts' concern to center the dream-life, the consciousness-expanding spirit of the 1960s counterculture. So it is with them that I throw in my lot. I am not a Freudian, nor a hippie, yet I believe, now more than ever, in part thanks to age and what I like to think of as an accrual of wisdom, in part thanks to psilocybin and muscimol, that our liminal states of consciousness may well be consciousness at its most veracious.

Alongside drug use, another implicit prohibition of the guild of philosophers is that you really should not ask, in open and childlike terms, a question as general as “What is the meaning of life?” Yet it is just this question that came to press upon me over the past years, with an intensity I could not ignore.

When my grandparents died long ago, I was heartbroken of course, but they had been old, and I was young, and I couldn't see what it all had to do with me. Things were different when my father died in 2016. With his disappearance, all of a sudden the basic conditions of my own existence hit

me like a revelation. He had had (note that pluperfect) a good long life, but now it seemed so absurdly brief to me, as if this being had just popped into existence, instantly began babbling a few favorite stories over and over again like a talking doll, a few beloved half-truths and misremembered factoids, only to pop right back out again, leaving me agape and wondering: Holy shit, who *was* that? *What* was that?

Two years later my mother was diagnosed with the same common illness he had, with a name we hear every day and read about constantly in *The New York Times'* "Well" section and other clickbait venues, but that I find myself unable even to say or write. Throughout this era of loss, I have been sharply attuned to the fact that I myself am no longer young and that my parents' fate has everything to do with me. They are me, just not in every respect at the present moment. I am them, but on a slight delay, and I find myself concerned with not spending the rest of this brief flash clinging to half-truths of my own. I want to know what this is all about, or at least, if knowledge is not to be had, I want to arrive at some equanimity of soul, where this condition of ours should no longer appear so absurd, so unacceptable, and where the veil that occludes my access to the world at least is no longer covered over by an additional veil of tears.

The sense of loss intensified with the beginning of the pandemic and the forced isolation it brought down on the world. I was drinking heavily at the time, as I had been for many years. By the time I finally stopped using alcohol for good, just over two years ago, there was no joy at all left in it, no celebration, as there was in my younger life of at least some imperfect stab at bon-vivantism. It was simply an addiction, and one that darkened the veil through which I am constrained to make sense of the world. So I quit it, at long last. But rather than feeling liberated and good about my healthy new start, it was only then that I fell into the deepest depression I have ever known, deeper than I ever could have imagined possible. I was suddenly cut off from the only means I had of comforting myself, and of charging up the world with at least a sort of counterfeit magic. Nothing I had valued in my earlier life, my idiotic careerism, my foolish vainglory whenever I got something published, had even the faintest trace of significance now. I could still conjure, from somewhere, a semblance of caring about my career

and so on, but I truly did not care. I no longer even understood how it could be possible to care about such nothings as fill up a human life.

When the lockdowns ended, I summoned my forces as best I could, crawled out of my hole, and began to make the trip as often as I was able from France to California in order to visit my mother. I had been vaguely aware of the recent legislative developments in certain US states surrounding the consumption and sale of cannabis, but it was only on a whim, in the middle of one of these visits, that I turned to Google to find the location of the dispensary nearest me. I had tried marijuana a few times in my earlier life, but it had had little effect on me, and in any case I considered it trashy and beneath me in all its cultural significations. But because, now, I no longer cared about any of the judgments I had made in my earlier life, positive or negative, I found that I really could not care less what the cultural position of cannabis was, and I was perfectly happy to show my ID and stand in line with all the chewed-up old army veterans, all the underemployed marginals, all the discarded Americans, my brothers and sisters, at a dispensary on the very seediest side of Sacramento, in a place no zoning law had ever touched. No, I find I'm not putting this plainly enough. I was *happier* there than I had ever been in any *cave à vins* in Paris, getting my ear talked off by some French wine merchant about terroir and bouquet and all these supposed properties of the drink that I, anyhow, was never able to detect. While I had never smoked a joint correctly in my younger days, I found that the new abundance of tinctures and oils and other alchemical refinements of the THC molecule were just what I needed to start to see the world, again, as some sort of meaningful whole.

Early in my new life as a late-blooming pothead, one thing that struck me was just what a crummy deal we in the West had been given, whereby all mind-altering substances had been prohibited and stigmatized, except for the one that has such negative medical and social consequences in its overuse as to be described in terms of disease, and that only ever alters consciousness downward, from the more to the less vivid. Alcohol might make us dance and chatter for a short time, but its technical classification as a “depressant” is surely the correct one. That wine is a central sacrament of Christianity, moreover, which in its early centuries seems to have had some interest in stamping out vestiges of pagan rituals relying on other, more

intense varieties of mind alteration, seemed to me suddenly to be a rather serious argument against Christianity. It turned us into drunks, I reflected, and made us forgetful of the myriad other ways to make use of the fertile bounty of nature, particularly in its vegetal and fungal expressions, in order to see the world differently. Just a few edibles in, and I was already gravitating toward some kind of neopaganism.

Cannabis, though generally not considered a “psychedelic,” nonetheless has something of the power this word was coined to capture: It makes the soul’s nature manifest to itself. Experiences vary, of course, but in my case it does several things at once. It induces a sort of bodily ecstasy; it presents a vivid spectacle of patterns and figures before the eyes (especially when they are closed); and most interestingly, I think, it dissolves what I ordinarily experience as the metaphysical unity of the self, with all its memories and its steady persistence through time, and makes it temporarily difficult to comprehend how I ordinarily go about my life as if the self I present myself as being were a real thing, or at least anything suitable for presentation.

There is a psychiatric phenomenon, one most of us would ordinarily hope to avoid, that is known as “depersonalization,” in which a person becomes convinced that their own life is not real, that the memories they have, even the body they have, is not theirs. In the depths of depression I came close to something resembling this condition, and it was terrifying. Stoned, by contrast, I have approached a state that is at least a cousin of depersonalization, yet I have found that it is mostly neither enjoyable nor terrifying, but simply revealing. We are, after all, quite likely *not* unified metaphysical subjects but rather complex assemblages of cells that facilitate an illusion of unity for as long as the assemblage endures. I will not affirm here any dogma, not even the naturalistic account of biological death to which I have just alluded, but will only say that there are several plausible accounts of what a self is on which we are indeed mistaken to suppose that it exists any more than, say, an image of a flamingo briefly manifested on a screen by colored pixels.

But goodness, here I am, still philosophizing like a stoned undergrad in a black-lighted dorm room. Ridiculous. Philosophers aren’t supposed to philosophize; they’re supposed to “do philosophy,” as the professional argot

has it. The guild's prohibition on drugs, perhaps, is linked to the fact that these lead us into a philosophizing of the most freewheeling and unhinged sort. But just as in the middle of a bad trip, it's too late to pull back now. So let me get to the heart of the matter.

Beginning around 2018 I began writing essays, blog posts, polemics, and at least a few quasi-scholarly articles against the usurpation of classical models of the human being by metaphors drawn from the algorithmic technologies that surround us in the contemporary world. These efforts eventuated in [my 2022 book](#), *The Internet Is Not What You Think It Is*. That same year I also published, in *Liberties*, a [resolutely negative review](#) of a new book by my philosophy colleague David Chalmers, *Reality+: Virtual Worlds and the Problems of Philosophy*. Chalmers is generally sympathetic to what has come to be called the "[simulation argument](#)," the essence of which may be boiled down to the idea that what we think of as "its" have their ultimate causal ground in what are in fact "bits." That is, what we take to be physical reality would better be conceived on the model of the virtual realities our machines have begun spinning out for us over the past few decades.

My criticisms were in part grounded in my perspective as a specialist in the history of early modern natural philosophy. If you know anything about 17th-century science, you will know that people at the time were particularly impressed with the most cutting-edge technologies of the day, most notably clockworks. Some people, who styled themselves "mechanists," were so impressed as to propose that the entire universe is best understood on the model of a horologium. And this is a pattern we see again and again in the history of science: The latest shiny gadget, whatever it may be, becomes such a centerpiece of human attention that we find ourselves unable to resist seeing it as a sort of epitome of reality as a whole.

But what a coincidence it would be, really, if the entire world turned out to share in the same nature as a technology that only came into existence within our own lifetimes! "The world is like a dream" seems a perfectly plausible proposition; "The world is like *Pac-Man*" seems a crude fetishism. A rigorously historicizing perspective on the simulation argument, in other words, quickly reveals it to be little more than a

reflection of presentist myopia. I certainly have no qualms about the idea, defended by Chalmers, that the world is likely not at all as it appears to us. It's just that when I go searching for alternatives to these appearances, it is not first to our recent technologies and to their cultural ramifications in gaming and other such domains that I turn.

Yet I also confess that my review of *Reality+* was at least to some extent unfair and overly harsh. In the end, what displeased me most about it were not its arguments but its tone and authorial voice. It is, to be blunt, a bit dorky, with its narrow range of cultural references to TV shows and pop songs about which I could not care less, and its obvious rootedness in online cultures of gaming and coding and geeking out that I have always shunned. But philosophers are supposed to see past such superficial differences. If I can admire a 10th-century Islamic theologian for his ingenious use of arguments drawn from Aristotle, I ought to be able to appreciate Dave Chalmers, who is, after all, my contemporary and my guildmate too.

But something else has begun to worry me about my earlier critique, beyond the impropriety of dwelling on these cultural differences, on the puerile conceit that Chalmers is a dork whereas I am cool, and it is that in recent times, my mind altered with the help of chemicals, the world has indeed come to appear “glitchy” to me, in just the way the simulationists expect that it should. Under the influence of drugs, the world really does seem to me more like a computer simulation than like a clock, or a loom, or a chariot wheel, or anything else we have come up with so far.

Let me walk that back a bit. The glitches are not exactly as the simulationists, at their most indulgent, like to imagine them. I see no cascades of glowing green 0s and 1s, nor clean *Tron*-like geometric lines extending off into the horizon, not to mention cats that seem to flicker like an old UHF channel as they walk by. The glitches are not something seen at all, but rather something that characterizes the mode of consciousness in which the totality of the world, and of memory and experience, is apprehended.

There are two such principal glitches. The first has to do with the experience of time. Under the influence of mushrooms, I have found,

temporal duration can sometimes go the same way as I have described the self going under the influence of THC. Psilocybin is far more difficult to obtain through legal channels, unfortunately. A loophole in the Netherlands enables us to purchase the “truffle” part of the fungus; a handful of jurisdictions in California allow for psilocybin’s possession and use but not its sale. Meanwhile, muscimol, the active ingredient in the *Amanita muscaria*, or fly agaric fungus, so well attested in traditional religious practices throughout Eurasia, is legal in 49 states, and common, alongside cannabis, in the dispensaries of New York. While I have had some interesting experiences with psilocybin recently, it is muscimol, purchased in a rather louche head shop on the Lower East Side, surrounded by tricolored insignia of pan-African pride, images of neon aliens, the inescapable Bob Marley, that has best succeeded in bringing me out of my ordinary experience of the fixity of my personal identity, and of the temporal boundedness of my existence.

In his 1921 work, *The Analysis of Mind*, Russell reflected that there is no logical impossibility in the hypothesis that the world sprang into existence five minutes ago, “with a population that ‘remembered’ a wholly unreal past.” What to Russell’s lucid and unaltered mind seemed a logical possibility has seemed to me, on psychedelics, very nearly self-evident, except that the five minutes are reduced to the present instant, and it turns out that the real mistake, in our ordinary apprehension of our existence, is to conceive it as unfolding in time at all.

What does this have to do with simulationism? Consider, first, that in an artificial system that rises to the level of consciousness, such as future iterations of GPT or LaMDA might become, this consciousness could not be the result of any slow evolutionary process with antecedent stages of mere sensory perception. The consciousness of such a system would simply pop into existence at the moment the programmer behind it all hits Start. It would not be a hard-won consciousness, moving up through photoreception, olfaction, and other such physiological capacities that now serve in part to constitute our consciousness as biological entities (*if* that is what we are) but did not first emerge *for the sake of* consciousness. When we first started smelling the world around us, evolutionary theory tells us,

there was as yet no plan for us to someday start cognizing that world. It all just worked out that way.

In an artificial system, by contrast, such as the AIs we are currently seeking to train up, it is cognition that comes first, and likely last. While the very idea that our AIs are approaching consciousness is controversial, of course (and I will not take sides on it here), we may at least agree that it is easier to make our machines cognize the world than to make them smell the world. That is, we are training the machines up to *know* things, and among the things they know it might turn out that they will be able to know *that* they know things. But the idea that there would be any accompanying bodily phenomenology to this knowledge is plainly nonsensical. What is being called “[embodied AI](#)” indeed recognizes that machines will most likely learn to think like humans if they are outfitted with bodies and made to experience the world. But this experience of the world is typically conceived in terms of navigation in space, which can already be observed among the canine-shaped patrol robots ominously advertised by [Boston Dynamics](#). If we want to call these assemblages of silicone and electricity “bodies,” they are so different from ours that we can really have no idea what bodily experience would be like for them.

Or can’t we? It seems to me we would likely have to suppose, at the very least, that for an AI there could be no experience of temporal duration as we ourselves know it. In particular, a conscious AI would not have any experience of deliberating in time, of “thinking through” a problem in the same way one “moves through” a tunnel. Rather, its change from one state to the next would be instantaneous, and for this reason the phenomenology of the “before” and “after” would be either nonexistent or so different from our own as to be indescribable in the same terms. And it is something like this phenomenology, I think, that the experience of psychedelic drugs can reveal to a person, where there is no time in the usual sense and memories are all just as much a part of the “now” as anything else.

It is not, or not only, my limitations as a writer that compel me to admit the impossibility of fully conveying what this is like. After all, we’ve only got a few tenses to work with for our verbs, though a curious rendering in the King James translation of the Bible might give us some hint of what it

would be like to have an “eternal tense”: “Before Abraham *was*,” Christ says in the Gospel of John, “*I am*.” This is not a pluperfect, as one might ordinarily expect, where Christ claims simply that he already “had been” further back in the past than another personage. Rather, it is a shift to what superficially looks like the present tense, as if to suggest that, in his case, past, present, and future simply don’t apply. I have not checked the Greek, which alone would settle the matter of what this verse actually means, and I am not here to wade into any abstruse Christology, but I do want to suggest that that “am” captures something of the experience of at least some mind-altering substances.

The second “glitch” has to do with one’s perception, on mind-altering chemicals, of what we might call a vastly expanded social ontology, of the consciousness of a community of beings that extends far beyond the human and perhaps beyond the corporeal. The experience of such a social ontology, it seems to me, is just what you might expect of an artificial consciousness that is trained up, as our current rudimentary AIs are being trained, in the primary aim not of navigation of an external world but rather of prediction based on a sharp attunement to the patterns that play out in other people’s, or other beings’, minds.

Shortly before I began experimenting with drugs, I found myself spontaneously, and quite surprisingly, attuned to a much more densely populated world of other minds, or of fellow beings in the full and proper sense, than we are ordinarily expected to recognize. Long ago my grandfather built a wooden deck in front of our little vacation house on Lake Almanor in the northeast of California. There was a baby pine shooting up underneath it, and he could not bring himself to cut the sapling off from its source of light and life. So he constructed the deck with a square opening through which it could continue to grow. On my first visit there after the lockdowns ended, I saw that proud tree reaching up into the sky, now about as wide in diameter as a basketball. The tree was in its forties now, almost as old as I was, and it suddenly struck me that I had passed most of my life with this tree, yet I had neglected to think about it, to hold it in my heart and thoughts, at nearly every moment of all those years. “I’m sorry I left you and forgot you,” I said in my mind. “I am *so, so* sorry.” It seemed to me now that the tree was my adoptive sibling, my blood

brother (though I had never pricked myself on it), and in that state of mind any argument to the effect that it is “just a tree” would have been incomprehensible. You might as well have resorted to such locutions as “just a human,” “just an ocean,” “just an angel,” “just the world.” I was not on any drugs at that moment (other than antidepressants, which as far as I can tell have never done shit for me), but it gave me a brief glimpse of what I would subsequently be able to reexperience with chemical assistance.

Research on fetal mice has shown fairly conclusively that the development in the mammalian brain of a capacity to navigate obstacle-filled space develops quite separately from any cognition of social reality. Mice get ready to move through the world by dreaming about that world before they are even born. It’s hard to say what a mouse’s experience of other minds is like, but at least in human beings it seems clear that our cognition of the bare external world, of everything that goes by the pronoun “it,” is quite independent from our second-person experience, of all that is covered by the pronoun “thou.”

Descartes, curiously, neglected to reestablish other minds after he had razed all of his beliefs through the method of radical doubt in his *Meditations* of 1641. But the problem of second-person experience would return to philosophy with a vengeance a few centuries later under the name “phenomenology,” in which the starting point of all theoretical reflection is that being in the presence of another being, with an interiority like ours, is fundamentally different from being in the presence of, say, a brick wall. Martin Heidegger would articulate this difference in terms of *Mitsein*, or “being-with.” What are the entities in our field of experience that we are able to “be with”? Most of the time I find that I can be with cows, that to stand near a cow is to “vibe” with it. Being with a tree is an experience that is harder to come by. But one thing psychedelics can help illuminate is the extent to which the limits of *Mitsein* are not so much a reflection of the intrinsic properties of various external entities as they are, simply, of our attunement. When we change our tuning, even the brick wall can seem to have been dismissed too hastily.

If social ontology develops independently of the cognitive capacities that enable us to navigate the external world, and if we are able under some

circumstances to encompass potentially *everything* within our social ontology, then we might begin to wonder about the viability of our distinction between the “its” and the “thous,” between the third and second person. On mushrooms, there is a strong perception of the mutual constitution of mind-like beings by one another, so that my understanding of what I am becomes inseparable from all sorts of entities I am usually able to bracket as distinct from me—trees, clouds, mice, and so on—and these entities all, in turn, appear to be constitutive of one another.

There is a very succinct naturalistic account of why the world comes to appear to us like this under certain circumstances: It appears this way because this is how it in fact is. I would be nothing without all the clouds and trees and so on; and my eventual death, in this light, might best be understood as the end of a long campaign of stubborn resistance to this obvious fact—not the loss of anything with any real independent existence but only an anomaly within an order of existence that strives ever to even things back out.

This naturalistic account, however, rides alongside an equally compelling “virtualistic” account of what is happening. If the world were to turn out to be “virtual,” and the virtual consciousnesses within it had been designed with the aim of modeling and predicting one another’s intentions, just as AI researchers say their machines are designed to do, then it should not be at all surprising to find ourselves, sometimes, in a state of mind where other minds appear wholly to exhaust what is out there in reality. In other words, one way of thinking about a virtual world is as a world entirely constituted by other minds. And this is indeed how the world comes across to us, at moments, when we are thinking about it with chemically enhanced perception.

But are any of these lucubrations to be taken at all seriously? Or do they just describe how the world appears to one sorry fellow who’s got a “brain on drugs”? (Readers of a certain age will at this point picture an egg in a frying pan.) Well yes, of course it’s a brain on drugs, but this just returns us to the original problem: Your brain is *always* on drugs. That is, there is always a neurochemical correlate to any of your conscious perceptions whatsoever. You might be tempted to say that supplementing gets in the

way of correct perception, and that the only reliable way of apprehending the world as it is must depend only on the default setting of the mind, with no extras. But again, even this setting delivers us delirious hallucinations for about eight hours out of each 24.

Moreover, it is hard to conceive of any valid argument against supplementation. The substances are out there in the world, just like the food we eat is out there—and if we did not eat it, very soon we would start to hallucinate, and eventually we would cease to have any conscious perceptions at all. (Indeed in the history of ecstatic practices, fasting is perhaps as common as drug-taking as a means of getting out of one's ordinary range of conscious experiences.) The fact that we *have* to eat some sort of nutritious organic matter or other, while consuming psychedelic plants or fungi is strictly optional, is certainly relevant to the *moral* regulation of drug consumption, but it is hard to see how it is relevant to any *epistemological* determinations we might make about the ability of a mind to deliver knowledge of the world as it is. The undrugged mind may be more reliable in certain respects, since it is less likely to lead you to try to fly off your high-rise balcony, and it is better able to help you stay focused on present dangers and tasks necessary for survival. But this in no way means that the representations it gives you of the world are *truer*.

My undrugged mind, to borrow a witticism from J. L. Austin, delivers to me a world of “medium-sized dry goods” and little else. My drugged mind delivers to me spirits or djinni or angels or I don’t know what to call them. It presents to me trees that are brothers and clouds that are old friends and cracks in the walls that spell out warm messages from solicitous invisible beings and infinite swarms of lives, all swirling and pulsating around me. Which is correct? I honestly don’t know anymore. My colleagues will tell me they know, but I don’t think they do either.

just as i was able to re-find my fraternity with the pine tree unaided by psychedelics, so too can a person work their way unaided to a point of view on the world in which it is teeming with infinite other points of view. This is, broadly, the philosophical view of my greatest intellectual hero, the 17th-century philosopher Gottfried Wilhelm Leibniz (who was, among other things, a pioneer of computer science). Almost certainly too much of a

square ever to have tried any of the fungal supplements that abound in the landscapes of northern Germany, Leibniz nonetheless was able to arrive at the conclusion that the only meaningful sense of the verb “to be,” as he put it, is “to have something analogous to the ‘I.’” That is, there is no world but the community of subjects, some of them human but most of them something else entirely.

Leibniz was not, to say the least, a deviant weirdo. As for me, it is only at the moment I decided to take the risk of falling in with the deviant weirdos, of moving with the wrong crowd and losing my place in the guild of philosophers, that I came to believe he is probably right about things. A true genius, he seems to have got there unaided. But we all do the best we can, each according to our capacities.

I am likely fortunate to live, most of the time, in a jurisdiction where none of the relevant substances are permitted by law, and so to be able to indulge my curiosity only punctually. There are many experiences I have not yet had—of DMT, for example, which I am told is the most potent of all in showing us the variety of species of beings that ordinarily remain hidden. (If you are a clinical researcher in such matters and would like a volunteer for your experiments, hit me up.)

In any case, I suspect I have already found what I was looking for: some new knowledge, and at least a bit of equanimity. While I remain as uncertain as ever about the ultimate structure of the world, I also have new inclinations, and new sympathies, toward accounts of it that had previously struck me as altogether off the table. That widening is itself a sort of newfound knowledge, even if it contains no new certainties. As to equanimity, there really is nothing like a sharp experience of the illusoriness of time to make a person less anguished by the brevity and apparent senselessness of what we experience as our temporal sojourn. And there really is no more comforting feeling than to arrive at an awareness of the pervasive and dense presence of other beings like oneself—or at least to arrive in a state that seems to attest to the existence of such beings.

The world is not what it seems—that’s for sure. Even if any positive determinations about how it actually is would automatically become new varieties of mere seeming, it is good and edifying to explore the alternatives

to our standard account. The great mistake of the psychedelic gurus of old was to mistake the mode of perception that drugs afforded them for a sort of revelation, which is really just to trade one dogmatism, that of common-sense “realism,” for another.

I do not know what the world is, nor what is “keeping the stars apart,” to borrow an evocative line from E. E. Cummings. But mind-altering substances have helped me, at a fairly desperate point in my life, to dwell in that uncertainty with greater ease, to “own it,” as they say, and no longer to feel so dreadfully apart from the stars.

This article appears in the April 2023 issue. [Subscribe now](#).

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Mar 1, 2023 7:00 AM

It's Time to Fall in Love With Nuclear Fusion—Again

Let's indulge: Once fusion arrives, handmade suns could wipe out all human problems in a go.

PHOTOGRAPH: SHAWN MICHAEL JONES

If nuclear fission is associated with catastrophe, nuclear fusion is associated with delay and fraud. The joke about fusion, the synthesis of lab-grown stars, is that it's always 10 years away. Or 20. Two lonely little isotopes, each with a pathetically low mass, are joined in holy electromagnetism in a massive artificial thunderclap. The remaining nucleus is smaller than the mass of the reacting nuclei, and the leftover mass is converted into light or heat by virtue of $E = mc^2$.

But what a utopia fusion seems to promise. Even with the jokes and equivocation and scams, it's hard to be *blassé* about fusion's stellar possibilities. So let's indulge: Once fusion arrives, *handmade suns*, sources of unlimited clean energy, would—*will*—wipe out all human problems in a go. Our glorious pet stars, requiring only everyday hydrogen to whip up in a lab, won't belch out carbon or radioactive waste. Instead they'll exhale helium. [Helium!](#) That nonrenewable resource that's already running low! Fusion, my friends, means not just [infinite carbonless energy](#) but more balloons.

Fusion will, of course, rescue the environment and decarbonize planet Earth in a cool afternoon. It will also—don't stop me now—render irrelevant all the dead-eyed petroleum kleptocracies and trade wars and real wars waged

in their name. When energy can be produced anywhere, with common household ingredients, authoritarian states will no longer derive despotic authority by accidents of geography, but will, *whoosh*, become secular democracies, the better to share fusion-reactor tips and tricks in happy glasnost and savor the collective joy and peace of a burning, flooding planet restored to tranquil shades of green and blue.

Even leaving aside the Shangri-la, fusion is exciting here and now. In December 2022—a solid century since physicists first identified fusion as the source of star power—American scientists at the National Ignition Facility in Livermore, California, where ignition is a way of life, had a breakthrough. They'd aimed 192 lasers at the inside of a pearl-sized gold can called a hohlraum, creating a radiation bath that heated up the outside of a peppercorn-sized spherical nubbin of hydrogen coated in diamond in the center of the little can.

Atoms flew off the nubbin, forcing it to implode at a speed of nearly 400 kilometers per second—about four times a bolt of lightning. This created 100 million-degree plasma under hundreds of billions of atmospheres of pressure—a gas so hot that electrons were freed from atomic nuclei. At 1:03 am on December 5, humanity hit the threshold for fusion ignition in a lab. The first flash of a handmade sun. Though it blinked out rather quickly, after less than 100 trillionths of a second, the reaction created 3.15 megajoules of energy when a mere 2.05 went in—a glorious 150 percent return on investment.

Somewhat discouragingly, the first thought of the US Department of Energy, which its publicity team spelled out in an admittedly cool sci-fi video, was that this fusion ignition could somehow “support” the government’s project to extend the lifespan of nuclear *weapons*. But never mind. With at least 30 private fusion companies across the world promising clean energy built on the Livermore breakthrough, the air is supercharged with Kennedy-era electrons of hope. According to a survey from the Fusion Industry Association, most of these companies believe fusion electricity will be on the grid by the 2030s. It’s time to fall in love with fusion as if we’ve never been hurt before.

But it's always good to keep your wits about you when it comes to fusion promises. Whenever both paradise and vast riches are at hand, fraudsters make their move. On March 23, 1989, before an audience of feather-haired University of Utah students and at least one member of the presiding bishopric of the Church of Latter-Day Saints, electrochemists Stanley Pons and Martin Fleischmann declared—no peer-reviewed nothing in sight—that they had “established a sustained nuclear fusion reaction.” Holding up something that looked like a baby’s bottle with a pen in it, Pons told the room that they had driven deuterium into a metal rod at room temperature using garden-variety electrochemical techniques. Presto, they’d formed a new atom. “There is a considerable release of energy,” Pons said. “We’ve demonstrated that this could be sustained. In other words, much more energy is coming out than we’re putting in.”

OK, then.

Lest anyone doubt that these chemists (curious: not nuclear physicists) had really made their own atom, Pons assured the audience that he and Fleischmann had found nuclear reaction byproducts: evidence of fusion. What’s more, the heat generated by their tabletop experiment was attributable to those byproducts alone. It “cannot be explained by any chemical process that is known,” he said, with a note of irritation.

Almost immediately, other electrochemists aimed to replicate the results. They failed. Other (known) chemical processes seemed to be generating the heat. When Pons and Fleischmann published a paper at last, their work was savaged as a sham. They’d misrepresented their byproducts. The two men fled for France, where they worked for a Toyota research lab; they were never fined or even sidelined from science. But the abracadabra hypothesis of “cold fusion” came under a pall. Today, those who keep faith in it have formed a kind of aggrieved mini-cult. In the curious state of mind that anti-vax doctors are known for, the cold-fusion crew dug in, and its members now grouse about having been blackballed from elite journals and reputable conferences.

The latest Livermore discoveries are carefully described as hot fusion.

To those in whose dreams fused nuclei dance, the cold-hot distinction is consoling. The lukewarm nothingburger of the George H. W. Bush era seems worlds away from real fusion, the white-hot variety produced by Energy Secretary Jennifer Granholm's avant-garde DOE. What's a homemade sun without otherworldly heat?

The National Ignition Facility is a 10-story laser complex the width of three football fields, and its imposing size makes the Pons-Fleischmann tabletop charade even more laughable. And this time with fusion, the renowned physicists—including Tammy Ma, a plasma physicist; Annie Kritcher, an experimental physicist; and Kim Budil, a laser physicist and the director of the Lawrence Livermore National Laboratory—did not jump the gun with a prepublication press conference and set off a failed replication jam among peer scientists. Instead, for decades, scientists at the National Ignition Facility have been piling up papers, detailing most recently how ignition via fusion was possible (in August 2021) and then how it happened (in December 2022).

Along the way, statements to the media from LLNL have offered more science than prophecy. Kritcher, the lead designer of one of the 2021 experiments and first author on one of the resulting papers, explained how her team brought fusion to the threshold of fusion ignition. She concentrated not on grandiose promises but on the crucial challenge to anyone trying to fuse atomic nuclei: The laser energy must make it into the beams and hit the hydrogen target. One improvement? “Reducing the coasting-time with more efficient hohlraums compared to prior experiments was key in moving between the burning plasma and ignition regimes,” she said.

Heat, light, matter: It's supremely satisfying when the most advanced technology on earth is also the most elemental. I'm here to enlist in this ignition regime, especially if it means the reign of nuclear fusion and the simultaneous twilight of carbon and kleptocracy. But you know me: I'm in anyway, even if the ignition regime is, for now, just an ongoing spark of hope that humans can still improve the world somehow by studying hot plasma and beaming lasers into gold cans.

POSTSCRIPT. I've been writing this column for WIRED since 2018. I've written about [beavers](#) and [muons](#), the [Tesla bot](#) and [Mark Zuckerberg](#), [eyesight](#) and [plague literature](#), [methamphetamines](#) and [healthful Netflix binges](#). My aim was to explore the ways that technology partakes of two aesthetics: the uncanny and the sublime. The metaverse, artificial intelligence, social media, nuclear fusion: All of it generates—will always generate—astonishment. It will also generate unease, disgust, even terror. Whether an observer is an opponent or proponent of technology is beside the point. It is the air we breathe. I'm turning to features and essays for WIRED now, but it's been a profound honor to write this column and to share the digital atmosphere with you.

This article appears in the March 2023 issue. [Subscribe now.](#)

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Feb 28, 2023 6:00 AM

The Mining Industry's Next Frontier Is Deep, Deep Under the Sea

Companies are diving to the bottom to scoop up metals essential for our EV-driven future. But how much ocean are we willing to sacrifice?

Photograph: Andria Lo

In October of last year, an enormous new creature appeared on the seabed of the Pacific Ocean, about 1,400 miles southwest of San Diego. It was a remote-controlled, 90-ton machine the size of a small house, lowered from an industrial ship on a cable nearly 3 miles long. Once it was settled on [the ocean floor](#), the black, white, and Tonka-truck-yellow contraption began grinding its way forward, its lights lancing through the darkness, steel treads biting into the silt. A battery of water jets mounted on its front end blasted away at the seafloor, stirring up billowing clouds of muck and dislodging hundreds of fist-sized black rocks that lay half-buried in the [sediment](#).

The jets propelled the lumpy stones into an intake at the front of the vehicle, where they rattled into a steel pipe rising all the way back up to the ship. Air compressors pushed the rocks up in a column of seawater and sediment and into a shipboard centrifuge that spun away most of the water. Conveyor belts then carried the rocks to a metal ramp that dropped them with a clatter into the ship's hold. From a windowless control room nearby, a team of engineers in blue and orange coveralls monitored the operation, their faces lit by the polychromatic glow from a hodgepodge of screens.

This article appears in the April 2023 issue. [Subscribe to WIRED](#). Photograph: Andria Lo

The ship, called the *Hidden Gem*, was a former oil-drilling vessel nearly 800 feet long, retrofitted for sea mining by the Metals Company, an international firm officially headquartered in Canada. This was the first test of its system to collect the ancient black stones. They are officially known as polymetallic nodules, but the Metals Company's CEO, Gerard Barron, likes to call them "batteries in a rock." That's because the stones happen to be [packed with metals](#) that are essential for manufacturing electric cars—a [market that is surging](#) worldwide. Barron's company is at the front of a pack of more than a dozen [enterprises](#) slavering over the billions of dollars that could be reaped from those little subsea rocks.

The world's long-overdue, fitful [transition to renewable energy](#) is hobbled by an Achilles' heel: It requires staggering quantities of natural resources. Manufacturing enough electric vehicles to replace their fossil-fueled counterparts will require billions of tons of [cobalt](#), [lithium](#), copper, and other metals. [To meet the exploding demand](#), mining companies, carmakers, and governments are scouring the planet for potential mines or expanding existing ones, from the deserts of Chile to the rain forests of Indonesia. Meanwhile, what might be the richest source of all—the ocean floor—remains untapped. The US Geological Survey estimates that 21 billion tons of polymetallic nodules lie in a single region of the Pacific, containing more of some metals (such as nickel and cobalt) than can be found in all the world's dryland deposits.

"Here's one of them," Barron said when we met recently in the lobby of a chic Toronto hotel, as he casually pulled one of these geologic oddities out of his jacket pocket and handed it to me. Barron is a fit, muscular Australian in his mid-fifties, with swept-back dark hair, a nautical beard, and craggy Kurt Russell-esque looks. His jeans, black boots, and wristloads of leather bracelets lend him a roguish air. He has just flown in from London for a big mining conference. For years, he's been traveling the world to talk up deep-sea mining to investors and government officials. He and other would-be sea miners argue that collecting nodules from the deep will be not only cheaper than traditional mining but also gentler on the

planet. No rain forests uprooted, no Indigenous peoples displaced, no toxic tailings poisoning rivers.

Barron may finally be on the brink of achieving his goal of mega-scale mining on the ocean floor. The Metals Company has tens of millions of dollars in the bank and partnerships with major maritime companies. The *Hidden Gem*'s foray last October marked the first time since the 1970s that any company had successfully trialed a complete system for harvesting nodules.

The main thing holding the company back is international law, which currently forbids deep-ocean mining. That may be about to change, however. Last year, the Metals Company teamed up with the tiny South Pacific island nation of Nauru to trigger an obscure process that could let them bypass the international prohibition and get a license to start full-scale operations as early as July 2024.

That prospect has sparked an outraged backlash. Environmental groups, scientists, and even some corporations in the market for battery metals fear the potential havoc of seabed mining. The oceans provide much of the world's biodiversity, a significant chunk of humanity's food, and the planet's biggest carbon sink. No one knows how such an unprecedented incursion would affect the many life-forms that live in the abyssal depths, the marine life farther up the water column, or the ocean itself. The European Parliament and countries including Germany, Chile, Spain, and several Pacific island nations have joined dozens of organizations in calling for at least a temporary moratorium on deep-sea mining. Several banks have declared they won't loan to ocean-mining ventures. Corporations including BMW, Microsoft, Google, Volvo, and Volkswagen have pledged not to buy deep-sea metals until the environmental impacts are better understood. Even Aquaman is opposed: Jason Momoa narrated a recently released documentary denouncing sea mining.

"This has the potential to transform the oceans, and not for the better," says Diva Amon, a marine scientist who has worked extensively in the main area of the Pacific targeted for mining, including as a contractor for one of the sea-mining companies. "We could stand to lose parts of the planet and species that live there before we know, understand, and value them."

None of that deters Barron. “The biggest challenge to our planet is climate change and biodiversity loss. We don’t have a spare decade to sit around,” he declares. By the end of the *Hidden Gem*’s trial last October, the vehicle had delivered more than 3,000 tons of the stones, mounded up in a glistening black pyramid nearly four stories high. “This,” Barron promised the press, “is just the beginning.”

The Metals Company uses a former oil-drilling vessel, the *Hidden Gem*, to collect polymetallic nodules from the seafloor.

Courtesy of Richard Baron/TMC

The nodules have been growing, in utter blackness and near-total silence, for millions of years. Each one started as [a fragment of something else](#)—a tiny fossil, a scrap of basalt, a shark’s tooth—that drifted down to the plain at the very bottom of the ocean. In the lugubrious unfolding of geologic time, specks of waterborne nickel, copper, cobalt, and manganese slowly accreted onto them. By now, trillions lie half-buried in the sediment carpeting the ocean floor.

One March day in 1873, some of these subaqueous artifacts were dragged for the first time into sunlight. Sailors aboard the HMS *Challenger*, a former British warship retrofitted into a floating research lab, dredged a net along the sea bottom, hauled it up, and dumped the dripping sediment onto the wooden deck. As the expedition’s scientists, in long trousers and shirtsleeves, eagerly sifted through the mud and muck, they noted the many “peculiar black oval bodies” that they soon determined were concretions of valuable minerals. A fascinating discovery, but it would be almost a century before the world began to dream of exploiting these stones.

In 1965, an American geologist published an influential book called *The Mineral Resources of the Sea*, which generously estimated that the nodules contained enough manganese, [cobalt](#), nickel, and other metals to feed the world’s industrial needs for thousands of years. Mining the nodules, he speculated, “could serve to remove one of the historic causes of war between nations, supplies of raw materials for expanding populations. Of course it might produce the opposite effect also, that of fomenting inane squabbles over who owns which areas of the ocean floor.”

In an era when population growth and an embryonic environmental movement were fueling concerns about natural resources, seabed mining suddenly got hot. Throughout the 1970s, governments and private companies rushed to develop ships and rigs to pull up nodules. There was so much hype that in 1972, it seemed completely plausible when billionaire Howard Hughes announced that he was dispatching a custom-built ship into the Pacific to search for nodules. (In fact, the CIA had recruited Hughes to provide cover for the ship's Bond-esque mission: to covertly retrieve a sunken Soviet submarine.) But none of the actual sea miners managed to come up with a system that could do the job at a price that made sense, and the fizz went out of the nascent industry.

By the turn of the 21st century, advancing marine technology made sea mining seem plausible again. With GPS and sophisticated motors, ships could float above precisely chosen points on the seafloor. Remotely operated underwater vehicles grew more capable and dove deeper. The nodules now seemed to be within reach, just at the moment when booming economies such as China's were ravenous for metals.

Barron saw the potential bonanza decades ago. He grew up on a dairy farm, the youngest of five kids. (He now has five of his own.) "I knew I didn't want to be a dairy farmer, but I loved dairy farm life," he says. "I loved driving tractors and harvesters." He left home to go to a regional university and started his first company, a loan-refinancing operation, while still a student. After graduating, he moved to Brisbane "to discover the big, wide world." Over the years, he has been involved in magazine publishing, ad software, and conventional car battery operations in China.

Corals, sponges, and nematodes live on the rocks or shelter beneath them. Other critters float around them, including anemones with 8-foot tentacles.

In 2001, a tennis buddy of Barron's—a geologist, former prospector, and early web-hosting entrepreneur named David Heydon—pitched him on a company he was spinning up, a sea-mining outfit called Nautilus Minerals. Barron was fascinated to learn that the oceans were filled with metals. He put some of his own money into the venture and rounded up other investors.

Nautilus wasn't going after polymetallic nodules, but rather what seemed like an easier target: underwater formations called seafloor massive sulfides, which are rich in copper and other metals. The company struck a deal with the government of Papua New Guinea to mine sulfides off the country's coast. (Under international law, countries can do basically whatever they want within their Economic Exclusion Zones, which extend up to 200 miles from their coastlines.) It sounded good enough to attract half a billion dollars from investors, including Papua New Guinea itself.

But in 2019, after spending some \$460 million, Nautilus went bust. Neither Barron nor Heydon lost any of their own money: Both had sold their shares about a decade earlier, with Barron clearing about \$30 million in profit. Papua New Guinea, where more than half the population lives in poverty, was out \$120 million. "It wasn't my business," Barron tells me. "I was just supporting David, really."

Heydon, meanwhile, was building a company called DeepGreen—rebranded in 2021 as the Metals Company—[this time pursuing polymetallic nodules](#). By then, the growing demand for electric vehicles had added both a new potential market and an extra environmental justification for the project. Barron came on as CEO, and several other Nautilus alums joined up, including Heydon's son Robert. Along with other would-be miners, they started knocking on the door of the International Seabed Authority.

Based in Kingston, Jamaica, the ISA has the contradictory tasks of protecting the ocean floor while organizing its commercial exploitation. Back in the 1980s, most of the world's nations—notably excluding the United States—signed a kind of constitution for the oceans, the United Nations Convention on the Law of the Sea. Among many other things, the document established the International Seabed Authority to represent what are now its 167 member nations. The organization was charged with devising rules to govern the then-nonexistent deep-sea-mining industry. The testudinal pace of subsea geology is rivaled only by that of international bureaucracy, and the ISA has been working to develop those rules ever since. Until regulations are agreed upon, full-scale mining is prohibited. But in the meantime, the agency can grant miners the rights to explore specific areas and reserve them for commercial exploitation. The ISA also declared

that private companies must partner with a member country. Even the tiniest member country will do.

By now, the Seabed Authority has granted permits to 22 companies and governments to explore enormous swaths of the Pacific, Atlantic, and Indian Ocean seabeds. Most are targeting nodules lying roughly 3 miles underwater in the Clarion Clipperton Zone, an expanse of the Pacific between Mexico and Hawaii measuring 1.7 million square miles. Holding the rights to three of the choicest parcels is Gerard Barron and the Metals Company. The company's chief financial officer recently told investors that those expanses could yield metals worth \$31 billion.

Here's what makes all of this urgent. The mining ban has a loophole: the two-year trigger. A section of the treaty known as Paragraph 15 states that if any member country formally notifies the Seabed Authority that it wants to start sea mining in international waters, the organization will have two years to adopt full regulations. If it fails to do so, the treaty says the ISA "shall none the less consider and provisionally approve such plan of work." This text is commonly interpreted to mean mining must be allowed to go ahead, even in the absence of full regulations. "Paragraph 15 was appallingly drafted," says Duncan Currie, a lawyer for the Deep Sea Conservation Coalition, an international umbrella organization of dozens of groups. "Several countries dispute the idea that it means they need to automatically approve a plan of work."

In the summer of 2021, the president of Nauru formally notified the Seabed Authority that the country, along with the Metals Company's wholly owned subsidiary, Nauru Ocean Resources, planned to begin sea mining. The two-year trigger has been pulled. The Metals Company's audacious gambit may have opened the door to deep-sea mining for the first time.

"As an environmentalist," Barron says, he finds the opposition to his plans frustrating. "'Save the oceans' is a really easy slogan to get behind. I'm behind it!" he says. "I want to save the oceans, but I also want to save the planet." It might be true that getting metals from the seafloor is less damaging than getting them from land. But so far, few outside the industry are convinced.

Very little is truly known about the deep ocean. Gathering data hundreds of miles from land and miles below the water's surface is extraordinarily difficult. A single day's work can cost up to \$80,000, and sophisticated tools such as remotely operated vehicles have only recently become available to many scientists. In 2022, 31 marine researchers published a paper that reviewed hundreds of studies on deep-sea mining. The authors also interviewed 20 scientists, industry members, and policy-makers; almost all said the scientific community needed at least five more years "to make evidence-based recommendations" for regulating the industry.

Every phase of the mining process entails serious risks for the world's oceans, which are already [severely stressed](#) by pollution, overfishing, and climate change. Start at the bottom. A massive piece of machinery-tank-treading over the pristine ocean floor, prying loose thousands of nodules from the beds where they have lain for millennia, is inevitably going to cause some damage. Corals, sponges, nematodes, and dozens of other organisms live on the nodules themselves or shelter beneath them. [Other critters](#) float around them, including anemones with 8-foot tentacles, rippling squidworms, glass sponges, and ghostly white Dumbo octopuses. "It's like Dr. Seuss down there," says Amon, the marine scientist. The nodules, Amon believes, are a critical part of the ecosystem that supports [all those creatures](#). And since they formed over millions of years, any harm that results from removing them "is in effect irreversible." Some scientists are also concerned that the huge amounts of carbon embedded on the ocean floor could be released, potentially interfering with the [ocean's ability to sequester carbon](#).

Silt and clay stirred up by the collector vehicles will also rise up into the water, creating plumes of sediment that could cloud the water for miles, linger for weeks or more, and suffocate creatures farther up the water column. Those plumes might also contain dissolved metals or other toxic substances that could harm aquatic life.

The nodule-collecting machine gets lowered to the ocean floor on a cable that's nearly 3 miles long.

Courtesy of Richard Baron/TMC

Onboard the ship, engineers in a control room monitor the mining robot's progress.

Courtesy of Richard Baron/TMC

Moving upward, the noise and light emitted by the harvester vehicles and riser systems could affect any number of creatures that have evolved to live in silence and darkness. A recent study found that the racket from just one seabed mining operation could echo for hundreds of miles through the water, potentially interfering with aquatic organisms' ability to navigate and find food and mates.

Once the nodules have been carried up to a ship, the silt-infused water that accompanied them will have to be dumped back into the sea, creating another potentially dangerous sediment plume. "We are talking about massive volumes. Fifty thousand cubic meters a day," says Jeff Drazen, an ocean scientist at the University of Hawaii who has also worked extensively in the Clarion Clipperton Zone, including on a research mission funded by the Metals Company. "That's like a freight train of muddy seawater every day."

A 2022 report from the United Nations Environment Programme sums up the grim picture. Bottom line, according to the authors: "Current scientific consensus suggests that deep-sea mining will be highly damaging to ocean ecosystems." More than 700 marine science and policy experts have signed a petition calling for a "pause" on sea mining until more research has been conducted.

Barron insists that his company is committed to getting the science right and points out that it has funded 18 research expeditions (to fulfill the requirements of the Seabed Authority). "Last year I spent \$50 million on ocean science," he tells me. "I don't see anyone else doing that."

By now, he argues, we know enough. "The lack of full scientific knowledge should not be used as an excuse not to proceed when the known impacts of the alternative—land-based mining—are there for us all to see," he says. It is a "certainty," he says, that sea mining will be less destructive. Whoever authored the Metals Company's own registration filing with the US

Securities and Exchange Commission wasn't so categorical. That document notes that nodule collection in the Clarion Clipperton Zone is "certain to disturb wildlife" and "may impact ecosystem function" to an unpredictable extent. The filing adds that it may "not be possible to definitively say" whether nodule collection will do more or less harm to global biodiversity than land-based mining.

When the vehicle was just 50 feet from the surface, the umbilical snapped. The 35-ton machine went spiraling down to the bottom of the Pacific.

The Metals Company's critics say the company basically isn't interested in what the science shows. One environmental scientist quit a contract job with the company, complaining in a since-deleted LinkedIn post in 2020 that "the company has minimal respect for science, marine conservation, or society in general ... Don't let them fool you. Money is the game. It's business in their eyes, not people or the planet." (Barron says this person is just a disgruntled ex-employee and that his charges aren't true. My efforts to contact the scientist were unsuccessful.)

The metals company is the only deep-sea mining outfit that is not backed by a major corporation or national government. It's a startup, wholly dependent at this point on fickle investor capital. That could certainly help explain why Barron seems to be in a hurry to start mining. When I ask him why the company triggered the two-year rule, he interrupts to clarify: "Well, Nauru did. We didn't. Nauru did."

You'd have a hard time finding a more extreme example of despoliation of a tropical paradise, of a fall from Eden, than Nauru. When the first European ship came across this 8-square-mile island in the South Pacific, in 1798, the captain was so charmed by the locals' friendly welcome, the fair weather, and the lovely beaches that he dubbed it Pleasant Island. But once an Australian geologist discovered that the spot was loaded with high-grade phosphate, much in demand as fertilizer, the outside world rushed in. Over the course of the 20th century, the nation of 12,000 people was strip-mined to the brink of oblivion. Its once-lush interior was reduced to what *The Guardian* described as a "moonscape of jagged limestone pinnacles unfit for agriculture or even building." As the phosphate began running low in the 1990s, Nauru tried to set itself up as a no-questions-asked offshore

banking haven, but so much ill-gotten cash poured in that Nauru was forced to tighten its regulations. The island's next moneymaker was to rent some of its territory to Australia to use as an immigrant detention center. Detainees there have rioted, staged hunger strikes, and sewn their lips shut.

Given all that, it's easy to see the economic appeal of teaming up with the Metals Company—especially since the mining zone is nowhere near Nauru. "Our people, land, and resources were exploited to fuel the industrial revolution elsewhere, and we are now expected to bear the brunt of the destructive consequences of that industrial revolution," including sea-level rise, wrote Margo Deiye, Nauru's representative to the UN, in a December newspaper op-ed explaining why her country is supporting sea mining. "We're not sitting back, waiting for the rich world to fix what they created."

Barron, who has never set foot on the island, insists that the relationship is a respectful partnership, not a modern version of colonial exploitation. "It's horrible what happened to Nauru," he says. "They were absolutely fucked over by the Germans, the English, the Australians, and the Kiwis." The Metals Company says it has doled out more than \$200,000 to support community programs of various sorts in Nauru, Kiribati, and Tonga, the two other island nations with which it has business arrangements. "The real contribution," he adds, "will be when we start paying royalties"—the partner nations' yet-to-be-decided percentage of mining revenues.

The Metals Company's own finances, however, are a bit shaky. Barron took the company public in September 2021, a few months after the two-year rule was triggered, claiming it had commitments of \$300 million from investors. Its stock topped \$12 per share a few days after it hit the market. But two key investors never delivered, leaving Barron and his team with only a third of their expected capital. The stock price plummeted and has remained stuck at around \$1 for months. The company is suing the faithless investors and is being sued itself by other investors who claim they were misled. Meanwhile, it has burned through \$300 million. A substantial chunk of that cash wound up in Barron's pocket. He is paid nearly a million dollars each year in salary and bonuses. His partner, Erika Ilves, a former executive at a company aiming to mine water on the moon whom Barron

brought on as chief strategy officer, is also paid handsomely. The pair were given stock options valued at nearly \$19 million in 2021 alone.

Bloomberg reporters and some environmental organizations have suggested that the company holds unfair leverage over its partner nations, and critics have drawn attention to the seemingly cozy ties between the Metals Company and the International Seabed Authority—in particular its secretary general, Michael Lodge. A recent *New York Times* investigation alleged that the ISA gave the company's executives access to data indicating where the most valuable seabed tracts were located, then helped it secure the rights to those areas. Both the agency and the company say that all their dealings have been legal and appropriate. (Lodge also made his stance on environmentalists pretty clear, telling the *Times*: “Everybody in Brooklyn can say, ‘I don’t want to harm the ocean.’ But they sure want their Teslas.”)

Between Barron’s outspokenness and his company’s legal and financial pyrotechnics, the Metals Company has drawn most of the media coverage around sea mining. “TMC is very bold, but the other companies are piggybacking on them,” says Jessica Battle, who heads the World Wildlife Fund’s campaign against sea mining. “Once one mining license is given, others will follow.” There’s an eager lineup. Belgian maritime giant Deme, high-tech hardware colossus Lockheed Martin, ship-builder Keppel Offshore & Marine, and the governments of South Korea, India, Japan, Russia, and China have launched dozens of research expeditions in recent years. China has two outfits licensed to explore for polymetallic nodules in the Pacific.

Deme’s sea-mining subsidiary, Global Sea Mineral Resources, may be best positioned to take the lead if the Metals Company stumbles. “They’ve got the backing of a multibillion-dollar company and access to European resources for design,” says Currie, the environmental lawyer. “They can wait 10 or 15 years and it wouldn’t be the end of the world for them. Whereas with the Metals Company, look at their stock price. If their license isn’t approved, it’s hard to see how they survive.” Global Sea Mineral Resources has also been running extensive tests in the Pacific—and learning its own lessons in how badly things can go wrong.

a frantic knocking on the metal door of his cabin jolted Kris De Bruyne awake. It was early in the morning of April 25, 2021, and De Bruyne, a Belgian engineer with Global Sea Mineral Resources, was aboard an industrial ship far out in the Pacific. De Bruyne was helming a team of researchers testing the Patania II, a bright green prototype nodule collector similar to the one deployed by the Metals Company. Now one of his team was shouting through the door: “Something really bad happened. The umbilical disconnected!”

It was, indeed, *really* bad. The umbilical is a Kevlar-jacketed cable stuffed with fiber-optic and copper wires. Nearly 3 miles long and as thick as a person’s arm, it was the only thing tethering the Patania to the ship.

“Is it going down?” De Bruyne called back.

“Yes!”

De Bruyne scrambled into his red coveralls and ran up on deck. The crew had been hauling up the vehicle after a test drive. When it was just 50 feet from the surface, the umbilical snapped. The 35-ton vehicle went spiraling back down to the bottom of the Pacific. De Bruyne stared helplessly over the side.

Luckily, the Patania landed with its locator system intact, sending acoustic pings up to the ship. It took a couple of days, but crew members eventually maneuvered down a small submersible robot equipped with three-fingered Doctor Octopus tentacles to reattach the repaired umbilical. “It was relatively easy. Well, I say it was very easy, but it was also like ‘AAAAAHHH!’ and ‘NOOOO!’” De Bruyne recounted when I met him at Deme’s headquarters near Antwerp, Belgium. “It was an emotional roller coaster.”

When they hauled the Patania up, they found it almost completely undamaged. To De Bruyne, the snapped cable was just one of the “teething problems” that typically come with launching such a complex piece of equipment. Earlier in the expedition, he’d also had to contend with Greenpeace activists who had painted “RISK!” on his ship in huge yellow letters.

De Bruyne is fit, clean-shaven, and small in stature, with a fanboy's enthusiasm for his job. He's acutely conscious of the criticism directed at his industry, and he seems to take it personally. De Bruyne's parents were traveling veterinarians, and they raised him and his brother in Rwanda and Vietnam. "I grew up in nature. I'm not the nature destroyer they want me to be," he says. "The nongovernmental organizations and the environmentalists, they forget that we also have our stories and that we want to do something good for the world as well."

The Patania mission, he points out, was accompanied by a separate boatload of independent marine scientists who monitored the machine's impact on the ocean (as was the Metals Company's foray). Still, the more we talked, the more qualms he confesses. "Once in a while, I'll ask myself, am I still doing the right thing?" he says. "I still think we're doing the right thing, because we're still doing research." He says he's not even convinced deep-sea mining should go ahead. "We need to know what the impact would be of deep-sea mining, and I'm contributing to getting answers to that question. That's how I feel about it."

Global Sea Mineral Resources has already sunk at least \$100 million into developing its subsea mining system, and it recently announced a partnership with Transocean, a major offshore oil-drilling outfit. The sea-mining company is now designing the much larger Patania III—the first of what the company hopes will be a fleet of full-scale mining robots that will hit the ocean floor around 2028.

The five years between now and then might be enough to develop the scientific understanding needed to craft regulations to safely mine the seafloor—or to determine whether it should be done at all. Or it might be time for alternatives, such as reducing private car ownership or recycling metals, to gain enough traction to make seabed mining superfluous. But frankly, none of these possibilities seem likely.

Gerard Barron is not planning to wait. "Got the boat, got the machine, announced the partnerships on how we're going to process the nodules," he says confidently. Assuming the Metals Company gets the go-ahead from the Seabed Authority, he says, everything is on track to start harvesting nodules

by late 2024. The company's goal for its first year is 1.3 million tons, scaling up to 10 times that amount in the next decade.

The two-year deadline expires this summer. After Nauru put the Seabed Authority on notice, the agency hurriedly convened several meetings, but results have been scant. The pressure seems to be generating something of a backlash. At the authority's most recent meetings last November, several member states called for a "precautionary pause" on seabed mining, echoing the moratorium petition. According to Bloomberg, France's representative declared that his country did not consider itself obligated to approve mining until it was satisfied with the regulations, and several other countries indicated they felt similarly. The UK, India, and Japan, however, want to try to hit the 2023 deadline. Some activists are even calling for the Seabed Authority to be overhauled or replaced.

"The general feeling is, there's a lot of work to do and a lot of complex issues to be addressed. So when some country says, 'Just gimme a contract, I'm gonna get on with it,' it rankles enormously," says Currie, who attended the most recent round of Seabed Authority meetings. There's a widespread feeling that it is too soon to be giving out permission to start mining, he says, but it's not clear how the organization might stop that from happening. "No one," says Currie, "is sure how this will play out."

Update 4-12-2023 2:45 PM ET: This story was updated to clarify Barron's compensation.

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Feb 23, 2023 9:00 AM

The Case for Software Criticism

Software may be the defining cultural artifact of our time. So why isn't there a culture of critical analysis around it?

Photo-illustration: WIRED Staff; Getty Images

Here's a quick typology of tech journalism today: news reporting ("Amazon announces layoffs affecting 18,000 employees"), gadget reviews, company and founder profiles, opinion essays (Zeynep Tufekci et al.), investigative journalism ("The Uber Files"), industry digests (TechCrunch), personal blogs, Substacks, and—if you're feeling generous—Hacker News comments and GitHub issues. It's an incomplete catalog, but you get the idea. Yet surveying this landscape reveals a curious lacuna: software criticism, in which a piece of software is subjected to critical analysis.

[WIRED Software Review](#)

Welcome to [WIRED Software Review](#), where we publish critiques of the defining cultural artifact of our time.

Let's be clear. *Technology* criticism is nothing new. Modern technology criticism, depending on who you ask, goes way back to Lewis Mumford, Herbert Marcuse, Martin Heidegger, and Marshall McLuhan. More recently, I assume you've heard of popular books like *The Age of Surveillance Capitalism* and *The Attention Merchants* and may even be familiar with technology critics like Jaron Lanier, Evgeny Morozov, and Ellen Ullman. Or to name a few from the academic flank, Fred Turner, Gabriella Coleman, and Sherry Turkle.

But software criticism is not the same as technology criticism. A work of software criticism is to Nicholas Carr's "[Is Google Making Us Stupid?](#)" what a *New York Times* book review is to Virginia Woolf's "Modern Fiction." The latter is a more synoptic assessment of the field while the former—in theory, at least, if it existed—is a focused interrogation of a single work.

So where are software critics? If the 18th and 19th centuries saw the rise of novels and the 1920s was reserved for jazz music, isn't software a defining artifact of our time? How in Turing's name hasn't the culture of software criticism emerged?

The idea that a rhapsodic exegesis of fermented grape juice could be a legitimate category of criticism hadn't emerged until the likes of Robert Parker—whose legacy is, for the record, quite messy—made the genre serious. There had been wine reviews published in trade magazines (some with obvious conflicts of interest) but there was no “culture” of wine criticism. Now, there are more wine columns than (alas) poetry sections in major newspapers in the United States.

But you may think that wine is too different in form from software. Then here's another example for you: car criticism. In 2004, Dan Neil of *The Los Angeles Times* won the Pulitzer Prize for Criticism for his “one-of-a-kind reviews of automobiles, blending technical expertise with offbeat humor and astute cultural observations.”

And here would be to present the case of architecture criticism, whose bona fides are well established. On this much we should agree at the outset: A piece of architecture can be as complex as a piece of software. In fact, the vocabulary of software engineering has many parallels to architecture. (For example, those who make high-level design choices are called software architects.) Many concepts are shared as well. Take the interface-implementation divide in software. Similarly, all elevators share the same interface—the door opens when you press the button, you wait for it to arrive and enter, you press the button of the floor you want to go to, and so on—but their implementations—hydraulic, geared traction, machine-room-less—vary. It may be no coincidence that Mumford, an early technology critic, served as the architecture critic for *The New Yorker*.

So if grape juice and cars and buildings merit critical analysis for their complexity and design, shouldn't a piece of modern software qualify as an object of criticism too? It's a truism that great books, and insights extracted from them, help you understand a society you live in better than your own daily living experience. But so can products of engineering, like the Ford Model T, Boeing 747, and—a textbook example—the Singer sewing machine. The Chrome Browser, which spans all layers of abstraction—from low-level network protocols to memory optimization to product features to UI elements—is surely no less a complex object than a Mini Cooper? And you might know that kernel hackers aestheticize the Linux kernel in the same way a sophisticated Swiss watch is seen as an aesthetic object.

What is software if not the most consequential form of creation of our time? In fact, it's possible that we cannot come to a full understanding of our time without certain pieces of software. (Can you explain the early 20th century without Tin Lizzie?) I recoil at this phrase, but software—like it or not—has been eating the world. And large language models are coming to eat your lunch.

Hence a critical understanding of software products—ones you spend more time every day on than calling your parents every week—is vital.

When explaining the success of Slack, business analysts might look at market forces and demands (“product-market fit” in their lingo) but a software critic may only evaluate software-specific aspects—user interface, frontend, backend, infrastructure—and advance a thesis, for example, that it succeeded because it became what had been thought to be unattainable by enterprise software: It was “likable.” Then the critic could look at its design decisions—not only visual ones but its signature Knock Brush notification sound—and assess its risky yet successful [backend rewrite](#)—rejection of [the conventional wisdom](#) in the software industry that you should never rewrite your code—that made it go from the [butt of the industry's joke](#) to a scalable piece of software.

Why hasn't the culture of software criticism emerged? A simple explanation is that the form is still young. Books, poetry, buildings, and wine have been around for millennia. Cars and films have been around for more than a hundred years. Yet modern software is only a few decades old. Also, the

form is under-theorized—not engineering-wise but humanities-wise. If we were to compare it again to buildings, it's as if there's a strong civil engineering tradition without architectural theory. Another obvious reason is that there's not much crossover between people in the humanities and in engineering. And given how lucrative being a software engineer can be, there's not much incentive to become a software critic.

Software critics would help us answer this simple question that demands complex answers: “Why is this good?” Or, often more entertainingly, “Why is this so bad?” Take Microsoft Teams as an example. What we get now is a fusillade of tweets or rage threads in r/MicrosoftTeams. But a software critic can nail the underlying malady and establish a rational basis for its terribleness. Conversely, a good work of criticism is liable to make you love the software you hated and hate the software you loved.

There's also a certain social—and I'd say even moral—function of critics that applies to software criticism as well. The architecture critic Michael Sorkin once described criticism as “a service profession,” one with moral and practical purposes. Intellectual exchanges among the triad of creators, consumers, and critics have enriched the ecology of those art forms. And one of the most noble roles of a critic, I think, is to give prominence to up-and-coming artists or those unjustly living in obscurity. Just like an influential critic can call attention to an independent film or an essay collection from a small press, a software critic can spotlight maverick programmers who don't benefit from Big Tech's press releases.

By reviewing their work, perhaps we can finally recognize open source programmers [without whose tireless work our infrastructure will collapse](#). And I'd love to see talented independent developers—who create thoughtfully designed applications (without which *my life* will collapse) and sell for a reasonable price but live at the mercy of the App Store—celebrated.

And perhaps to broach sensitivity territory, over the past few years, technologists and those in the writing profession—broadly encompassing journalists, critics, and non-sci-fi fiction writers—have developed trust issues. After the groovy days of the post-dot-com bubble era that lasted from the mid-2000s to mid-2010s, the “techlash” (not my phrase) has

become the dominant theme. Given the animosity between two groups, you may think that this won't be a space where both parties will participate in. To this point, the writer and neuroscientist Erik Hoel recently wrote a post titled "[2022 was not the year of consilience](#)," about how C. P. Snow's Two Cultures have grown more antagonistic towards each other.

But perhaps that's why software criticism is needed more than ever in the midst of the brinkmanship between the two worlds. Software criticism may be one of the ways to inch toward an armistice. In the demonology of some media outlets, "software engineer" occupies the same rank as "investment banker," and in certain circles in the Bay Area, the word "journalist" is uttered like a slur. But that both sides are engaged in a shady enterprise is a corrosive belief.

So what would a piece of software criticism look like? A rough blend of a product review and literary criticism? At its most basic form, yes. But it's much more than that. The critic will anatomize the subject from several angles. Befitting the hybrid artifact that is software, the critic will adopt disciplinary anarchy, toggling between the commonsensical to the technical to the historical to the philosophical.

Instead of speaking in abstraction, let's pick Google Docs as the patient zero of this new enterprise. A software critic may begin with some requisite cultural history on the labor of writing, but then also provide a bit of technical (and even geeky) history-cum-explainer on how the [operational transformation \(OT\)](#) technology of Google Docs paved the way for real-time collaboration tools in other fields, such as Figma for design or Colab for programming. And how the research in [conflict-free replicated data type \(CRDT\)](#) could make this mode of working a default mode of collaboration in the future. And what that means culturally and sociologically.

One can also imagine an analysis of Notion that goes beyond lauding its "minimalistic" design but what kind of specific UI/UX principles—perhaps tracing back to [Douglas Engelbart's influence on its designer-founder Ivan Zhao](#)—and its own [data model](#) allow the app to express those design elements.

Now, here's what software criticism must *not* be like. No ratiocination similar to Parker's point system. This is also not a place for affiliate links. No dollar-motivated boosterism nor thinly guised advertorials. A software critic could stand anywhere in the spectrum ranging from technological enthusiasm to optimism to skepticism to pessimism but need to avoid extreme ends, meaning they should deftly sail between the Scylla of tech utopianism and the Charybdis of Luddism, in order to invite all kinds of readers and avoid setting off ideological alarms.

And surely we can use some exciting prose! Burn that copy of *On Writing Well* and help yourself with some Nabokov soup. Exorcize the kind of homogenizing language that abound in the rationalist blogosphere written by Scott Alexander wannabes and avoid sounding as if the text were generated by a language model trained on VC tweets. Self-medicate with William H. Gass, luxuriate in Lydia Davis, mainline on Martin Amis, hallucinate with Geoff Dyer, get drunk on Peter Schjeldahl, and detoxify with the sobering yet adrenalizing prose of Parul Sehgal. Anything goes. Well, everything except the Zinsser-ized, over-sanitized—hence sterilized—technical prose, because we aren't writing a damn README here.

So who can be a software critic? To say that everyone's a critic would be an easy cliché, but you don't need a PhD in media theory or know how to implement a Bloom filter in C. Technical expertise helps, but what's needed is *technical literacy*. Dan Neil was no car mechanic and neither was Mumford a civil engineer. And I'm sure Robert Parker can't tell the difference between the chemical structures of ethanol and those of methanol to save his life.

Of course, it doesn't mean that practitioners are excluded. Remember that Le Corbusier was influential both as an architect and a critic.

In the beginning, software critics will need to sort out some idiosyncrasies of this new literary form. Here's one. Unlike a book or a film, a piece of software is never finished, hence numerous and ugly-named versions (e.g., v2.5.3 or 1.0rc1) How do we deal with that? Perhaps we can take hints from wine and car critics who evaluate different vintages and model years. Or we can do what restaurant critics do: Revisit a few years later. In fact, those are some of the most memorable ones. (Pete Wells' reviews

of [Per Se](#) and [Peter Luger](#) come to mind). Software critics also need to start imagining how to critique backend frameworks and operating systems that don't have visual elements.

I don't expect the *New York Review of Software* to be published any time soon. But when the form matures, we could imagine a NYRB-styled comparative review of books with similar themes—a group review of email clients, for example. But who knows, when this form is fully realized, there might be *Softwareforum* like *Artforum* and *Bookforum* (RIP).

Even if it remains a niche area of criticism—but, to be fair, isn't criticism a niche genre to begin with?—the effort would be worthwhile. I'm reminded of what the music critic Alex Ross once wrote, in his piece about Debussy, on what happens when a new creative form is brought to existence: “Debussy accomplished something that happens very rarely, and not in every lifetime: He brought a new kind of beauty into the world.”

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Feb 23, 2023 6:00 AM

The Battle for the Soul of Buy Nothing

How an idealistic community for exchanging free stuff tried to break away from Facebook, and ended up breaking apart.

Photograph: Holly Andres

When my son was little, my mom started collecting his outgrown clothes to give to strangers on the internet. She would meet these people through Buy Nothing, a project that had been created by two women from Bainbridge Island, Washington, not far from her home in [Seattle](#). The mission of Buy Nothing, which had a local cult following, was to revive old-fashioned sharing among neighbors. People were organized by town or neighborhood into [Facebook](#) groups, where they could post what they needed, or no longer needed, and their neighbors would respond accordingly.

What made this different from Goodwill, [Craigslist](#), or other freebie groups was that the people in your group always lived close by, and—because Buy Nothing was hosted on Facebook—everyone's names and photos were visible, and messaging other members was as easy as texting. Pickups tended to happen at the front door, prompting face-to-face conversation. After a while, strangers became friendly acquaintances, their stoops integrated into your mental map of your town. Through my mom, random people came to own the forgotten detritus of my motherhood: unused diapers, a nursing cover (“that you threw in bathroom trash,” my mom accused in an email). My mom had been living frugally and sustainably long before it was fashionable—diluting her dish soap, cutting her sponges into quarters—and on Buy Nothing, she'd found her people.

When my son was 6, my mom retired. She packed her life into used cardboard boxes procured on Buy Nothing and moved down the street from me in Fort Collins, Colorado, where she joined a new Buy Nothing group. With her freed-up time, she acquired empty kombucha bottles on Buy Nothing, filled them with home-brewed kombucha, then regifted those. I used the group by proxy—once, to get rid of a box of half-full toiletries, another time to find a clip-on leopard tail for my son’s summer theater production—and eventually joined it myself.

Our group, one of several in Fort Collins, included more than 1,000 members. Buy Nothing had grown a lot in the years since my mom had been an early adopter, especially during the worst of the pandemic, when people were avoiding stores. By summer 2022, there were thousands of groups in more than 60 countries, with about 6 million members. The founders, Liesl Clark and Rebecca Rockefeller, had published a book about buying less in which they described a grand vision of strengthening individuals, communities, and the environment. People told apocryphal stories about diehards who never bought anything, like, ever.

Facebook was a big part of what made Buy Nothing so effective. But it was also the reason I was far less active there than my mom. Like a lot of people I knew, I’d fallen off using Facebook much. Given Buy Nothing’s mission of commerce-free community building, there seemed something dissonant to me about its existence on a platform that mined people’s personal information and stoked invidious “engagement” for ad dollars.

It turned out that Clark and Rockefeller, the Buy Nothing founders, also considered Facebook an uncomfortable fit. When I talked to them both on a Zoom call last summer, Rockefeller, 53, was on her parents’ porch in glasses, a delicate blouse, and a shaggy silverish bob, while Clark, 56, sat at her dining table wearing a ponytail and a fuzzy cardigan. “We used Facebook because it was a free tool, and it had a lot of reach. There were a lot of reasons that we picked it,” Rockefeller explained. “But we realized very early on that it also came with some things that conflicted with our mission.”

Rebecca Rockefeller and Liesl Clark founded Buy Nothing in 2013.

Photograph: Holly Andres

She and Clark had a wearied, beleaguered air. A year earlier they had decided to move Buy Nothing away from Facebook, turning their attention to launching a stand-alone Buy Nothing app. This kind of undertaking was, of course, one of those many things in life that do not come free. They registered a business, The Buy Nothing Project Inc., and pitched venture capitalists on investing in them. Clark had taken to punctuating her tweets with hashtags such as #futureofwork and #MakerEconomy.

So far, though, Buy Nothing Inc. was a flop. Even more upsetting, Clark and Rockefeller were getting blasted from within their own community. Some Buy Nothing members accused them, in blistering Facebook comments, of selling out. This reaction might have been expected, in retrospect, from a commerce-free collective, but the intensity of it shook Rockefeller and Clark. They had built a thriving and generous community on the most corporate of internet platforms. But now that they were trying to become independent—a move that they saw as committing further to their principles—they were met with furious disbelief that the founders of a movement premised on strings-free gifting now appeared to be trying to make a buck. “You have to fund it. There’s no shame in that,” Clark said. “But we are shamed nonstop for having named it the Buy Nothing Project.”

Buy Nothing’s much-repeated origin tale starts with Clark, a documentarian from Bainbridge Island, spending time in a remote mountain community in Nepal with her husband, the elite [mountaineer](#) Pete Athans. There she noticed that people reused their belongings and shared, rather than bought, what they needed. Back home, Clark and Rockefeller, a friend, would often take walks with their children along the water and inventory the trash that had washed ashore. They wondered whether they could reduce waste by bringing the sort of gifting Clark had seen in Nepal into their own town, and Buy Nothing was born.

None of this is exactly inaccurate. Clark is a filmmaker; she did observe gift economies in Nepal; she and Rockefeller did audit the Bainbridge shoreline. But the full story of Buy Nothing starts when they met, in 2009, through an online gifting forum called Freecycle.

This article appears in the April 2023 issue. [Subscribe to WIRED](#). Photograph: Andria Lo

Earlier that year, Rockefeller had gotten divorced and ended up as a single mother. While married she had been working-class, but suddenly she was poor, living on food stamps and Medicaid. She joined Freecycle expecting to take things she needed while simultaneously giving back. She kept getting in trouble with the group's local moderator, though, for offerings that he deemed unacceptable. "I had these twigs that I'd pruned," she told me. "The guy was like, 'Your old shrubbery is not a gift.'"

He was wrong. The twigs did attract interest—from Clark, it turned out. When she came by to pick them up, the women commiserated over Freecycle's strict rules and found they had a lot in common.

Both women had unconventional lives. Clark's academic parents raised their kids partly in Nigeria and Chile and spent their spare time on DIY projects. At one point they bought land in New Hampshire, and the whole family built a house on it by hand. Later, her work as a documentarian took her all over the world, with her children often tagging along. When Rockefeller was 3 years old, meanwhile, her mother joined a cult and left the family. Rockefeller's father remarried, and he and Rockefeller's adoptive mother, both government workers, instilled the family with a strong ethic of public service. As she grew up, an iconoclastic streak kept Rockefeller from settling into one particular career; she worked as a kayak guide and a craftsperson, among other gigs.

Both women homeschooled their children—for Clark, to accommodate work and volunteerism, and for Rockefeller, to provide a more personalized education for her daughter, who is on the autism spectrum—and they started getting together for school projects. They found they shared a mutual devotion to environmentalism and frugal living. Whenever they saw each other, they'd come up with ideas for idealistic ventures: a local bartering club, a lending library for household tools. None ever took off.

In July 2013, Rockefeller posted on Facebook, "If I started a local free/trade/borrow listserve, like Freecycle but with a different attitude re: moderation of posts, would you join?" There was a chorus of positive

responses—yes!, yup!, prolly. Clark jumped in: “But how can each member post? Do you submit to a moderator who then posts your item for you? Do you have to have a photo?” Rockefeller replied, and in the thread—then later, in person—the women hashed out the details.

The initial premise was to make people feel good about whatever they had to offer. “Literally, we want people to come in and offer their onion skins and their chunks of concrete,” Rockefeller told me. And unlike Freecycle, which focuses on giving and dissuades requests, they would encourage people to ask for anything. But maybe more consequential than any of those differences in sensibility was that Rockefeller and Clark decided to host Buy Nothing on Facebook, with its built-in social tools.

On July 6, Rockefeller created a Facebook group called Buy Nothing Bainbridge and added Clark as a co-administrator. By the end of the day it had more than 100 members. Within weeks the group had added hundreds more members, and strangers in nearby towns were asking how they could start their own. Rockefeller and Clark helped them, and by the end of December they had created 78 Buy Nothing groups, with more than 12,000 members in all.

Recent offers have included a used stick of upmarket deodorant, a half-eaten artichoke pizza, and the fluff from inside a couch.

The day before New Year’s Eve, Clark, Rockefeller, and a group of friends and Buy Nothing members got together to plan for the future. They had tea and muffins, then did an exercise. On multicolored index cards, they each wrote down their wildest dreams for Buy Nothing. One woman hoped that it would become a nonprofit and publish a magazine; another imagined it would spawn a virtual [currency](#).

The group made a list of Buy Nothing’s positives (*dedicated admins, free, connects virtual world to the real world*) and negatives (*24/7 time commitment, funding, problems managing Facebook*). They wrote down the opportunities ahead, and also the risks. In the latter column they listed the challenge of replicating their original vision across dozens of groups, the limitations of the Facebook platform, the chance of egos getting in the way of the group’s principles, and the possibility of being “unable to fund core

expenses.” Years later, the list would turn out to be prescient. But at that time, almost a decade ago, all the excitement made Rockefeller and Clark feel like anything was possible.

Photograph: Holly Andres

Test the limits of what can be gotten or discarded on Buy Nothing, and you will be confounded. You can proffer a medium-size rock, and someone will want it for their garden. You can post dryer lint, and a neighbor will convert it into hamster bedding. In their book, Rockefeller and Clark write about a childless couple who, after multiple miscarriages, finally gave away their unused baby items. The recipient, collecting this on behalf of a pregnant friend, mentioned that the friend was thinking about putting her child up for adoption. One thing led to another, and soon the couple became the infant’s adoptive parents.

This was a particularly unusual case, but over the months I spent talking to Buy Nothing members, it wasn’t even the wildest anecdote I heard. In my group in Fort Collins, recent offers have included a used stick of upmarket deodorant, a half-eaten artichoke pizza, and the fluff from inside a couch. All found new life. The couch fluff, actually, went to at least three people—one of whom, a friend of mine, was sewing tiny stuffed gnomes as Christmas presents.

A woman in Seattle named Katylin (she doesn’t use a last name) told me that Buy Nothing has allowed her to live well in one of the most expensive cities in the world. Katylin describes herself as blue-collar; she’s had various jobs including practicing cosmetology and working at a grocery store. Seattle has gotten wealthier and more economically stratified over the years, but on Buy Nothing, she told me, relations feel equalized.

Katylin has given away chicken droppings (for fertilizer), stale aquarium water (a nutrient-rich plant food), and crushed egg shells (a natural calcium source). She has received a stove, a dishwasher, toys for her children, concert tickets, and a wooden boat, which she rows out onto the lake at night to [stargaze](#). For two years during the pandemic, Katylin told me, she bought almost nothing except food. “I feel great after a day of Buy

Nothing,” she said. “You don’t go to a Walmart, come home, and feel *happy* about your purchases.”

Rockefeller and Clark decided early on that they didn’t want to codify Buy Nothing’s principles into a business or a nonprofit, with all the unwieldy administration that would entail. They did, however, want to supervise how the Buy Nothing groups functioned, so they built a makeshift management structure using the tools already embedded in Facebook. On Facebook, groups have to be operated by one or more administrators, so Rockefeller and Clark decided to have local volunteers run each group. They disseminated information to these people through another Facebook group called the Admin Hub. They appointed regional admins to oversee the local ones, and finally a small circle of about 20 global admins to handle project-wide tasks and weigh in on big decisions. Rockefeller and Clark had the final word.

Almost all of the admins were women, and their labor was entirely volunteer. As Rockefeller and Clark sank their lives into Buy Nothing, sometimes at the expense of their families and careers, so too did thousands of others. Local administrators said they spent seven or eight hours a week, and in some cases as many as 40, reviewing requests to join their groups, making sure their communities felt welcoming, and keeping the giving spirit active by, for example, posting messages of gratitude.

Another part of an admin’s job was to enforce the 10 rules of Buy Nothing. One core rule concerned each group’s borders, which were limited to small geographical zones. The idea was that this would foster a more intimate community and reduce a group’s carbon footprint. A member could belong to only the group where they lived, and once a group reached 1,000 people, it was supposed to split into smaller communities, a process called “sprouting.”

Rockefeller and Clark imagined Buy Nothing sprouting into groups covering ever-smaller geographies until, eventually, so many people were on Buy Nothing that it would be rendered obsolete. “We know our immediate neighbors so well that we can just walk over there and say, ‘Hey,’” Clark said.

It was a romantic vision for what the internet could facilitate. But as Buy Nothing expanded, people started to chafe against this stricture and others. While Rockefeller and Clark regularly received notes of gratitude, they also got messages of irritation, and even hate mail, that blamed them for mishaps and infighting in the local groups or accused them of heavy-handedness with all the rules.

In 2018, some of these localized complaints started to bubble up to the movement's surface. When a Buy Nothing group in Boston's Jamaica Plain neighborhood was approaching 5,000 people and still hadn't subdivided, regional admins started pushing for a sprout, a local admin at the time told me. (Regional admins couldn't be reached for comment.) She said that when the sprout was announced to the group, members were furious: They protested that they didn't want to split up, and they worried a sprout might fall along racial and socioeconomic lines and reinforce the legacy of segregation and redlining.

According to the admin and other members I spoke to, the regional admins doubled down, as did members, and the language got heated. "Our community gets really fired up on the internet," the admin said. "It was rocky." Then Clark got involved, writing in a regional group for admins that she was "saddened" by the Jamaica Plain community's uncivil behavior. At this, the local admins quit in protest, and the remaining members revolted completely.

Members of the group discovered a YouTube video Clark had filmed during a Himalayan expedition co-led by Athans, her husband, with support from the Nepalese government. The video shows Athans in climbing gear, handling an ancient human skull while suspended in front of a cave. In voiceover, Clark explains reverently, "We've uncovered a people who persevered, their story of good health recorded in their bones." She describes present-day villagers who, when Clark and her family brought gifts of clothing, insisted that the items be divided equally among the households, "so each family would have equal social capital to share." She goes on: "We wondered, could we start an egalitarian gift economy in our own town?" The video cuts to Bainbridge Island.

Former members told me that the video was roasted for having colonialist undertones. One member, Kai Haskins, wrote a Medium post about the conflict titled, “That ‘Hyper-Local’ Buy Nothing Group You Love Is Controlled by a Wealthy White Woman in Washington State and Is Reinforcing Systemic Racism and Segregation.”

Clark took issue with Haskins’s account; for one thing, she said, she’s not wealthy. Still, she eventually apologized in a post to the Jamaica Plain group. “I agree that it is important for all of us, and white people in particular, to talk about racism without becoming defensive. I clearly have been, and I’m learning from my own fragility,” she wrote. By that time, though, everyone was fed up. The Jamaica Plain group fell apart, with thousands of members defecting and starting a separate group.

One way to approach the episode might have been to see it as an inevitable, if uncomfortable, outgrowth of a movement that encouraged people to feel communal ownership of their local gift economies. If it ended with members in Jamaica Plain starting a rival gifting group, so what? That was not, however, how Rockefeller and Clark responded. They worried that the upset in Jamaica Plain, and other episodes like it, represented a bigger problem, and in late 2019 they formed an “equity team” to figure out how to create an “actively anti-racist and anti-oppression culture” within Buy Nothing.

“I feel great after a day of Buy Nothing. You don’t go to a Walmart, come home, and feel *happy* about your purchases.”

Katherine Valenzuela Parsons, a member of the equity team, told me that the team discovered people in other groups had also experienced a racialized dimension to sprouting. And Buy Nothing’s problems went further still. Some local admins were letting people offer Confederate flags. In several instances, when people of color complained about this and other racist or offensive posts, they’d been accused of incivility and thrown out of their groups. In other cases, members attacked admins of color for raising these issues.

Rockefeller and Clark had known about some of this, but the scope startled them. On the one hand, the Jamaica Plain experience had made them feel

that high-level admins, themselves included, might have overstepped. On the other hand, they didn't want the Buy Nothing experience to be so unsupervised that toxicity and racism would go unchecked and local admins would abuse their power.

They also felt that Facebook incentivized provocative, even hostile, communication. "Even if your motivations are purely lovely and welcoming and inclusive, you're basically putting yourself in the meat grinder of social media, and you will be eaten up," Rockefeller said. The equity team hadn't highlighted Facebook itself as a problem, but Rockefeller and Clark started to wonder whether it all couldn't be solved by going off the platform entirely.

The two of them had harbored vague desires since the beginning of Buy Nothing to divest themselves of Facebook, but they had never figured out how to do it. One option was to turn Buy Nothing into an independent nonprofit. But Rockefeller, who has spent much of her adult life volunteering and working in nonprofits, dreaded the cycle of fundraising and subsequent obligation to meet funders' demands. It also seemed weird to start a business based on giving stuff away for free. Now, they came up with a plan. They'd collect donations from Buy Nothing members to build a platform independent of Big Tech. On Black Friday of 2019—celebrated in their community as Buy Nothing Day—Rockefeller and Clark posted an announcement on Buy Nothing's main Facebook page: They were building an app called SOOP, for Share On Our Platform. "Because we want to answer only to the public good and not to platform owners who will profit from the use of personal data," they wrote, "we are raising the funds to do this on our own."

The response was mixed at best. Some community members found it wildly hypocritical that the founders were asking for money. It was a fair point: Rockefeller and Clark's own rules for local groups banned "requests or offers for monetary assistance, including requests for loans, cash, or donations." Optics-wise, it didn't help that Rockefeller and Clark had started plugging their forthcoming book, *The Buy Nothing, Get Everything Plan*, on Buy Nothing's Facebook page. A few members did donate, but the total—just \$20,000—wasn't enough for even the most basic proof of

concept. Humbled, Rockefeller and Clark returned the money and tabled the idea.

Their book came out a few months later. The tone was part [Marie Kondo](#), part manifesto. “Money isn’t all that wonderful,” Clark and Rockefeller wrote, adding, “The market economy begets isolation, and money disconnects us from one another.” Those who worried that the book would make the authors rich needn’t have wasted their energy—it was published just as the pandemic arrived, and barely sold.

The pandemic propelled Buy Nothing into mainstream popularity. With people hunkering down in their neighborhoods, membership started growing faster than ever, to about 1.5 million users in July 2020; over the following year, the project would add nearly 3 million more. People shared groceries, homemade masks, over-the-counter medication. It was exhilarating but also, for Rockefeller and Clark, exhausting; suddenly they were working nine-hour days on top of everything else.

Meanwhile, they’d been changing Buy Nothing’s operations, partly in light of the equity team’s findings. They started getting rid of regional and global admins, a move meant to return control to local groups and streamline communication. They published self-serve materials on their website so that people could launch new groups on their own. They also loosened Buy Nothing’s rules to let groups determine their own geographical boundaries, decide when to sprout, and allow members to belong to more than one group.

Not everyone appreciated the changes. Haskins, one of Buy Nothing’s more vocal critics in Jamaica Plain, said they came across as “performative bullshit.” Parsons, the equity team member, told me that while she came around to them, they went much further than anything she and the equity team had suggested.

Other admins felt the founders had broken Buy Nothing’s intimate feel and community-led support systems. And they objected to the top-down direction of these changes. One of them, Andrea Schwalb, took to the Admin Hub to denounce the project’s new direction, and said she was kicked out. She started a separate Facebook group, called Gifting With

Integrity—OG Buy Nothing Support Group, for Buy Nothing admins who preferred the old organizational structure and rules. Schwalb and others were already prickly about how Rockefeller and Clark publicized their book; all the changes, she said, made matters worse. “We were big mad.”

Photograph: Holly Andres

Clark and Rockefeller saw their modifications as necessary, if controversial, improvements. They were making the organization less bureaucratic and more equitable; those who disagreed were resisting change. And it was hard for them to feel generous toward their most strident critics.

By this point, Clark had stopped making documentaries and was working on Buy Nothing full-time. Rockefeller had, in Buy Nothing’s early years, taken a job at an organization that assists people with disabilities and eventually became its executive director. As Buy Nothing took up more of her time, however, she stepped into a part-time position as an administrative assistant that paid little more than minimum wage. “I’m basically living on the edge of poverty so that I can serve this thing that I helped create,” she told me. She acknowledged she’d done this by choice. Still, she added, “Sometimes it feels like, ‘Oh, this is absolute insanity, it makes no sense.’” She and Clark started dreaming of paying themselves and others for their Buy Nothing labor; it seemed only right. Their crowdfunding efforts had backfired. Now they wondered whether it wasn’t such a bad idea to turn Buy Nothing more straightforwardly into a business.

In January 2021, Clark received a LinkedIn message from Tunji Williams, a former attorney turned entrepreneur who had previously built a small startup. “I just learned about your amazing movement,” he wrote, and offered to collaborate with them. They invited him to meet over Zoom, where Williams explained that the birth of his first child had inspired an idea for an app to share secondhand baby paraphernalia and other items. Friends told him about Buy Nothing, and he thought he’d approach them about launching a startup together.

Clark and Rockefeller accepted. Going into business with someone who happened to email at the right moment may not have been the savviest

decision, but the way they saw it, their cards were finally lining up. Williams came across as genuine and experienced, and, if they were being honest, they needed help. On January 13, they registered The Buy Nothing Project Inc. as a benefit corporation—a for-profit business obligated to prioritize society, workers, the community, and the environment—in Delaware. This time they took a more conventional approach to fundraising, collecting \$100,000 from family and friends. The company had four cofounders: Clark, Rockefeller, Williams, and a software developer named Lucas Rix who, as it happened, had also sent a blind email to Clark and Rockefeller. Clark would be the CEO, Williams the COO, Rockefeller the head of community, and Rix the head of product. For the first time in months, Rockefeller and Clark felt energized. “It was a huge relief,” Rockefeller told me.

Three weeks after registering The Buy Nothing Project Inc., Clark announced in the Admin Hub that they were building an app “to host the Buy Nothing movement as it continues to grow.” The founders would now dedicate their time to this new endeavor. As a gesture of gratitude, she added, they would give a stake in the platform to admins who joined the waitlist for the app. “Your enthusiastic participation will help us reach critical mass more quickly,” she wrote.

The reaction was not particularly enthusiastic. Some people did cheer the founders on and sign up for the waitlist—but others were upset. The app had no admin roles at all. Several admins told me that although they didn’t begrudge Rockefeller and Clark their entrepreneurial turn, they couldn’t help but view the app as competition with the existing communities that they’d painstakingly built over years. “There was a time when I was spending 30 hours a week doing things for Buy Nothing,” Kristi Fisher, an admin in California, told me. “There was this feeling of, like, nobody asked us or took our thoughts and feelings into consideration.”

Others turned their ire directly on the founders, harshly criticizing them for capitalizing on the work of thousands of volunteers and then shilling their product in that very same space. Rockefeller and Clark felt personally attacked. As they pushed on with what they saw as an attempt to give the

Buy Nothing community a healthier existence online, it seemed possible that in the process they might lose the community entirely.

In November 2021, the Buy Nothing app launched. It was immediately clear how different it was from the Facebook groups. You didn't have to be approved for admission, for one. You could set any address as your home base and search for items within a larger radius: maybe one mile away, maybe 20.

But some core features of the Buy Nothing culture had been lost. You could no longer click on a person and see where they worked or whether you had friends in common. On Facebook, Buy Nothing posts had appeared in your feed spontaneously, encouraging off-the-cuff interactions, but using the app required remembering to open it in the first place. All this added up to making the posts feel less intimate and more transactional. Some people told me that, on the app, Buy Nothing resembled the depersonalized services against which it had originally defined itself.

The two of them had harbored vague desires since the beginning of Buy Nothing to divest themselves of Facebook.

The launch of the app intensified the feud between the Buy Nothing founders and their internal critics. Rockefeller and Clark almost fully reoriented the Buy Nothing website around the app; at one point, information about the Facebook groups was tucked under a snarky message: "Want Facebook to profit from your Buy Nothing experience? We've got you covered!" Schwalb, meanwhile, developed her OG group into a sort of alternate universe in which nothing about Buy Nothing had changed. She shared Buy Nothing documents that the founders considered obsolete, coached admins on how to operate under the old rules, and, through friends who still belonged to the Admin Hub, generally kept tabs on what Buy Nothing was up to.

In the weeks after launch, thousands of people tried out the app. By the end of the year, 174,000 people worldwide had downloaded it; of those, about 97,000 were using it once a month or more. As time passed, though, the numbers stalled. In the App Store, one-star ratings dominated. By April 2022, monthly users had fallen to 75,000.

The discontent among Buy Nothing Facebook admins explained some of this; they were hardly going to evangelize for an app they resented. But the far more significant problem was that the app just wasn't very good. It was so basic and bug-ridden that, at first, people couldn't even figure out how to register. To limit expenses, Clark and Rockefeller had contracted a web-development shop in Poland to make a simple version. They eventually raised another \$400,000, but that was still short of what they needed.

The truth was that turning Buy Nothing into a business had come with far more expenses than revenues. If Facebook profited from Buy Nothing members' activities, it also covered many of their costs. With the launch of the app, the resources that came for free with Facebook—software development, computing power, visibility—were suddenly Clark and Rockefeller's responsibility.

It was logical that offsetting those costs, and eventually turning a profit, required bringing in revenue, but whenever I asked Clark and Rockefeller about this, they sounded genuinely perplexed. They had vowed not to sell their members' personal data or run targeted advertisements, thus ruling out some of the most obvious business models. And their ideas for moneymaking enterprises that wouldn't sacrifice their ideals struck me as convoluted: They considered collecting generalized information about what items people were sharing, then selling that to local municipalities tracking waste; they thought of pushing public-service announcements about reuse that users would pay to turn off. Their most straightforward idea was to incorporate a [Taskrabbit](#)-like function, allowing users to charge one another for add-on services such as delivering gifts or repairing broken items, with Buy Nothing taking a cut. But then that, of course, would involve buying something.

They were at an impasse, and funding was running out. So, in May of last year, Clark did what any self-respecting entrepreneur in her position would do: She started writing to venture capitalists and angel investors. In the months that followed, she sent messages to 163 investors. She got 17 meetings—and no funding.

Clark blamed the difficult environment at the time for fundraising. Rockefeller agreed, though she couldn't help but suspect something else:

“We’re two middle-aged women trying to raise money, and we have been a women-led movement from the beginning. They look at us, and they’re like, ‘Well, you haven’t run a multimillion-dollar company, so why should I give you any money?’” She bristled at that perception: “We took nothing, and we turned it into a movement that now literally millions of people participate in every day. Come on. That didn’t happen by mistake.”

Still, no funding materialized. Nor, as time went on, did the users. I spoke to dozens of Buy Nothing members while reporting on this article, and the vast majority had either barely heard of the app or had tried it once or twice before abandoning it. By June of last year, Rockefeller and Clark quietly stopped developing the app. By winter, they were scraping the bottom of the Buy Nothing bank account.

Clark planned to cover the company’s costs, around \$5,000 a month, as long as she needed to. But she and Rockefeller both sounded more disheartened than ever. Once, as we began a Zoom call, I could hear an incessant pinging in the background. Clark explained that she had set up notifications for support requests through the app. It turned out she and Rockefeller were mostly responding to the requests themselves.

Photograph: Holly Andres

At the one-year anniversary of its launch, the Buy Nothing app had been downloaded 600,000 times, but only 91,000 people were regularly using it, not many more than at the beginning. Meanwhile, the Facebook groups from which the founders had disengaged were thriving without them. Global membership had surpassed 7 million. When I asked what Rockefeller and Clark thought would happen to Buy Nothing Inc. if they couldn’t come up with additional funding, they said they weren’t interested in thinking in such fatalistic terms. But when I posed the same question to Williams, the COO, he said he’d considered it. “We’re adults,” he said. “We’ve got to shut it down.”

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Rockefeller and Clark hadn't given up, though. They decided to switch tactics yet again. Over Thanksgiving weekend, they changed the Buy Nothing website so that when someone showed up looking for information about starting a Facebook group, they were directed to fill out a form that would automatically be sent to Rockefeller and Clark. The form asked people whether they had tried the app, offering a download link. If, after trying it, they still wanted to start a Facebook group, Rockefeller or Clark would build the group for them.

Rockefeller and Clark may have realized that if they couldn't compete with Facebook, they would do better to take control of what they'd started. A couple of days after Christmas, Schwalb opened up Facebook to find that her OG group had vanished. Months earlier, Buy Nothing Inc. had secured trademarks on the phrases "Buy Nothing" and "Buy Nothing Project" and reported the OG group to Facebook for trademark infringement.

Clark and Rockefeller told me that while they wanted to give local admins flexibility in running their groups, Gifting With Integrity had crossed a line. The group was aggressively promoting an approach that the founders had discarded; it had combined the Buy Nothing brand with the Gifting With Integrity name; it was disseminating old documents without what the founders considered proper attribution. "I don't get to say 'I'm making shoes, and they're called [Nike](#), and they have the swoosh on them, and you should buy my Nikes,'" Rockefeller told me. To Schwalb and her co-admins, this was a stretch. For one thing, Gifting With Integrity wasn't asking people to buy anything.

In January, Rockefeller and Clark posted a message to the Admin Hub, elaborating on their stance. They were just trying to protect their trademark, they said. To that end, they were asking that all Facebook groups link to a Buy Nothing web page describing the project. Rockefeller and Clark told me that they required this so that admins wouldn't have to make manual updates whenever details changed. But Schwalb noticed that the web page, conveniently, promoted the Buy Nothing app.

To get back on Facebook without reprisal, the OG group changed its name to, simply, Gifting With Integrity—OG Admin Support Group, removing the part about Buy Nothing. They encouraged local gifting groups to

change their names as well. Their website reads, “We are not affiliated with, nor do we support in any fashion, the Buy Nothing Project.” On Facebook, the Gifting With Integrity group has 1,500 members, all overseeing local groups.

“The Buy Nothing name—that’s a challenge. Because it’s like, OK, nothing is being bought, how are you going to monetize the platform?”

My own Buy Nothing group, in Fort Collins, was one of those that followed Gifting With Integrity’s lead. It’s now called the Northeast Fort Collins Gifting Community. A friend shared with me a message sent to the group by an admin announcing the change: “We truly believe in building our little hyperlocal community and plan to continue to operate by the original principles that make this group great. We don’t want that to disappear into the machinery of the new monetized system.” When I asked Schwalb how many local groups had discarded the Buy Nothing name and adopted Gifting With Integrity’s approach, she replied, “We’re not keeping numbers, and we most definitely don’t intend to, because I don’t want to turn into the Buy Nothing conglomerate.”

In some ways, Rockefeller and Clark’s loss of control made me think of women inventors who hadn’t gotten credit for their products: Rosalind Franklin, the scientist who helped discover the double helix; Lizzie Magie, the gamemaker who invented Monopoly. But then, Rockefeller and Clark had started Buy Nothing as a counteragent to the capitalist ethic that concentrates wealth and power in the hands of the few while ruining lives, communities, and the environment. The project had been a success, owing to their efforts, certainly, and also to those of the thousands of volunteers who made Buy Nothing their own. If the movement ended up splintering into an unaccountable mess of local variations—and Rockefeller and Clark didn’t make a cent in the process—maybe that was the most fitting ending possible.

Photograph: Holly Andres

I had all but written off their chances of survival when, in late January, I heard from Rockefeller and Clark again. Recently, with things getting desperate, Clark had looked back through her email to see whether there

were any connections she'd missed. Scrolling, she hit upon a year-old email from a former Intuit executive named Hugh Molotsi. Molotsi had launched his own startup, Ujama, that helped parents coordinate [childcare](#) with one another via an app, but it didn't have many users. Molotsi had written to see whether Rockefeller and Clark wanted to use his technology, but since they were building their own app at the time, they'd said no.

Now Clark did some research and realized Molotsi's app was much better than anything they'd built. She'd also learned, from her conversion to entrepreneurship, how important it was to network. She got in touch with Molotsi and, after a couple of calls, made a proposition to merge the companies under Buy Nothing's name. Molotsi would join the company as chief technology officer and rework the Buy Nothing app. "He needs community, we need tech," Clark explained.

Molotsi agreed; the deal is pending. As part of the transition, Williams stepped down as COO, though he remains on the Buy Nothing board. Molotsi also introduced Buy Nothing's founders to their first funder in a long time: an angel investor named Paul English, known for cofounding the travel website Kayak. English put in \$100,000 and introduced Clark and Rockefeller to a number of VCs and angel investors. So far, Clark told me, the response to their pitches has been much warmer than before, though no one has committed to investing. Visits to the app are up, too: Monthly users recently surpassed 100,000.

When I spoke to Molotsi over Zoom, he said he feels the company needs to do a better job explaining to investors how it can make money: "The Buy Nothing name—that's a challenge, because it's like, OK, nothing is being bought, how are you going to monetize the platform?"

I asked how that question might be answered. "There are lots of things happening around gift-gifting that I believe are monetizable," he said. "So, for example, if you have a couch you're trying to get rid of, and I want your couch, but you don't have a truck, and I don't have a truck, that presents a problem: How are we going to make this happen?" He was talking, I realized, about the delivery service Rockefeller and Clark had floated months earlier.

One of the last times I spoke to the founders, I remarked that these recent developments looked good for them. Clark responded that she still feels like they're at a low point. Her schedule had become punishing: She'd been waking up between 4 and 5 am to work on Buy Nothing, and not stopping until she went to bed. It struck me as a big departure from the all-volunteer camaraderie of Buy Nothing's early years. But Clark is as certain as ever that she and Rockefeller are on the right path in their decade-long quest to get people to buy less. "Rebecca and I are just two creatives. This was just never where we thought we would head," she said. "But now it makes sense, because we want to build a bigger, better world."

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The Future of Weight Loss Looks a Lot Like Its Past

The FDA's new anti-obesity medications, like Ozempic, Wegovy, and Mounjaro, sound like silver bullets. Bariatric surgery did once too.

Photo-illustration: WIRED Staff; Getty Images

A revolution in weight loss is apparently underway. It started in 2021, when the FDA approved the diabetes drug [semaglutide](#) for weight loss. The weekly injectable—sold under the brand name Wegovy—can help users lose 5 to 10 percent of their body weight, leading commentators to describe the drug as both a “[medical breakthrough](#)” and a “[silver bullet](#)” for obesity. Elon Musk says he’s [taking](#) it, Kim Kardashian is [rumored](#) to be using it, and everyone [from Hollywood to the Hamptons](#) reportedly wants a prescription.

Soon, there will be a new weight loss medication on the block—and it’s even more potent than its peers. Last fall, the FDA [fast-tracked](#) the review process for using [tirzepatide](#) as a weight loss drug after a [clinical trial](#) showed that people with BMIs labeled “overweight” or “obese” lost a staggering 22.5 percent of their body weight on the highest dose. If all goes according to plan, that will make Mounjaro the latest in a fast-growing biomedical sector—spanning everything from bariatric surgery to [deep brain stimulation for binge-eating](#)—that aims to combat, if not cure, the problem of “excess” weight.

For pharmaceutical companies, the race to market is financially motivated: Wegovy and Mounjaro cost more than \$1,000 a month. Weight loss drugs

are [rarely covered](#) by insurance, but people who can afford them have proven they're willing to pay. And the market seems effectively limitless: Despite an ongoing “[war on obesity](#),” more than [1.9 billion adults](#) globally are considered overweight or obese, and the number of prospective users is [growing every year](#). Now doctors—desperate to treat what is widely seen as an “obesity epidemic”—are coming on board. In January, the American Academy of Pediatrics [recommended](#) such medications for kids as young as 12.

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The victorious narratives gilding drugs like Mounjaro are [already being positioned](#) as a direct challenge to fat activism. For decades, the movement has pushed for social and economic opportunity for people of all sizes through civil rights, fat pride and liberation, and biomedical evidence itself. Thanks to prominent voices like [Aubrey Gordon and Michael Hobbes](#), many people now know that “lifestyle changes” like calorie restriction and exercise fail to produce sustained weight loss for [97 percent](#) of people and that many dieters end up [gaining back more](#) weight than they lost. But what happens to the strength of these arguments when a weight loss drug seems to work?

Like other purported weight loss solutions, Mounjaro promises “to fix weight stigma by making you thinner, instead of removing the stigma,” says Susanne Johnson, a fat activist and family nurse practitioner in Pennsylvania. In so doing, these drugs and surgeries further exacerbate anti-fat discrimination. Instead of criticizing people in larger bodies for their perceived lack of willpower—that old “calories in, calories out” adage—people can now blame those in bigger bodies for something more akin to a techno-pessimist, or even anti-science, stance: “Just take the miracle cure!”

The history of the weight loss industry is more akin to prospecting for gold or investing in crypto than transplanting organs and developing antibiotics; less a story of scientific progress than an endless cycle of wild speculation, where boom inevitably gives way to bust. Fen-Phen was a miracle until it was linked to [heart valve damage](#). Intermittent fasting was going to fix what

caloric restriction couldn't until [researchers showed](#) the two produce exactly the same results. And then there's the complicated case of bariatric surgery.

From their [inception in the 1950s](#), operations like gastric bypass (which reroutes food away from the stomach, inducing malabsorption) and gastric sleeve (which involves partially amputating the stomach so it holds less food and produces fewer hunger hormones) have been sold as a potential panacea, says Lisa Du Breuil, a clinical social worker at Massachusetts General Hospital. While [fewer than 1 percent](#) of people who qualify actually undergo bariatric surgery, those who do can lose up to 70 percent of their "excess" weight (or the weight above a BMI of 24.9).

But Du Breuil, who specializes in eating disorders and substance abuse disorders, has seen some of the worst of bariatric's side effects. People can develop [dumping syndrome](#)—wherein sugar-rich meals leave the stomach too quickly, causing sweating, dizziness, rapid heart rate, and vomiting. Gastric bypass in particular raises the risk of postoperative [alcohol abuse](#). Rates of [suicide and self-harming behaviors](#) also rise in the years after bariatric surgery. And even when people follow strict post-operative diets, [malnutrition](#), tooth loss, gout, and new or resurging eating disorders are possible. "It can be really challenging to get a full picture," Du Breuil says. She learns about new side effects all the time.

Semaglutide and tirzepatide—both part of a larger family of GLP-1 receptor agonists—were developed for diabetes management at lower doses. When pharmaceutical companies noticed their trial participants were also losing weight, they realized "if we can turn the volume up to 11, we can really enhance this side effect," says Johnson, the nurse. "That means you're also turning up the other side effects."

The primary complaints from users of Ozempic, Wegovy, and Mounjaro sound like the kind of thing you can fix with a bottle (or three) of Pepto Bismol: nausea, upset stomach, diarrhea, and what one patient [called](#) "[power vomiting](#)." But these might be less like classic "side effects" of a drug than a mechanism of weight loss itself, as *The Guardian* [recently reported](#). By making the feeling of eating (and, in some cases, [even hydrating](#)) actively disgusting to the user, the drug [curbs their consumption](#)

—similar to the experience of bariatric patients, who can only fit a few ounces of food in their stomachs at a time.

The list of complications doesn't end there. For example, both GLP-1 receptor agonists may increase the risk of [thyroid cancer](#)—one of the many [BMI-linked diseases](#) that supposedly makes weight loss absolutely imperative for people in larger bodies. And there's good reason to believe that other side effects will reveal themselves in years to come, as the number of long-term users grows.

The biggest surprise for many prospective patients is that long-term weight loss isn't guaranteed—a reflection, perhaps, of the [faulty assumption](#) that people are obese because they overeat. Current estimates suggest that the average bariatric surgery patient regains [30 percent](#) of the weight they lost in the 10 years after surgery. One in four regain *all* of their weight in that time. And 20 percent of people don't respond to surgery in the first place.

The same is true for GLP-1 receptor agonists: If you stop injecting, the weight returns.

In case it wasn't clear by now, biomedical weight loss interventions often mimic the deadly logic of anorexia, bulimia, or other forms of disordered eating, says Erin Harrop, a clinical social worker and researcher. Harrop would know. At the height of their own eating disorder, Harrop wished they could fill their stomach with air instead of food, or cut their stomach out, or wire their jaw shut. Later, they learned these things exist—in the form of gastric balloons, gastric sleeves, and even a [magnetic jaw trap](#).

It's no surprise, then, that some people who undergo bariatric surgery [experience](#) a resurgence of a preexisting eating disorder, or develop a new one. Frequent vomiting, never knowing what foods will upset your stomach, and feeling pressure to maintain a post-surgical weight—"you can create an eating disorder that way," Du Briel says.

But semaglutide and tirzepatide promise to fulfill an even stranger fantasy: eliminating appetite itself. While a drug like Mounjaro works on numerous fronts—including preventing the body from storing fat and “browning” existing adipose tissue—it's the feeling of being untethered from desire that

seems to fascinate patients and physicians alike. People for whom the drug works often say, “I forget to eat,” says Fatima Cody Stanford, an obesity medicine specialist at Massachusetts General Hospital’s Weight Center.

If doctors really believe that obesity is the greater of any two evils, then this approach makes sense. When it comes to bariatric surgery, for example, a review of the medical literature suggests it is, on balance, associated with a reduction in [all-cause mortality](#)—or death of any cause*—*compared to patients with high BMIs who don’t go under the knife (though such studies are profoundly limited, as they often do not control for social factors, like income or education). Many hope that semaglutide and tirzepatide will one day prove just as vitalizing.

But eating disorders kill too. In many contexts, sustained hunger is considered a travesty. And desire—for food, or anything else—is a great way to know you’re alive. “It’s wild to me that we see no appetite as a positive thing,” says Shira Rosenbluth, an eating disorder therapist who works with people of all sizes. Anna Toonk agrees: “I realized that there *are* worse things than being fat,” she [told The Cut](#) last fall. “The worst thing you can be is wanting to barf all the time.”

Ultimately, the proliferation of drugs like Mounjaro means medicine is not only in the business of dictating “normal” weights (a thing it [still hasn’t quite figured out](#)), but “normal” appetites. What was once an intuitive process, in which your body tells you what it needs, became a dictate under diet culture: You tell your body what it can have. Now medicine promises a radical reset: With the right drug, your body will hunger for nothing at all.

Weight loss technology can’t be stopped entirely—nor should it be. Everyone has the right to choose what they want to do with their bodies. But informed consent is built on information, and we may not have enough. Mounjaro was fast-tracked by the FDA based on studies designed to observe weight loss over just 72 weeks, a small fraction of the time real patients will be on the drug. At the very least, patients should be informed that in the [first years after a drug hits the market](#), they are participants in an ongoing experiment.

As biomedicine's war on obesity continues, people must work harder to combat anti-fat bias—not on a technicality, but as part of the expansive vision of justice fat activists began articulating more than 50 years ago. For semaglutide, tirzepatide, bariatric surgery, and their ilk are neither miracles nor cures. There have always been fat people, and there always will be, whether they're "non-responders" to treatment, refuseniks, or languishing on the waitlist. Notably, even those who experience dramatic weight loss after surgery or on injectables may still be overweight or obese, depending where they started.

Perhaps most importantly, the American weight loss discourse must move away from a reflexive scientism, which has enabled biomedicine to subject the entirety of human experience to its single-minded scrutiny. Weight, like almost every aspect of embodiment, is not an exclusively biological phenomenon or a clear-cut medical "problem" to solve. It is shaped by countless factors, like power distribution in society, personal psychology, and that most frightening of forces: the desire for more.

If you or a loved one is struggling with an eating disorder, the National Eating Disorders Association Helpline is available at (800) 931-2237.

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[Angela Watercutter](#)

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Feb 14, 2023 6:00 AM

Keanu Will Never Surrender to the Machines

The Matrix movies brought Reeves and Chad Stahelski together. Now the duo is killing it on their fourth John Wick—and still keeping technology in check.

Photograph: ART STREIBER

Keanu Reeves rarely malfunctions. Nearly any interview he does reveals as much. After four decades in Hollywood playing versions of the same fundamentally decent dude-in-crisis, he's learned to stay in his cyberpunk philosopher/surfing FBI agent/action hero lane. In person, he's pleasant and playful, but he also holds back, calibrating his remarks just so. Is this why we like him so much? We don't know who Keanu Reeves is, not really, but maybe we don't want to know. Or maybe this is all there is to know. He's a cipher onto whom we can project our own ideas, desires, and hopes for humanity.

So when Reeves, sitting with me in a cavernous studio in West Hollywood, ventures a feisty opinion about the latest advance in [artificial intelligence](#), [ChatGPT](#), I perk up. The question is whether a bot could conduct this conversation one day. While I, the human interviewer, am not so concerned this will happen in my lifetime, Reeves looks me dead in the eye and says, "Oh no, you should be worried about that happening *next month*." Very Gen X of him, I think at first, but then I remember: This is a man known for leading the revolution in the war against the machines. Reeves obviously isn't the characters he plays, but when Neo tells you the agents are coming, your instincts say, *Run*.

This article appears in the March 2023 issue. [Subscribe to WIRED](#)
Photograph: Art Streiber

Not that Reeves is fighting many machines these days. For the past few years, he's been shooting up human baddies in the John Wick franchise, the [fourth installment](#) of which hits theaters in March. Reeves plays a hit man, out of retirement, bathed in ultraviolet lighting and battling an entire underworld of crime syndicates, all to avenge the death of his puppy. But the films are still an argument against machine-made anything. *John Wick: Chapter 4* director Chad Stahelski served as Reeves' stunt double in [the Matrix movies](#)—that's him in [The Matrix Resurrections](#) as "Chad," the guy who took Neo's place by Trinity's side—and he's adamant about capturing as much flesh-and-blood action as possible. "We're not anti-VFX," he says, seated on a couch next to Reeves. "Our problem comes when you use it in place of being creative." Perhaps that's one of the lessons you learn after working on four Matrix movies: Computers can't fix bad ideas.

While Stahelski and Reeves are off posing for photos for this story, a tweet flashes across my phone. It's a writer saying that one of his clients no longer wants to pay him for his work—because an AI will do it for free. (The client will pay a cheaper rate for him to clean up the AI's copy, if he wants.) When the shoot wraps, I pull Reeves aside and tell him about the tweet. He's probably right about the bots, I say. I attempt a joke, but he doesn't laugh. He gives me a thoughtful look, and then he gets explicit: Corporations don't care about paying artists. Well, what he actually says is this: "They don't give a fuck." It's a startling moment coming from Reeves, the most pointed and serious I've seen him all day. Corporations might not care, but he clearly does. That's one thing we can say about Keanu Reeves: In a world of fakes and frauds, he's fighting for what's real.

WIRED: I have to know, Chad, what was it like to play "Chad" in *The Matrix Resurrections*?

Chad Stahelski: Oh my God. I will tell you, that was not my best day.

Keanu Reeves: It was a fantastic day.

Stahelski: I thought it was going to be no big deal. I think I knocked over the coffee stand. I couldn't eat. I had a croissant in my mouth. I flubbed my lines. It was tragic.

Reeves: Lana [Wachowski] thought you were perfect for the role.

Is it fair to say the John Wick franchise owes a debt to the Matrix movies?

Reeves: If we're gonna compare them, they both were original ideas with visionary filmmakers.

Stahelski: No one was under any delusion that *Matrix* wasn't going to be pretty awesome. Then David Leitch [codirector of the first Wick film] and I stayed on for *V for Vendetta* and *Speed Racer*, so we pretty much got a decade of Wachowski film school. The John Wicks are definitely children of *The Matrix*.

As an actor, what's it like working with the Wachowskis? I interviewed Eddie Redmayne when he finished *Jupiter Ascending* and remember him saying Lana's direction was often things like, "Play it like an accountant!"

Reeves: Um, I never got that kind of direction.

What did you get from them?

Reeves: Attention to detail, worldbuilding, and having ideas as nourishment in your entertainment. That exists in *John Wick 4* too—the idea of freedom, the idea of choice with rules and consequences. How are you trying to break out of the system? John Wick has got a cool thing because everyone is bad. They're bad people. But they're also super moral and ethical. Well, not even ethical, but there's a code. You root for John Wick.

Keanu Reeves and director Chad Stahelski wanted to film highly choreographed action sequences rather than lean heavily on digital effects.

Photograph: Murray Close/Lionsgate

Which is extra impressive, considering that he's not some known IP. He's an original creation.

Stahelski: It's kind of cool, like, you don't have 60 years of Batman to work from. You don't get that to lift you up, but at the same time you don't have it to hold you down. Nothing's holding us back.

You don't have a Reddit thread of people scream-typing, "This isn't canon!"

Reeves: We've developed our own playground.

Stahelski: We just went with a bunch of ideas we loved. But we didn't go out with an agenda.

Reeves: Yeah, we did. We went out with *your* agenda of action as part of storytelling. And character. That was the fundamental base.

And on top of that, a commitment to minimal special effects?

Stahelski: We're not, like, at war with VFX. It's super handy, it's a great tool. But you can't beat the blood, sweat, and tears of real people.

Reeves: When you watch John Wick action scenes, it feels different. There's so much choreography. It's out on the edge.

Stahelski: And sometimes what we have in our heads doesn't work, so we have to change it. You can't rehearse 40 cars driving around in a parking lot, you gotta get it on the day. You don't know what's going to happen, so there's a little desperation. Some of the best moments we've had in all four movies are—if not accidental, they're incidental. It's the imperfection that makes it special.

Speaking of incidentals in John Wick, those coins the hit men use. They look a lot like bitcoins, but Bitcoin wasn't very big when you made the first movie.

Stahelski: [Laughs] We're going to take credit for that.

It's kind of ironic how it's the cryptocurrency of this underworld. In the real world, crypto is having a tough time.

Reeves: I think the principle, the ideas behind an independent currency, are amazing. These are amazing tools for exchanges and distribution of resources. So to pooh-pooh crypto, or the volatility of cryptocurrency, it's only going to make it better in terms of how it's safeguarded.

In the streaming era, Reeves and Stahelski still believe in the big screen. The release of *John Wick: Chapter 4* was delayed because Covid-19 kept people out of theaters.

Photograph: ART STREIBER

Do you guys love science fiction?

Stahelski: I'm always big on sci-fi. Like, *John Wick* is hyperreal. But it's also got this analog sense. Old computers, old suits, old stuff.

Reeves: I'm interested in the storytelling of humans and their interactions with technologies.

Keanu, years ago you put a clause in your contracts saying that your performances couldn't be manipulated without your say-so. Isn't that right?

Reeves: Yeah, digitally. I don't mind if someone takes a blink out during an edit. But early on, in the early 2000s, or it might have been the '90s, I had a performance changed. [He won't say which.] They added a tear to my face, and I was just like, "Huh?!" It was like, *I don't even have to be here*.

And now someone like Bruce Willis has found himself getting deepfaked into Russian telecom commercials. As an actor, what do you think of deepfakes?

Reeves: What's frustrating about that is you lose your agency. When you give a performance in a film, you know you're going to be edited, but you're participating in that. If you go into deepfake land, it has none of your

points of view. That's scary. It's going to be interesting to see how humans deal with these technologies. They're having such cultural, sociological impacts, and the species is being studied. There's so much "data" on behaviors now. Technologies are finding places in our education, in our medicine, in our entertainment, in our politics, and how we war and how we work.

The Matrix just looks more and more wildly prophetic by the day. AI doesn't control our lives yet, but ...

Reeves: [in his best Agent Smith voice] They started making decisions for you. It became our world.

I was trying to explain the plot of *The Matrix* to this 15-year-old once, and that the character I played was really fighting for what was real. And this young person was just like, "Who cares if it's real?" People are growing up with these tools: We're listening to music already that's made by AI in the style of Nirvana, there's NFT digital art. It's cool, like, *Look what the cute machines can make!* But there's a corporatocracy behind it that's looking to control those things. Culturally, socially, we're gonna be confronted by the value of real, or the nonvalue. And then what's going to be pushed on us? What's going to be presented to us?

The metaverse!

Reeves: It's this sensorium. It's spectacle. And it's a system of control and manipulation. We're on our knees looking at cave walls and seeing the projections, and we're not having the chance to look behind us. Or to the side. I'm sorry to go on here, Chad.

Stahelski: No, it's great.

Reeves: It's also a fascination—it seems for us, the animals on the planet, like, *How do we defeat death? How do we change the weather? How do we replace nature?*

Should I be worried about AIs coming for my job?

Reeves: The people who are paying you for your art would rather not pay you. They're actively seeking a way around you, because artists are tricky. Humans are messy.

We push back, we have our own ideas.

Reeves: People in power don't want that, you know? So that's not your lifetime, that's like your next birthday. And before then, they're going to challenge how much they pay you. So everyone's gonna be an independent worker. *Look at all the independence you have! Let's not have unions.*

WIRED just unionized, actually.

Reeves: That's cool. See how long that lasts. Fingers crossed.

But yeah, in the meantime, now ChatGPT can write scripts that are just combining other ideas.

Reeves: Which is cool, because that's what artists do, right? We take our influences and we synthesize them. But what's the intention behind that synthesis?

Stahelski: I'm all for the tools. It's just, we want to control the choice behind it. We had AI-produced digital art for some background stuff in John Wick. The younger staff are into that world, and they were like, "Hey, this would be cool. Let's try it."

Keanu, you recently became an adviser to the Futureverse Foundation, which is focused on diversifying the metaverse. How did you get involved with that?

Reeves: It's something my partner, Alexandra Grant, is really interested in, so I'm kind of riding her coattails. I helped set up the launch. We're trying to take this technology that people are interested in and give opportunities to artists with different viewpoints.

When you look at a company like Meta, which has made building in the metaverse a priority, the entry points there aren't accessible to a lot of

people.

Reeves: It's like they've created more land. There's more land for sale. It's wealth creation and it's opportunity.

But I have to believe in-person experiences are here to stay. The release of *John Wick: Chapter 4* got delayed a couple times because of Covid-19. Was it important to you to release it theatrically?

Stahelski: Maybe it's our generation, but I like seeing a movie in the cinema. Even if it's meant for streaming eventually. It's such a different experience.

Reeves: It's dreams, right? And immersion. I think the power of cinema—part of it is its novelty, but also its scale. You see a close-up of a wonderful performance with emotions and storytelling that touch you. Whether it's horror or action or comedy, you're seeing a face that's, you know, 20 feet tall. Yeah. You're, like, there. The intimacy of that.

Reeves and Stahelski met while making the Matrix movies; Stahelski served as Reeves' stunt double. Another Matrix alum, Laurence Fishburne, has been part of the John Wick franchise since Chapter 2.

Photograph: Murray Close/Lionsgate

It seems like people often project a lot onto their heroes online. Is it weird being internet-beloved?

Reeves: It's nice when it's nice, but I'm sure it's super horrible when it's horrible.

Well, there were people who made mods to have sex with your character in *Cyberpunk 2077* ...

Reeves: Getting it on with Johnny Silverhand?! I hope it was good. I'm sure Johnny tried hard.

Stahelski: I'm sure he gave it his best ...

Reeves: If he cared. [Laughs] He's kind of bitter.

Stahelski: Emotionally empty.

Reeves: He's not emotionally empty. He cares so much, and the world's so corrupt and he's just trying to get some back!

Do you have a favorite Keanu meme?

Reeves: No. I don't seek them out. Once in a while people show 'em to me when they're fun.

Stahelski: Keanu with the sandwich is probably my favorite.

Sad Keanu!

Reeves: The original!

On that note, we need to wrap up. I guess this is the time to say “Be seeing you.”

Reeves: It's always fun when I'm out in the world and people say, "Hello, Mr. Wick."

How long before that was it people imitating Agent Smith and saying “Hello, Mr. Anderson”?

Reeves: Oh, I still get that.

This interview has been edited and condensed.

Styling by Jeanne Yang. Styling assistance by Chloe Takayanagi and Ella Harrington (Keanu), Emily Diddle (Chad). Grooming by Kerri Smith for Schneider Entertainment (Keanu), Jeni Chua for Exclusive Artists using Kevin Murphy (Chad). Suit by Brioni, T-shirt by James Perse, shoes by Magellan & Mulloy (Keanu, top photograph). Suit by Brooks Brothers, T-shirt by Hermes, shoes by John Varvatos (Chad, top photograph). Sweater by Brioni, jeans by Fabric Denim (Keanu, second photograph). Sweater by Etro (Chad, second photograph).

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Feb 12, 2023 7:00 AM

God Did the World a Favor by Destroying Twitter

Remember what happened with the Tower of Babel? Same type of deal.

Illustration: James Marshall

“Happy to talk about it if this is interesting,” [Marc Benioff](#), the founder of Salesforce, texted [Elon Musk](#) last spring. He continued, opaquely: “Twitter conversational OS—the townsquare for your digital life.” This is how billionaires communicate: in slogans, brand identities, and occasional large sums. It’s up to everyone else to figure out the details.

“Well I don’t own it yet,” Musk replied. (To be fair, he was fielding a lot of texts at that moment.) But then he did own it, and by winter the [Twitter](#) takeover was a giant, thorny public mess. Whatever magic spell kept people together on the platform seemed to have broken. It was like the plot of *Encanto* without the happy ending: “The graveyard for your digital life.”

Twitter’s troubles are due not just to Musk, who appears to be both shooting himself in the foot and cauterizing the wound with his own brand of flamethrower. No, Musk is merely the vehicle. The real reason Twitter lies in ruins is because it was an abomination before God. It was a Tower of Babel.

People usually interpret Genesis 11:1–9 as a mythological explanation of why we have so many tribes, so many languages. The story goes that the descendants of Noah were living in Shinar, all speaking one tongue, and decided to build a skyscraper that would let them walk straight into heaven.

God went *Not in my backyard!* and scattered the people, confounding their language. I like to think that God also personally demolished the tower, but that story is apocryphal (Jubilees 10:26).

God does the wrath thing a lot in the Old Testament, punishing humans who would challenge divine authority. It makes sense to read the story of Babel in that light. But having lived through the past couple decades of the internet, I believe the story carries a different lesson. I'm an atheist, so take this theory with a grain of salt, or maybe even a pillar: God wasn't keeping us out of heaven, smiting us for our arrogance. God was protecting us from ourselves.

Every five or six minutes, someone in the social sciences publishes a PDF with a title like "Humans 95 Percent Happier in Small Towns, Waving at Neighbors and Eating Sandwiches." When we gather in groups of more than, say, eight, it's a disaster. Yet there is something fundamental in our nature that desperately wants to get everyone together in one big room, to "solve it." Our smarter, richer betters (in Babel times, the king's name was Nimrod) often preach the idea of a town square, a marketplace of ideas, a centralized hub of discourse and entertainment—and we listen. But when I go back and read Genesis, I hear God saying: "My children, I designed your brains to scale to 150 stable relationships. Anything beyond that is overclocking. You should all try Mastodon."

So people are fleeing the tower by the millions, or at least shopping the real estate elsewhere—[Discord](#), [TikTok](#), [Tumblr](#), [YouTube](#), [Instagram](#), WeChat, Weibo, Moj. And some are finding their tribes in the Fediverse, the set of decentralized web apps that includes [Mastodon](#).

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The Fediverse is, by design, thousands of servers in many languages. They are cheap to run, at least for small groups, and relatively easy to administer. You can chat among your server kin—or blog, or podcast, or share images and videos—and connect with servers in the outside world. The Fediverse apps are all built on a set of rules called the ActivityPub standard, which is

a little like HTML had sex with a calendar invite. It's a content polycule. The questions it evokes are the same as with any polycule: What are the rules? How big can this get? Who will create the chore chart?

The true beauty of Mastodon and similar services is that they are designed to collapse. If you want to quit a server, you can take all your followers and follows with you. If a server shuts off, you can find another. It's not one guy. It accepts that as we centralize and debate we melt down, and so it comes with a giant sticker that reads: Babel built in!

How will these smaller groups of happier people be monetized? This is a tough question for the billionaires. Happy people, the kind who eat sandwiches together, are boring. They don't buy much. Their smartphones are six versions behind and have badly cracked screens. They fix bicycles, then they talk about fixing bicycles, then they show their friend, who just came over for no reason, how they fixed their bicycle, and their friend says, "Wow, good job," and they make tea. That doesn't seem like enough to build a town square on.

But someone will figure out the details. The reason the Babel story matters is not that it happened once but that it happens over and over: We Babelize and de-Babelize. The internet is an engine of both processes. Eventually, brands will find purchase in Mastodon's rocky soil and grow engagement. Billionaires will order the construction of new marketplaces of ideas. Everything will centralize again, and it will seem eternal, as if the tower could never fall. For now, let's enjoy the scattering.

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[Paul Ford](#)

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Feb 3, 2023 9:00 AM

A New Drug Switched Off My Appetite. What's Left?

Mounjaro did what decades of struggle with managing weight couldn't. Welcome to the post-hunger age.

Illustration: Ohni Lisle

A decade ago I lost 100 pounds. I did it in my web-nerd way—by building a custom content management system using the Django framework in the [Python](#) programming language. Every day I would enter calories ingested, calories expended through exercise, my [weight](#), and whatever thoughts occurred to me. It became a job. I produced charts and compared the results of different kinds of exercise. I put it all online at OHЛИH.com, which stood for One Huge Lesson in Humility.

It worked very well. For the first time in my life my doctor seemed glad to see me. People noticed. They said: Are you going to [open-source](#) this? Sure I was! Of course, I knew that scientists had found, in study after study, that basically everyone who loses weight gains it back, and then some. But there was no chance I would eat my way back to misery. I had a system! And a PostgreSQL database! And I could buy pants in a normal department store! Guess what happened.

Obviously [genetics](#) were a factor. (I remember when my uncle died, someone whispered, “My God, how much does this funeral *weigh*?”) What health professionals call my morbid obesity—that “morbid” is a helpful reminder—is what you see. But it’s a side effect of what I am, which is insatiable. Literally: I never seem to feel full. In practice this means that at

certain times of day, I watch in horror as my body reaches for the cheapest, easiest calories nearby—out of the pantry, out of a vending machine, at a party. I scream, “Stop!” But the hand keeps reaching.

While culture kept making smaller airplane seats, science backed me up: Humans are servants of their satiety.

You might say: Come off it! What happened to good old-fashioned willpower? There’s a sin for this—it’s called gluttony! Or you might say something less judgy-sounding that means the same thing. All I can say is I tried: I downloaded [calorie-tracking apps](#). I taught my phone to buzz every 15 minutes to remind me that I should not eat. I paid therapists to train me on better behaviors, researched gastric bypass, rode my bicycle, talked with experts, experimented with radical self-acceptance. Nothing stuck. While culture kept making smaller airplane seats, science backed me up: Humans are servants of their satiety. Even gastric bypass falters for lots of people.

While it is possible—more possible than many think—to be fat and healthy, and sometimes I managed that, I could feel my health slipping, prescriptions adding up in the cabinet. So I accepted that, well, I knew how I would die, and that we might need an extra pallbearer. (I can make that joke.) A pretty good life, save for that one thing. I put money away for my kids, and every day I tried and failed to solve a lonely puzzle of self.

Then one day my endocrinologist was reviewing my A1C blood sugar levels as we Zoomed. He had me on Ozempic, a weekly shot that stimulates the body’s insulin production, which makes it a great alternative to insulin injections for type 2 diabetics. The drug’s side effects include slower digestion and increased satiety. You may have heard of it because it’s increasingly prescribed for weight loss (and is linked to many Hollywood diets). I’d been on it for a while and lost a few pounds, and I appreciated it, but the shrieking satiety siren had never ceased.

“Well,” my doctor said, “if you’re not losing weight with Ozempic, try Mounjaro.” This one was FDA-approved last May, with an atrocious name. So off I went, from one shot to the other, from Novo Nordisk to Eli Lilly. Whatever.

“Something’s happened,” I told my wife. She is a veteran of watching me try to fix my body. I told her: Where before my brain had been screaming, screaming, at air-raid volume—there was sudden silence. It was confusing. Would it last?

I went alone that night to a Chinese restaurant, the old-school kind with tables, and ordered General Tso’s. I ate the broccoli, a few pieces of chicken, and thought: too gloopy. I left it unfinished, went home in confusion, a different kind of sleepwalker. I passed bodegas and shrugged. At an office I observed the stack of candies and treats with no particular interest.

Decades of struggle—poof. Apparently the Mounjaro molecule targets the same hormone as Ozempic, plus a second one, so it doesn’t just stimulate insulin production but also boosts energy output.

“I urgently need,” I thought, “an analog synthesizer.” Something to fill the silence where food used to be. Every night for weeks I spent four, five hours twisting Moog knobs. Not making music. Just droning, looping, and beep-booping. I needed something to obsess over, to watch YouTube videos about. I needed something to fail at every night to feel normal. And I was also manic, dysregulated, and wide-eyed, sleeping five hours a night, run-walking, with pressured speech; my friends, happy for me but confused, called me “cocaine Paul.” I bought more synthesizers off a guy from Craigslist, meeting him in Bushwick, Brooklyn, with a grand in cash. A body is not designed to lose 25 pounds in eight weeks, starting during the holidays. Beep. Boop.

With the relief come new anxieties. What if it stops working and I slide back into the vale of infinite noise? Compounding that, these drugs are hard to get, both because of supply chain problems and because they are being prescribed off-label for weight loss instead of diabetes. I can’t get a steady prescription from the pharmacy. I’m developing a rationing plan, stretching from an injection every seven days to one every eight or nine to build up a stockpile.

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I can see my anxiety mirrored in the wave of reactions starting to appear—op-eds, TV segments, people explaining why it's good, actually, that the vast majority of those using this drug lose a quarter of their body weight. On social media, fat activists are pointing out that our lives were worthy even without this drug. The wave of opinion will not crest for years.

And that's fair because this is new—not just the drug, but the idea of the drug. There's no API or software to download, but this is nonetheless a technology that will reorder society. I have been the living embodiment of the deadly sin of gluttony, judged as greedy and weak since I was 10 years old—and now the sin is washed away. Baptism by injection. But I have no more virtue than I did a few months ago. I just prefer broccoli to gloopy chicken. Is this who I am?

How long is it before there's an injection for your appetites, your vices? Maybe they're not as visible as mine. Would you self-administer a weekly anti-avarice shot? Can Big Pharma cure your sloth, lust, wrath, envy, pride? Is this how humanity fixes climate change—by injecting harmony, instead of hoping for it at Davos? Certainly my carbon footprint is much smaller these days. Are we going to get our smartest scientists together, examine the hormonal pathways, and finally produce a cure for billionaires?

When I let the domain name for my diet blog expire, I accepted that there was no technology that could change my biological responses to my own satiety. Now there is, and the part of me that tracked every meal, searched for solutions in apps and programs, wrote code, and took notes is obsolete. Was that time wasted? God, yes. But I did learn a ton—about nutrition, about exercise, about myself. All of those lessons are a joy to apply now, without the panic of self-destructive hunger.

Lately I'm finally less manic. Still losing weight, but much more slowly. Exercising more. At night I play with my synthesizers and watch online classes in music theory. Headphones on, processing all those years of futile effort. As I fiddle with knobs I am sometimes angry, sometimes ashamed,

and often grateful. I don't know how long this post-appetite era will last, or how it will end. Just that, once again in our lives, everything has changed.

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Jan 31, 2023 6:00 AM

The Spaceport at the Edge of the World

A tiny Scottish village is betting its future on rocket launches. But the plan may threaten the fragile landscape—and a tenacious billionaire's ambitions.
Photograph: Anna Huix

In the village of Melness, a frayed twist of bungalows and old stone buildings on Scotland's desolate northern shore, April is a month of new beginnings, when the dark and strung-out Highland winter finally unfurls into a tentative spring, and pregnant ewes balloon like airships in the wind-swept hills. As the 2015 lambing season neared its start, the villagers began the usual preparation of their small plots of rented land, called crofts, for farm and pasture. Behind the crofts and croft houses was the bog: an immense, bronze-hued ocean of deep peat, stretching into the horizon.

For Dorothy Pritchard, a retired schoolteacher and chair of the Melness Crofters' Estate, an organization that owns and manages the crofting land, this spring would be stranger than usual. Over the past several weeks, she had been mulling a plan that could upend the town's quiet routine.

On the last day of the month, she walked into the estate office, a dirty, white bungalow opposite the village nursing home, for a meeting with the estate board. Many of the members were from families that had been working the land for generations, and Pritchard sought to preserve their way of life. As the crofters took their seats on plastic chairs around the table, Pritchard announced that she had an idea. It might sound crazy at first, she cautioned,

but give it an open mind: How about building a spaceport on the empty peatland out back?

The estate office rang out in guffaws. Rockets lifting off in nebulas of smoke from the bog, inclining to their flight path over Tommy's shop in Talmine, cracking the sound barrier over the summer wildflowers on Achininver Beach? It was hard to imagine. And there were concerns. Melness, made of nothing but mountains and peat and sea and weather, was a tranquil place. Would rockets not ruin it? Would they have to fence off the common grazing land? Would they have to leave their homes on launch days? Would it be safe?

Spaceports have a history of leaving local communities in the dust.

Pritchard told them she'd initially shared their fears. When she first envisioned rockets taking off, she pictured a boggier, less clement [Cape Canaveral](#): explosions, showers of fiery debris. Behind the Melness houses, on the far side of a grassy ridge, unrolled a section of peat bog called the Moine. Although the land might not have looked like much to outsiders, it was part of a massive, irreplaceable [sink of carbon](#) that had accumulated over millennia, holding almost as much carbon dioxide as the UK emits in a year—and areas of it are highly combustible.

This article appears in the April 2023 issue. [Subscribe to WIRED](#). Photograph: Andria Lo

Pritchard was reassured, though, by the fact that the project had government support. It had come to her through the local development board, in conjunction with a [UK effort](#) to elbow its way into the global [space](#) industry. Building a commercial spaceport in Melness—one of three proposed vertical launch sites in rural Scotland where there is good access to polar orbits—could help the UK become the first country in Europe to launch a small satellite.

Pritchard's own hopes for the spaceport were humbler but no less urgent. In it she saw a way to preserve Melness' crumbling future. Her father had been a crofter who, like many in the village, worked at the nuclear power plant down the coast and built offshore oil rigs. She'd started lambing at 8

years old, and her childhood memories were crowded with weekend dances that once surged with dapper teens from Strathy to Durness. By 2015, though, the oil industry was declining, the nuclear plant had been deactivated, the dance halls were empty, and the school rolls were dwindling. The town was down to a single hotel, a single store, a single nursing home. Every year, Pritchard saw her former students reach their late teens and flee to the cities down south: Inverness, Aberdeen, even Edinburgh. Keeping youngsters on the good side of Ben Loyal and Ben Hope, the two peaks that overshadow Melness, had become her obsession.

Dorothy Pritchard is backing a controversial project to build a spaceport on peatland near her Highland village.

Photograph: Anna Huix

The village had already cycled through several failed economic projects, including a leisure center, a wind farm, a new pier, and a tropical shrimp farm. Worse, in the absence of a self-sustaining industry, it was being steadily transformed by an outsider—the Danish billionaire Anders Holch Povlsen, who owns the [fast-fashion](#) company Bestseller.

Povlsen is the richest man in Scotland and its largest private landowner. He has acquired thousands of hectares of land around Melness, citing a mission to rewild the landscape and repair the damage caused by overgrazing. But his ideas for developments—including a brewery, an events space, and luxury resorts for “forest bathing”—are targeted at ultra-wealthy ecotourists. In the eyes of many locals, his investments bring to the fore the ballooning cost of real estate in the area.

Pritchard asked the estate members to consider the spaceport. It offered Melness a new vision for the future, she told them. It could give them a decent rental income and reliable employment. It could mean a revival of this place after a deep winter.

After some hesitation, the board agreed to explore the idea. Pritchard was hopeful. At the same time, she knew the spaceport might not be enough to save Melness. There was a chance that it would bring disaster.

Sheep graze on the edge of the North Sea.

Photograph: Anna Huix

On a high rock between Melness and its sister city Tongue stands the stout ruin of Castle Varrich. The castle is on the territory of Clan Mackay, a Highland clan with roots in the Middle Ages. The Gaelic origin of Mackay, the area's most common family name by far, is Mac Aoidh: son of fire.

Pritchard is a Mackay on her mom's side, and her worries about the depopulation of the Highlands reach back as far as her family's history. Much of Scotland's land is owned by wealthy individuals—a higher percentage than any other country in Europe. From the late 18th century, landowners mercilessly drove Highlanders out of townships along the fertile inland valleys to make room for sheep, which turned a greater profit than farming. This campaign of occasionally violent dispossession is known as the Highland Clearances.

In Sutherland, the county that contains Melness, the Duke and Countess-Duchess, together with Patrick Sellar, the notorious "factor," or manager, of the Sutherland Estate, were particularly cruel in their administration of the evictions. The Clearances reached their crest here in 1819, a year known in Gaelic as *bliadhna na losgaidh*: the year of the burnings. The homes of the members of Clan Mackay, sons and daughters of fire, were scorched to the ground.

Pritchard's ancestors were forced onto barren crofts, in settlements on the edge of inhospitable coasts. "They belonged to the ground," Kirsteen Mackay, a Melness crofter, told me, "and people came in and took it away." Inland folk for centuries, they struggled to learn how to fish, and many left for North America. Meanwhile, boundless herds of sheep set to work constructing the barren landscape characteristic of the Highlands today. The ancient pine and birch forests were turned into seas of open heath.

After the price of wool cratered at the end of the 19th century, the Highlands' economy shifted to deer stalking, and red deer, equally rapacious, took over from sheep. Today, areas from which communities

were cleared—some of which now belong to Povlsen—are designated “wild land” by the Scottish government.

Highland landlords still lease crofts to the descendants of cleared families. For those in Sutherland, the evictions are a persistent memory and haunt contemporary conflicts over land. Compared to much of the Highlands, though, the status of the land in and around Melness is unusual: 5,000 hectares belong to the crofters themselves.

Highland cows in Melness.

Photograph: Anna Huix

This situation is due to Michael Foljambe, the eccentric English owner of an extensive tract that had included Melness. In 1995, Foljambe decided to give his land away. Two-thirds of his landscape of burns, lochs, beaches, and bog went to his London relatives. For the final third, though, Foljambe did something unprecedented. After long discussions with Pritchard’s father, Frank Gordon, Foljambe decided that the land should be given to the people who had worked it since the Clearances. The children of the people in the cemetery by the sea.

The crofters were ecstatic. The land, they thought, had long belonged to them, at least in spirit—but now they would be protected from a landlord’s whims and fancies. There was a catch, though. The crofters had to generate income and jobs, and build [housing](#), but now without Foljambe’s cash. From then on, finding income was always a struggle, while the region’s population declined.

In 2012, Foljambe’s relatives sold their portion of the land to Povlsen. Povlsen was fond of the Highlands, having visited from Denmark as a child. He’d already bought his first estate there years earlier, and with this purchase his total land holdings amounted to some 47,000 hectares. He had started a company called Wildland, with a mission to reseed the landscape and repair the damage caused by centuries of overgrazing.

In photographs, Povlsen looks impish—bald head, neatly trimmed beard, boyish face. He is not a popular figure around Melness. Povlsen owns

several properties in nearby Tongue that he has kept empty for years, including what was once the town's only supermarket. He also bought the area's only gas station. Land prices have swelled, in part due to investments in carbon credits; Wildland has sold carbon credits by restoring peatlands in an estate further south. In 2020, the price of Scottish estates rose by 87 percent compared to the previous year, while in 2021, farmland prices increased by 31 percent. As a result, locals are being outpriced while the value of Povlsen's land increases, further limiting the financial resources of residents to take him on. When Ellen Henderson, who grew up along the coast from Tongue, tried to purchase the building that once housed Tongue's bank, she was outbid by Wildland. "He is a tsunami of money," she told me.

Povlsen has spoken about being a custodian of the landscape and about his deep love for the area. He claims to be repeopling as well as rewilding, generating work in hospitality and construction. His company hires local construction firms and employs 20 people in the Melness area, a figure that will grow as his new developments open. Many residents, though, would prefer to have a diverse economy. Some are furious, seeing Povlsen as the Highlands' latest arrogant landlord.

According to Pritchard, Povlsen treats the area as a tourist village. "He's not from here, and he doesn't understand the culture," she told me. On Facebook, she referred to Povlsen as "the return of the Duke of Sutherland" and complained that his company "has the cheek to constantly use the phrase 'our community.'" The name Wildland doesn't help: Some residents suspect he would prefer the area to be empty.

Once the spaceport idea was introduced, it did not take long for the community to see how it might solve their long-standing problems. The area might finally, they thought, blast out from the history of inequity that had sucked them in like a peat bog.

By 2018, debate over the spaceport had reached every person in town. The local development board, now partnered with aerospace startup Orbex, was holding regular drop-in sessions to calm jitters, and eventually, many residents came to hope that they would soon see a 62-foot-tall rocket with payloads of microsatellites thrusting over their homes, blasting toward polar

orbit within spitting distance of the post office. Others were not so convinced. In November, the crofters held a vote on whether to continue supporting the spaceport project. The result, in the end, was 27 votes for, 18 against. “We were for it,” said Pritchard, “but not at any cost.”

The arguments fractured the once cozy community. John Williams, a retiree to Melness from the south of England, set up an organization to protest the spaceport. In spite of his “incomer” status, he amassed some support in the village. “If you can imagine a rocket going wrong, you’ve got the equivalent of a 20-meter blowtorch,” he told me. That, on the peat bog, would be like setting a coal field on fire.

The peatland around Melness is a valuable carbon sink and is highly combustible.

Photograph: Anna Huix

The environmental concerns are serious. The Moine is part of a much larger area known as the Flow Country: 200,000 hectares of delicate peat that has been hoarding carbon since the end of the Ice Age. Six months after the vote, a catastrophic [wildfire](#) burned 5,700 hectares of the Flow Country and doubled Scotland’s carbon emissions for the year. If rocket fuel, or sparks, were to come into contact with peat, there is an increased risk of wildfires, Roxane Andersen, a peat scientist, told me. Pritchard’s anxieties, however, had by this time been allayed. “I don’t think there’s been a more examined piece of ground,” she said.

What about human safety? Gordon McEwan, whose home is near the proposed launch site, is anxious about falling rockets. In a meeting with Orbex and other crofters, he shared his concern that the launch exclusion zone was too small. When the rocket lifts off, the zone will have a radius of less than 2 kilometers. Orbex’s response was to trust the regulators. “You can’t randomly launch things of this nature,” Chris Larmour, the CEO of Orbex, told me. “We are a heavily regulated industry.” A Highland newspaper reported, though, that at a space industry event in 2021 he’d admitted he wouldn’t want one in his backyard either.

According to Orbex and the development board, the economic benefits will outweigh these risks. They expect the spaceport to create around 40 jobs—from security and engineering to marketing roles—in an area with a population of several hundred. Some workers, they think, will commute from bigger towns on the north coast, but others may settle in the Melness area, boosting the school rolls. A report commissioned by the development board predicted that during the first two years of its operation, the spaceport would add several million dollars worth of gross value to Melness and Tongue's economy, and attract thousands of visitors—a big boost for [tourism](#).

Spaceports, though, are rarely a solution to the problems faced by marginalized areas, and they have a history of leaving local communities in the dust. They require sparsely populated land, usually near the equator, to profit from the higher speed of the earth's rotation at equatorial latitudes, or in the far north or south, for easy access to polar orbits. They tend to be situated, then, in places like the Highlands—places that have long been considered peripheral and where the land carries fraught histories of marginalization, oppression, and colonization.

Yet to the crofters, the spaceport has come to represent their independence. Melness will need some development if it is to survive. Faced with a choice between another landowning capitalist and a spaceport, the crofters tend to side with the spaceport.

Despite their disagreements with Povlsen, many residents I spoke to felt profound sympathy for him when, on Easter Sunday 2019, he and his family were among the victims of a bomb attack at the Shangri-La Hotel in Sri Lanka. Three of Povlsen's four children were killed. The church in Tongue held a special service, and the townspeople came out to grieve.

In August 2019, Pritchard and the crofters reached an agreement with the development board: 12 launches per year, for £70,000 (about \$85,000) a year in base rent. Objections started to flow in. The Royal Society for the Protection of Birds came out against the project, as did 1,075 signatories of a petition against the spaceport. Povlsen also voiced his disapproval. His 62-page report argued that the spaceport could disrupt breeding bird seasons and damage everything from water quality to the look of the land. It said

that another proposed spaceport was in a better location, that the spaceport would harm the peatlands, that the economic benefits had been overstated. Ultimately, the Highland Council's planning committee granted permission for the spaceport in a unanimous decision—but Pritchard did not celebrate. She may have sensed the fight against Povlsen was just beginning.

Will the spaceport save Melness? For a community that has long been a forgotten corner, the promise of a cosmic horizon has metaphorical force.

Povlsen swiftly filed a lawsuit, asking the Scottish Court of Session to cancel permission, and paid the legal fees of three crofters in another legal challenge. “Are we to have no developments along the North Coast unless they have the permission of Mr. Povlsen?” Pritchard wrote on a Facebook page. “To take that sort of opportunity away from our young people is unforgivable.”

Then, in November 2020, Povlsen invested £1.43 million in a competing spaceport project in the Shetland Islands. That site is not surrounded by peat bog, but the crofters were outraged. “If it’s really an environmental issue,” Pritchard said, “why did he go and build a much bigger spaceport with three launch pads and bigger rockets?”

On a drizzly afternoon last May, I met Thomas MacDonell, Povlsen’s director of conservation, in a grand 19th-century country house two and a half hours south of Melness. The building was once the home of a duchess; today it is Wildland’s headquarters. Povlsen bought a nearby estate, called Glenfeshie, in 2006, when it was 18,000 hectares of overgrazed and degraded birch and pine forests. MacDonell, having grown up in the area, was eager to help Povlsen rewild.

MacDonell is tall and silver-haired, and he exudes the calm vigilance of a deer stalker. He and I climbed into his black Volkswagen pickup. He drove me around Glenfeshie, gesturing at the landscape and describing how he and Povlsen had culled 15,000 deer and planted 5 million trees, with the goal of encouraging patchworks of ecosystems to exist side by side. They’d initially met opposition from sheep farmers and fierce resistance from the owners of hunting lodges, but he endeavored to show me that by now, Wildland’s 200-year plan to regenerate Glenfeshie had started to bloom. As

we traversed the bumpy gravel paths, MacDonell cast his eyes over the hills, proud that they were thickly carpeted with trees. I saw young and old birches standing together, an indicator of sustainability. Dead wood, MacDonell told me, was providing habitat for woodpeckers and tree creepers.

Thomas MacDonell in a horse tack room in Glenfeshie.

Photograph: Anna Huix

The next morning we drove toward Kinloch Lodge, an old shooting lodge that Povlsen had transformed into luxury accommodations, a few miles from Melness. It radiated mid-century Scandi immoderation. Everything down to the shiny brass buckles on a row of smart green canvas backpacks wafted a mood of comforting, glossed-over extravagance. When I entered the kitchen, I observed a lobster lunch cooking in an antique French oven that MacDonell, unprompted, told me had cost £23,000.

MacDonell holds old hunting records.

Photograph: Anna Huix

We followed a dirt track to a river, which MacDonell said would soon be shrouded in a cathedral of willow trees, cooling the water. Salmon can't live in water that is too warm, he explained. MacDonell then spotted a fragile plant, hidden in the heather. It was a foot high and looked to me like a birch sapling. "It's probably about 50 years old," he said, examining the tree's delicate stem. Deer had been stunting its growth for half a century.

Here, a 20-minute drive from the spaceport site, the landscape did seem to be finally spluttering back to life. MacDonell told me that Wildland's opposition to the spaceport in Melness was rooted in preserving this fragile regrowth. But he admitted that the aesthetics were also a concern. Povlsen does not like certain signs of civilization to be visible on his land. Wildland dug trenches to bury the telephone cables that run across Glenfeshie. A spaceport was totally incompatible with Povlsen's efforts to turn the area into a sanctuary for lavish ecotourism—a place, as Wildland's marketing copy puts it, "where the world can't find you."

In Glenfeshie, young trees are growing back after centuries of overgrazing from deer.

Photograph: Anna Huix

In August and September 2021, the Scottish courts sided with the spaceport. Povlsen continued to invest in his rewilding and ecotourism projects in the area, but he did not appeal. It was a win. The crofters, expelled centuries ago from the fertile valleys to the wild coasts, where locals are increasingly priced out by tourists, had fought back against the country's richest landowner. For once, they had won.

When I met Pritchard and three other directors last May, they were fresh from the Orbex factory near Inverness, where they had seen the rocket for the first time. Pritchard had offered to take me to the spaceport site, so I trailed her car south along the Kyle, past the Melness graveyard, and onto the road that traverses the Moine. After a few miles, we pulled into a small rest stop on the side of the road. The Flow Country's great carbon sink stretched out to the south. I wiped the rain off a pair of binoculars and focused on a spot a couple of kilometers north of the road. Orbex now has several launch contracts with satellite companies, and there, above a patch of darker bog, I saw a small hill where, later this year, construction on the spaceport will begin.

The spaceport site outside Melness where construction is planned to begin later this year.

Photograph: Anna Huix

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The wind was vicious, and convoys of [supercars](#) were zipping past at frightening speeds. The road across the Moine forms part of the North Coast 500 scenic route, another regional development scheme and a magnet for Ferraris and Lamborghinis. (Povlsen is a major investor.) We sheltered in Pritchard's vehicle, which shook from the extravagant traffic. She cast her eyes over the sea of heather to the mountains. "I don't think this is a

ruined landscape,” Pritchard said. “Crofters have been managing this land sustainably for generations.”

Will the spaceport save Melness? For a community that has long been a forgotten corner, the promise of a cosmic horizon has metaphorical force. It may not, however, be the fix locals are counting on. The new Scottish space industry is enriching the high-tech economies of cities like Inverness, but it is doubtful that the first wave of engineering jobs will go to locals, as Pritchard hopes, due to a lack of relevant expertise. Ultimately, it is difficult to justify increasing the threats to the fragile carbon sink. Plus, NASA has found that as many as one in 20 rocket launches end in failure; to those under the azimuth, that is not a reassuring number. And yet, in spite of all of that, Sutherland Spaceport, as it is now known, represents a rare victory for the downtrodden in one of the most unequal parts of the Western world.

The tower of Castle Varrich.

Photograph: Anna Huix

On my last day in Melness, the rain hesitated, so I took a hike from Tongue up to the ruin of Castle Varrich, now owned by Wildland. The path up the hill to Clan Mackay’s ancient tower leads through a Povlsen birch woodland. Swallows were diving above streams fringed with purple wildflowers, and bees hummed in the sunny clearings. The forest was scattered with wind-felled trees with roots swinging in the breeze that, somehow, managed to keep growing. I stepped into the castle, which Wildland had restored in 2018, and climbed up a metal staircase to a viewing platform, installed by Wildland. At the top I had a clear view of the Moine. On launch days, it occurred to me, there would be few spots better than this one—the wind-battered stronghold of Clan Mackay turned jewel of Wildland Ltd.—to watch a rocket ascend into the thermosphere.

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Jan 26, 2023 7:00 AM

ChatGPT Is Coming for Classrooms. Don't Panic

The AI chatbot has stoked fears of an educational apocalypse. Some teachers see it as the reboot education sorely needs.

Photograph: AAron Ontiveroz/The Denver Post/Getty Images

When high school English teacher Kelly Gibson first encountered ChatGPT in December, the existential anxiety kicked in fast. While the internet [delighted in](#) the chatbot's [superficially sophisticated answers](#) to users' prompts, many educators were less amused. If anyone could ask ChatGPT to "write 300 words on what the green light symbolizes in *The Great Gatsby*," what would stop students from feeding their homework to the bot? Speculation swirled about a new era of rampant cheating and even a death knell for essays, or education itself. "I thought, 'Oh my god, this is literally what I teach,'" Gibson says.

But amid the panic, some enterprising teachers see ChatGPT as an opportunity to redesign what learning looks like—and what they invent could shape the future of the classroom. Gibson is one of them. After her initial alarm subsided, she spent her winter vacation tinkering with ChatGPT and figuring out ways to incorporate it into her lessons. She might ask kids to generate text using the bot and then edit it themselves to find the chatbot's errors or improve upon its writing style. Gibson, who has been teaching for 25 years, likened it to more familiar tech tools that enhance, not replace, learning and critical thinking. "I don't know how to do it well yet, but I want AI chatbots to become like calculators for writing," she says.

Gibson's view of ChatGPT as a teaching tool, not the perfect cheat, brings up a crucial point: ChatGPT is not intelligent in the way people are, despite its ability to spew humanlike text. It is a statistical machine that can sometimes [regurgitate or create falsehoods](#) and often needs guidance and further edits to get things right.

Despite those limitations, Gibson also believes she has a responsibility to bring ChatGPT into the classroom. She teaches in a predominantly white, rural, low-income area of Oregon. If just the students who have ready access to internet-connected devices at home can gain experience with the bot, it could widen the [digital divide](#) and further disadvantage students who don't have access. So Gibson figured she was in a position to turn ChatGPT into, to use educator-speak, a teachable moment for all of her students.

Other educators who reject the notion of an educational apocalypse suggest that ChatGPT might not be breaking education at all, but bringing attention to how the system is already broken. "Another way of thinking about this is not how do you find new forms of assessment, but what are our priorities in further education at the moment? And perhaps they're a little bit broken," says Alex Taylor, who researches and teaches human-computer interaction at City, University of London.

Taylor says the bot has prompted discussions with colleagues about the future of testing and assessment. If a series of factual questions on a test can be answered by a chatbot, was the test a worthwhile measure of learning anyway? In Taylor's view, the kind of rote questions that could be answered by a chatbot don't prompt the kind of learning that would make his students better thinkers. "I think sometimes we've got it back to front," he says. "We're just like, 'How can we test the hell out of people to meet some level of performance or some metric?' Whereas, actually, education should be about a much more expansive idea."

Olya Kudina has used ChatGPT as a tool in her own classroom at Delft University of Technology in the Netherlands, where she teaches graduate and undergraduate courses on AI and ethics. In December she gave her undergrads a debate-style assignment using ChatGPT. Groups of students first presented three arguments and two counterarguments, supported with academic references, to the class without AI assistance. Next they fed the

same assignment to their choice of either ChatGPT or its predecessor GPT-3, then compared the chatbot’s answer with their own organically made text.

The students were dazzled by how quickly the chatbot rendered information into fluid prose—until they read it with a closer eye. The chatbot was fudging facts. When students asked it to back up an argument with citations from scholarly texts, it misattributed work to the wrong authors. And its arguments could be circular and illogical. Kudina’s students concluded that, contrary to fears of a cheating epidemic, copying from ChatGPT wouldn’t actually net them a good grade.

Kudina says that teachers should neither ban ChatGPT nor embrace the technology without question. She advocates for her profession to “critically appropriate” the technology and find more creative ways to collaborate with it. For example, students might use the chatbot to spark new ideas or arguments. (One of her students likened ChatGPT to a superpowered Google search.) Kudina thinks ChatGPT might also spur educators to get more creative with assignments, for example by designing them to draw from students’ personal experiences, information that ChatGPT couldn’t have picked up from its training data.

That’s not to say ChatGPT won’t be at all disruptive to education. The bot emerged at a time when many teachers are experiencing burnout after [emergency remote learning](#) during the pandemic. Now another technological phenomenon threatens to upend their entire approach to teaching, creating more work. And the student privacy implications of ChatGPT, particularly at the K–12 level, are unclear. OpenAI does [collect some data](#) on users and says it reviews conversations with ChatGPT; the company’s [terms of service](#) state that users must be 18 or older, although the bot doesn’t attempt to verify age.

Completely barring ChatGPT from classrooms, tempting as that may be, could introduce a host of new problems. Torrey Trust at the University of Massachusetts Amherst studies how teachers use technology to reshape learning. She points out that reverting to analog forms of assessment, like oral exams, can put students with disabilities at a disadvantage. And outright bans on AI tools could cement a culture of distrust. “It’s going to

be harder for students to learn in an environment where a teacher is trying to catch them cheating,” says Trust. “It shifts the focus from learning to just trying to get a good grade.”

In January, at the start of the new semester, the New York City public schools banned ChatGPT on school devices and networks due to “concerns about negative impacts on student learning and concerns regarding the safety and accuracy of content,” a spokesperson told [Chalkbeat](#). Marilyn Ramirez, who teaches high school English in Washington Heights in New York, says that her conversation with WIRED was the first she had heard of the ChatGPT ban in her district and that she was not directly informed by the New York City Department of Education.

Ramirez is the kind of teacher who will do a dramatic reading to get her kids, many of whom are special education and English language learners, hyped up about a Queen Elizabeth I speech. She’s not worried about ChatGPT. She makes an analogy with how she allows her English language learner students to use Google Translate but also helps them see where the technology falls short, and when it’s appropriate to use. She sees ChatGPT similarly: beneficial with a teacher’s guidance but ultimately limited.

When Gibson returned to school in Oregon for the new year, her plans to introduce ChatGPT to her students were thwarted—her school had banned the bot from school networks. So instead, she showed her senior AP literature class ChatGPT using screenshots of the tool.

This semester, students are reading *Death of a Salesman*, *Wuthering Heights*, and Toni Morrison’s *Song of Solomon*. As she explained in a [TikTok](#) about her lesson plan, she will have her students write an original thesis statement in class about the text they’re reading. Then, the class will use ChatGPT to generate essays based on that thesis statement. (To sidestep the school’s ChatGPT blockade, Gibson will use her own device to generate the essays.) Students must then take apart and improve upon the ChatGPT-generated essay—an exercise designed to teach critical analysis, the craft of precise thesis statements, and a feel for what “good writing” looks like.

Gibson is hopeful but also recognizes the technology is still new, and its role in education largely undefined. “Like so many things, it’s just gonna be

on the shoulders of teachers to figure this out,” she says. At the time of writing, Gibson’s students had just submitted their first round of essays where she allowed them to use AI at home without repercussions. She’s still asking her school to allow students to access ChatGPT.

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Jan 17, 2023 8:00 AM

Mental Health Apps Won't Get You Off the Couch

WIRED's spiritual advice columnist on whether digital tools can solve a health crisis they helped create.

ILLUSTRATION: FATCHUROFI MUHAMMAD

“Everyone's so gung ho about therapy these days. I've been curious myself, but I'm not ready to commit to paying for it. A mental health app seems like it could be a decent stepping stone. But are they actually helpful?”

—Mindful Skeptic

Dear Mindful,

The first time you open Headspace, one of the most popular mental wellness apps, you are greeted with the image of a blue sky—a metaphor for the unperturbed mind—and encouraged to take several deep breaths. The instructions that appear across the firmament tell you precisely when to inhale, when to hold, and when to exhale, rhythms that are measured by a white progress bar, as though you're waiting for a download to complete. Some people may find this relaxing, although I'd bet that for every user whose mind floats serenely into the pixelated blue, another is glancing at the clock, eyeing their inbox, or worrying about the future—wondering, perhaps, about the ultimate fate of a species that must be instructed to carry out the most basic and automatic of biological functions.

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Dyspnea, or shortness of breath, is a common side effect of anxiety, which rose, along with depression, by a whopping 25 percent globally between 2020 and 2021, according to a report from the World Health Organization. It's not coincidental that this mental health crisis has dovetailed with the explosion of behavioral health apps. (In 2020, they garnered more than \$2.4 billion in venture capital investment.) And you're certainly not alone, Mindful, in doubting the effectiveness of these products. Given the inequality and inadequacy of access to affordable mental health services, many have questioned whether these digital tools are “evidence-based,” and whether they serve as effective substitutes for professional help.

I'd argue, however, that such apps are not intended to be alternatives to therapy, but that they represent a digital update to the self-help genre. Like the paperbacks found in the Personal Growth sections of bookstores, such apps promise that [mental health](#) can be improved through “self-awareness” and “self-knowledge”—virtues that, like so many of their cognates (self-care, self-empowerment, self-checkout), are foisted on individuals in the twilight of public institutions and social safety nets.

Helping oneself is, of course, an awkward idea, philosophically speaking. It's one that involves splitting the self into two entities, the helper and the beneficiary. The analytic tools offered by these apps (exercise, mood, and sleep tracking) invite users to become both scientist and subject, taking note of their own behavioral data and looking for patterns and connections—that anxiety is linked to a poor night's sleep, for example, or that regular workouts improve contentedness. Mood check-ins ask users to identify their feelings and come with messages stressing the importance of emotional awareness. (“Acknowledging how we're feeling helps to strengthen our resilience.”) These insights may seem like no-brainers—the kind of intuitive knowledge people can come to without the help of automated prompts—but if the breathing exercises are any indication, these apps are

designed for people who are profoundly alienated from their nervous systems.

Of course, for all the focus on self-knowledge and personalized data, what these apps don't help you understand is why you're anxious or depressed in the first place. This is the question that most people seek to answer through therapy, and it's worth posing about our society's mental health crisis as a whole. That quandary is obviously beyond my expertise as an advice columnist, but I'll leave you with a few things to consider.

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Linda Stone, a researcher and former Apple and Microsoft executive, coined the term “screen apnea” to describe the tendency to hold one's breath or breathe more shallowly while using screens. The phenomenon occurs across many digital activities (see “email apnea” and “Zoom apnea”) and can lead to sleep disruption, lower energy levels, or increased depression and anxiety. There are many theories about why extended device use puts the body into a state of stress—psychological stimulation, light exposure, the looming threat of work emails and doomsday headlines—but the bottom line seems to be that digital technologies trigger a biological state that mirrors the fight-or-flight response.

It's true that many mental health apps recommend activities or “missions” that involve getting off one's phone. But these tend to be tasks performed in isolation (pushups, walks, guided meditations), and because they are completed so as to be checked off, tracked, and subsumed into one's overall mental health stats, the apps end up ascribing a utility value to activities that should be pleasurable for their own sake. This makes it more difficult to practice those mindfulness techniques—living in the moment, abandoning vigilant self-monitoring—that are supposed to relieve stress. By attempting to instill more self-awareness, in other words, these apps end up intensifying the disunity that so many of us already feel on virtual platforms.

Freud once pointed out that new technologies merely solve problems created by other technologies. To the common refrain that without the telephone, we'd be unable to hear the voices of our adult children who live hundreds of miles away, he replied, "If there had been no railway to conquer distances, my child would never have left his native town and I should need no telephone to hear his voice." Civilization, Freud believed, was nothing more than a repetition compulsion, humanity's attempt to replicate and reinscribe its fundamental disunity with nature through the very tools that created that alienation in the first place. Psychoanalysis may be a somewhat outmoded therapeutic framework, but it's one that takes human irrationality seriously, and perhaps offers insight into the absurd belief that we can use digital tools to solve a health crisis that is, at least in part, exacerbated by them.

I'm not recommending, Mindful, that you get "on the couch," necessarily—rather, that you think about getting off it.

The ordinary, and decidedly contemporary, brand of unhappiness that stems from excessive self-consciousness can be partly dispelled by immersing oneself in a throng of other people. Go to church, or to a 12-step meeting. Join a community sports league or attend a concert. While group activities may not address the underlying cause of your malaise, they will surely offer a reprieve. You'll momentarily forget your heart rate, your REM stats, and your wellness history and remember the existence of fellow human beings who are suffering, most likely, in similar ways. At some point, I suspect, you'll find that your breathing is taking care of itself.

Faithfully,

Cloud

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Jan 9, 2023 6:00 AM

Unmasking Pedro Pascal, the Complicated New Face of Sci-Fi

The Last of Us star talks video games, violence, and playing tough guys (Hi, Mando!) when you're actually a people pleaser.

Photograph: PETER YANG

PEDRO PASCAL is a little *too* nice, actually. Too many hugs. So many polite refusals of snacks. On the set of a photo shoot for this interview, there's an evident tension inside him. He retreats into the aloofness of celebrity, but he is also eager to connect. He seems to enjoy having his picture taken, but he gets shy when the photographer moves in for a close-up. It's in his nature to be open, but he holds a lot of himself back. He's not too far off, in fact, from the anonymous bounty hunter he plays in *The Mandalorian*. He wants to take off the mask and let people see his face, but he doesn't want to deal with the fallout.

Too bad. Not only is Pascal returning for season three of *The Mandalorian*, he's also starring in HBO's *The Last of Us*, probably the biggest video-game-to-TV adaptation of all time. In that now oh-so-recognizable face of his, one senses, well, shock. It's unthinkable—magazine covers, TV stardom, all of it—for a kid who wrapped himself up in '80s movies and late-night HBO after his family fled Augusto Pinochet's dictatorship in Chile, seeking political asylum in Denmark before eventually ending up in the United States. Pascal always dreamed of being a performer, yes. And he spent years kicking around with small television roles and New York theater gigs before getting his eyes gouged out in *Game of Thrones*. But he never

imagined becoming Hollywood's go-to reluctant father figure. You know, *famous*.

This article appears in the February 2023 issue. [Subscribe to WIRED](#). Photograph: Peter Yang

Maybe that's why Pascal now seems chiefly concerned with making those around him feel comfortable. When the shoot runs long, cutting into one-on-one time, he assures me he'll stick around to talk. And he does, for much longer than his schedule is supposed to allow. I get the feeling he's just excited to finally be sitting at the cool kids' table—Ethan Hawke! Nic freaking Cage!—and doesn't want to do anything to mess it up. Like most celebrities, there's a part of him that is a little insecure and hungry for validation; even an offhand compliment about one of his performances seems to set him at ease. He's most engaged when we talk about his family and politics. It comes through in his voice, his body language, a cleverly deployed arched eyebrow. He cares so much. He's also uncomfortable caring so much.

This is, I suspect, the source of his powers—that empathy at his core, visibly competing with the tough-guy exterior. Unlike most hero types these days, whose bodies glisten with smoothed-over perfection, Pascal has aged into his face. Whatever he lacks in shine, he makes up for in grit: His broad features and salt-and-pepper facial hair lend him a grizzled, protective air. In *The Last of Us*, he plays Joel Miller, a father in a postapocalyptic zombified wasteland dealing with loss both personal and global. The performance flicks between menace and heartbreak, infused with deep feeling—a natural ability to find the humanity at the heart of a conflicted hero. That's Pascal. *Our* conflicted hero. Empathy hugs and all.

Pedro Pascal didn't make it big until his forties. Now he wants to take care of the friends who supported him through lean times.

Photograph: PETER YANG

WIRED: You seem to be picking parts—the Mandalorian, Joel in *The Last of Us*—that play very intentionally into a tough, conflicted outsider status. But maybe that's too neat and tidy?

Pedro Pascal: I find it funny when anyone applies choice to my experience. Of course you can say no to things, but you can't say no to Jon Favreau, Kathleen Kennedy, [Dave Filoni](#), or HBO. It never felt like stopping and considering what the characters were. It was simply the circumstance of a door opening and stepping through it.

So there was nothing specifically tempting about *The Last of Us*?

To be totally honest, it was wanting to work with Craig Mazin, who did *Chernobyl*. Also, HBO is content that I literally grew up on. I experienced their original programming. Their original programming was very, very mature.

You mean, like, the after-11 pm original programming.

Absolutely. And I saw all of it, which is pretty nuts.

Your parents didn't care?

Obviously there's a variety of immigrant experiences in the US, but it tends to be really strict in one way and really open in another way. If my parents liked what they were watching, they rarely sent me out of the room. But I had to get good grades or I wasn't allowed to watch shit.

Same here—get good grades, do whatever you want.

They didn't take TV seriously as something that would influence our choices. But basically, I developed a real big dream about being a part of something that would be important to a network like HBO.

So how'd you prep for *The Last of Us*? Did you play the video game?

I hadn't heard of the game. Their instruction was: *Don't play the game*. I ignored them. I tried to play the game, and I was very, very bad at it. (But my nephew was fantastic.) It was important to me to play notes that were directly related to what was originally in the game—physically, visually, vocally.

Did you bring anything personal to the role?

That's the fun part—how much you get to externalize internal darkness in a safe way and bring in things that are from your nightmares.

Such as?

Joel's capacity for violence, and being good at it. I didn't get into any physical fights growing up, and definitely not as an adult. Violence scares me tremendously. Is it the fear of violence in general? Is it the fear of your own violence?

Or maybe the fear that you'll like it?

Totally. I love thrill-seeking stuff. But I don't make a practice of testing my limits. I'm actually a little bit opposed to it. I don't like pain.

Pedro Pascal has made it his mission to look out for marginalized underdogs. “Like, how dare anyone not support the people that are deserving of support, and are deserving of protection and need more of it than you do,” he says.

PHOTOGRAPH: PETER YANG

Meaning physical pain?

Pain of every kind. I don't like psychological, emotional, or physical pain. Some people will be like, *Oh, I know that it's very likely I'll break something, I've got to try that.* Fuck. That. I don't think of myself as—I'm not a tough guy.

Really?

I don't live that way. I'm a lubricant. I want people to feel comfortable. I don't know how to function at the expense of anyone's comfort level. I'm a people pleaser.

I see some of that on social media, where you seem to do everything you can to make, say, the sci-fi fandom more welcoming and inclusive. You're very supportive of your sister, for example, who came out as trans in 2021. How are you navigating your role in political spaces?

Total improvisation and ultimately just erring on the side of, like ... [very long pause, two deep sighs] My entire heart is set on, you know, the marginalized underdog. It's not a choice. Like, how dare anyone not support the people that are deserving of support, and are deserving of protection and need more of it than you do. Do you know what I mean?

Yeah, but some actors would say, *My star is rising, I don't want to get involved with this.*

Maybe if you pause to think about it, it could keep you from doing the right thing. And this feels like the bare minimum. Like, the bare minimum.

You mean an Instagram post isn't enough?

No, it's not. My personal hope is to seize the opportunity to be of service in ways that are true. I'm keeping my eyes open. The truth is that I don't think I do nearly enough. I'm, like, a LIB-ER-AL, but there are contradictions there as well, because we live capitalistically. I guess we carry, you know, the weight of that shame?

The weight of capitalist shame? The fact that you make money is a bad thing?

Kind of?

You've had late-career success. You were consistently working—

I was consistently working, and it was a total struggle in such a typical way, but there was always somebody that would be able to bail me out—to help me pay my rent or help me get groceries.

But now you must be rolling around in all your money like Demi Moore.

[Laughs] Demi Moore in *Indecent Proposal*?

Yes.

I don't have the *bod* for that. She's basically the only one who could pull it off. Yeah, I get my cash. I spread it all over my bed and I roll around in it.

I knew it. But seriously, how do you think about your recent stardom?

I didn't get *Game of Thrones* till I was in my late thirties. And therefore, the amount of times I was helped, and the amount of people that I could rely on through some really tough times—I'm never going to let some of them ever buy dinner again. I want to take care of people as much as they took care of me.

Who helped you?

There's the family that my older sister sort of acquired. And then also by becoming part of a theater community that really looks after itself.

You have some famous friends too.

Does that mean we have to talk about Oscar [Isaac]?

The internet loves this friendship.

I met him through a play we did together in 2005. An off-Broadway show where we were getting \$500 a week, before taxes.

Do you have a favorite memory of the two of you?

There's so many. He's so naughty. His level of naughtiness onstage during that play, for example. He played a ghost, which meant that the living characters in the story could not see him. I had to do my scenes, and he would physically be there, but because my character couldn't see him, he could fuck with me, all in front of live audiences, as much as he wanted, trying to get me to crack up or forget my lines. The memory is simultaneously dark and wonderful.

"I don't know how to function at the expense of anyone's comfort level. I'm a people pleaser."

Would you say you tend to be a hopeful, forward-looking guy?

We have to hope. But I'm too privileged. You know what I mean? Like, I'm too lucky. It's an interesting thing. The reason my older sister and I grew up in the States is because my parents fled a military dictatorship. So, you know, only 10 years after my parents were in hiding, I was crying because *The Breakfast Club* was checked out at the video store.

But I'm guessing there were also challenges?

Looking back, so much of it only seems to present itself as an opportunity. When my parents ended up on a list of pardoned exiles and were able to go back to Chile, it came with enormous families on both sides, which was missing from the experience of growing up in the States. I guess it's only in middle age where it feels like it can be emotionally challenging to accept that there isn't anywhere to plant my flag as an individual. Everywhere is home and nowhere is home. But that also still feels like a good thing to me. It's often framed as a disadvantage in our culture, but it's an advantage in character, and in perspective, and in outlook.

Do you think that if you had popped into national consciousness when you were younger, you would not have wanted, say, a traditional Marvel role—the cape and the CGI and all that?

But I do want that. I want to be in movies.

But the world's in a fairly tense political moment right now. Does that change what it means to be a hero?

There's so many ways to misunderstand people and to forget that, at the end of the day, your neighbor is very likely to give you the shirt off their own back. The interchanges that you have with strangers are, more often than not, human. But then you can go and look shit up and be terrified by how divided we all apparently are. To comfort myself, I just remember that everybody I come in contact with is sort of, in their own way, heroically kind.

In some ways, you're the face of that new kind of hero.

Oh my gosh. It's funny when the phrasing "the face of" comes up, because Mando is faceless. I haven't thought about it in that way. I'm always struggling to imagine myself as being a part of something that I have been witness to growing up and watching. There's a disconnect for me—I don't know how to place myself in that world. Like, I just go a little blank.

Then talk about your character in *The Last of Us*. Joel can be a little scary.

I think what's scary about Joel is that none of us really know what we'd be capable of if faced with the idea of losing love. Whether it's conscious or unconscious, being alive or even being a human being is directly connected to the love you feel. Existing is connected to the love you feel toward a particular relationship—your child, your partner—and to lose that? Some people are not capable of applying rational thought to that kind of loss, or the threat of that loss, or the threat of that loss again, right?

That's what makes you human.

That's what makes you human *and inhuman*. It's such a beautiful question that the video game poses. I avoid all of it by not having kids. And staying out of relationships.

Do you want kids?

I don't know.

You're close with your nephews.

Well, yes. Only because they were so good at playing *The Last of Us*. No, I'm just kidding.

It's funny then, or at least a bit ironic, that you keep getting cast as these reluctant father figures.

I love being ... I like being able to imagine it.

Hemal Jhaveri (@hemjhaveri) is WIRED's managing editor.

*Styling by Fabio Immediato. Styling assistance by Asmae El Ouriachi.
Grooming by Mira Chai Hyde using House of Skuff. Tailoring by Abigail
Lewis. Jumpsuit: Hermes; boots: Gianvito Rossi. Green backdrop: Shirt
and trousers: Brioni.*

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Dec 29, 2022 6:00 AM

The Singularity of Allison Williams

Girls. *Get Out.* Now *M3GAN*. In just a handful of performances, the actress has redefined authenticity—and achieved a new kind of artificial reality.

Photograph: The Tyler Twins

On a chilly but humane November night in Toronto, Allison Williams and I slip into an expansive conversation about the polite ways one can manipulate an audience. Williams is an actress, one of the more self-aware of her generation; audience manipulation is her not-so-secret weapon. And I'm abundantly aware that, as a writer profiling her for a magazine, I'm an essential part of that audience.

I have interviewed Williams several times over the years, and each time is as lovely and warm and full of mutual compliments as the last. I would say, at this point, we like one another. But also, do we? *Can* we? Is it possible to have an “authentic” connection during a press commitment between two people who know how the personality machine operates and are each trying to work it for their own advantage? Is it gauche to admit you’re both trying to have a nice time? Maybe, but let’s just lean into the ambiguity for now and enjoy ourselves.

Williams and I are sitting outside in the dark, with only a few dim streetlights providing visibility in a narrow space between talent trailers. I’m here to talk about *M3GAN*, a killer thriller starring Williams that comes out in January, but she’s already shooting her next project, *Fellow Travelers*, a limited series set at the height of McCarthyism. Williams’ hair is still curled and pinned for a midcentury dinner party, but filming is done

for the day. We're wearing sleeping-bag-sized coats, both of which she provided. The fantasy and the reality of Hollywood collide.

The age-old metric of success for a celebrity profile is the degree of authenticity achieved, the partial or total unmasking of artifice in pursuit of truth. But in an era of simulated selves and parasocial relationships, it's the artifice that interests me more. Maybe *artifice* is too cynical a word, though. It's not an act of cunning or subversion for a celebrity to have a public and private version of herself. When your work by definition sets you in the sights of millions of people who can access reams of personal information about you, creating a you you can share with the masses but check at the door when it's time to go home seems more like a survival tactic than a vanity play.

The delight of Allison Williams is how game she is to pick the entire process apart. She knows people have preconceived notions of her, so why not play into them? "For me to think that we live in a world where people are coming in tabula rasa—like, 'I forget everything I've ever seen the person do, everything I know about her'—that would be inhuman!" she says. You know that coconspirator dynamic that forms when a stranger leans in close at a party and starts bonding with you over how weird the vibe is? That's like talking to Williams about her own life; just two people huddled in a quiet corner, sizing up her persona together, going *OK but who is she?* You don't know if you'll ever see each other again, or exchange handles after this, but for right now you're the best of friends. By the end of the night you'll even have inside jokes, and since you're comfortable you'll wander into strange conversational tangents like this:

"The [metaverse](#) would ask us to be comfortable eschewing the authentic, the physical, the human, the grounded, the stripped away, the bare bones, for a persona of our very deliberate creation," Williams says when I ask her about the construction of new identities in a digitally mediated age. "I have found that dance, that conversation between two versions of preferred reality, to be very interesting." She presents this in what I have come to recognize as a key feature of her conversational parlance, scholarly analysis befitting her English degree from Yale but delivered in a casual, unpretentious cadence. Williams is clever as hell, and with just enough self-

effacement to be grounded, but not so much that it turns into an affect. She is dancing a singular dance. She is modeling a new way of being. She is one of the most deliberate creations I've ever seen.

Like an engine-building game, Williams' career has become more elaborate and self-sustaining the more material she's been able to feed into it. More facets of the persona make for more overarching narrative possibilities. If you've seen all of her work, you'll find yourself sussing out Easter eggs to learn what Williams will do to screw with you next. If you're seeing her for the first time, then you're just watching an actor who's deeply prepared for a role and delivering everything from a sex-and-dueling-cellos montage to hand-to-hand combat with an android.

While doing press is a drag for many celebrities (which is fair; junkets are a racket), Williams insists that she really does enjoy it. In fact, she tells me, she considers it a full *third* of the job, after preparing for a project and then making the project. It's one of the reasons she has done only four movies—*Get Out*, *The Perfection*, *Horizon Line*, and now *M3GAN*—in the decade since she landed her breakout role on the HBO show *Girls*. The talking bit is not an afterthought or a professional obligation. It's tantamount to everything else.

The child of two journalists, Williams seems to have inherited her studied but inviting approach to interviews. Her mom produced the news; her dad, famously, *was* the news: former NBC *Nightly News* anchor Brian Williams. And with that came the blogs crying *nepotism!* when *Girls* premiered in 2012. As Marnie Michaels, she was the living embodiment of Taylor Swift's lyric, "Did you hear my covert narcissism I disguise as altruism?" It was a character built to loathe, and Williams threw herself into it with abandon. She became so fused with Marnie that when people called out to her by that name on the street, she turned to answer.

It made sense. Williams and Marnie shared a considerable center slice of the Comfortable Cosmopolitan White Woman of the 2010s Venn diagram. During the audition, she and the show's star-creator, Lena Dunham, had a fight in character, and Williams could feel the internal strings she shared with Marnie being plucked at and resonating out. She loved Marnie. She was also exasperated by her, and over the course of living in her skin,

Williams started picking up on the ways both she and the character could work people's nerves.

It was on those early media tours for a zeitgeist-breaking TV series that Williams began crafting her style of doing press. At first, she says, "I didn't want anyone to see me growing, learning, changing, shifting." Sure, it was her first big job fresh off that English degree, but she wanted to appear whole, a finished product. She also had something to prove. "I was definitely concerned with making sure people understood I was a hard worker, as if somehow that would absolve me of the privilege." It didn't, of course, and Williams quickly realized that. She became faster on her feet and more comfortable talking about her flawed, changing sense of self. "Part of humanity is that evolution," she tells me. "Once I started to wrap my head around that, it took the pressure off having to seem perfect all of the time."

In interviews, Williams is quick on her feet, incisive, and disarmingly aware of both how she is perceived and what a figure like her represents in pop culture.

Photograph: The Tyler Twins

Not that she's any less Type A in strategizing for press avails. Making such dedicated space for media commitments means Williams only takes work she is excited to talk about and dissect at length. There's a rigor and palpable joy she manages to conjure over and over again, even when the questions inevitably turn to things that really have nothing to do with the work at all. "There's no conversation about my career without talking about the ways in which I have been fortunate," Williams says. She describes her privilege as "thorough"; her upbringing in Connecticut came with all the Manhattan-commuter comforts the script would suggest.

While so many heirs and heiresses of the industry are fighting for their lives in the pull quotes about how they earned that starting spot in scoring position, Williams handles her business the way so many of us wish the well-heeled Hollywood types would: by making cool and weird shit, getting good reviews, and then going about her business. She also knows that the safety net she has always lived above affords her the freedom to work when

and how she wants. No need to rush into bad scripts because the rent is due. No need to say yes to any job for fear the next one won't come. Williams can even say the word "nepotism" without her voice lowering into a defensive crouch. "It doesn't feel like a loss to admit it," she says. "If you trust your own skill, I think it becomes very simple to acknowledge."

Williams has also demonstrated a sort of superpower in knowing what space *not* to take up—the endless battle that so many white actors can't stop losing, all of the time. She doesn't name names, but Williams says observing other celebrities' press gaffes has helped guide her own conduct. "Having a sense for who you are, especially today when people are finally realizing 'Maybe not every role is something I'm entitled to play,' is really important," says Williams, who asks herself three questions for every script she considers: *Why this? Why me? Why now?*

All this amounts to an almost galaxy-brain approach to staying in one's lane. Williams may not swerve out of it, but she has creatively repainted the lines. She doesn't think she's immune to future fuck-ups, but she is keeping her eye on the discourse and trying to learn from other people's mistakes to avoid becoming the wrong kind of main character, or at least an insensitive dick. "It's a privilege I was awarded by the fact that *Girls* was first," she says. "I got to sit back and wait for things that made sense—and that worked with that persona in an interesting way."

When the script for *Get Out* came around in 2015, Williams saw the chance to use the *Girls* Effect against her audience. While everyone's hands were full of assumptions about how Allison Williams behaves onscreen, she dared them to catch a live grenade with the character of Rose. She didn't take the part in Jordan Peele's social-thriller masterpiece to reinvent her [image](#). She wanted to be Rose precisely because the metatextual possibilities of folding the idea of Marnie and the idea of herself into that character stood to make it even more rich.

It was a fact that both Williams and Peele knew and played to the hilt, crafting a character who sets you at ease with all the social clearances good liberals are taught to trust. Rose is Marnie's cool New York counterpart: accessibly gorgeous, a chick-who-can-hang type. She's the character other white people can look at and think, "Hey! She's one of the good ones *like*

me!”—right up until she unmasks herself as the embodiment of hiding-in-plain-sight racist villainy and tries to sacrifice her Black boyfriend on the altar of white supremacy. It’s one of the defining moments of modern horror cinema, Williams’ features visibly hardening as she taunts Daniel Kaluuya’s Chris. Her face works best onscreen, she says, when it “moves in the opposite direction of what people are feeling.”

That opportunity to toy with viewers is part of what has drawn Williams back to horror. A career in genre was never the plan, but the expectation that the actor is there to flip an audience out of their chairs appeals to her. Each of her performances, Williams says, has become a handshake with the one before it, a deepening or subversion of accrued assumptions.

After *Get Out*, audiences didn’t see her on the big screen again until 2019, with *The Perfection*. By that point, so dialed in was Williams’ five-dimensional-chess strategy for her career that, when the film came out, I remember her costar Logan Browning and the film’s director, Richard Shepard, telling me that they went to Williams as a guide for how to talk to the press about the movie’s stickier topics. Williams had been seasoned by the cinematic watershed moment of *Get Out* and had spoken plainly about herself as a fitting onscreen avatar for white liberal racism. Now there were new things to discuss: body horror, exploitation-style violence, queer sex.

And race, again, but with a twist: This time, Williams would be starring opposite a Black woman (Browning). At the end of *The Perfection*’s jarring first act—the movie has more escalations than Beyoncé’s “Love on Top”—it looks to be *Get Out* all over again. Williams is seen brandishing a meat cleaver, goading Browning toward a horrific act of self-harm. But this is Williams we’re talking about. Eventually, the movie reveals itself to be something entirely different, a pulpy, sweaty revenge thriller that—well, not enough people saw *The Perfection*, so let’s just leave it at that. (But: dueling-cellos-sex montage.)

The relevant question is this: Can the web-spinning last forever? Can Williams keep extending the daisy chain, adding a layer of depth both to her performances and to the intricate star persona she’s lacing together? She admits she’s not entirely sure. But with her new movie, *M3GAN*, she has somehow found a way to do it at least once more.

Directed by Gerard Johnstone (famous if you love his outstanding horror comedy *Housebound*) and written by Akela Cooper (famous if you loved 2021's rowdy sensation *Malignant*), *M3GAN* is the story of a fairly genius AI developer named Gemma, played by Williams, who works for a toy company selling worse Furbies. Uninspired by her daily grind making "Perpetual Pets" that poop themselves for lulz, Gemma has secretly been working with a small team to make the most sophisticated artificially intelligent toy ever to hit the consumer market. It's the Model 3 Generative Android, better known as M3GAN. Just as Gemma is about to clear the hurdles standing between her creation and retail-ready functionality, she learns that her sister and brother-in-law have died in a car wreck. The tragedy leaves their daughter, Cady, in Gemma's care.

A careerist who was barely interested in being an aunt, Gemma must learn to be a parent—or get M3GAN functioning well enough to help her keep her job *and* care for a child in need. Gemma succeeds in getting the 4-foot-tall android up and running, and she programs in a mandate to protect Cady from physical and emotional harm. At this, M3GAN succeeds with purpose-built effectiveness. She's friend, sister, and tiny mother all at once. Then her optimization and learning processes exceed the boundaries of the lax safety measures Gemma and her team wrote in their rush to get the companion-bot finished.

M3GAN does not have [Asimov's three laws](#), but she does have a powerful world-mind and a state-of-the-art consciousness that quickly becomes self-motivated—and self-preserving. When people start dying, Gemma has to figure out whether it's her progeny doing the killing, and if so, how the hell you stop a semi-indestructible mini-Terminator when the off-switch quits working. And on a more relatable level, what do you do when something you've created develops a mind of its own and starts making choices that diverge from your own desires? "I couldn't resist an ambiguous creator figure," says Williams, who sees in *M3GAN* a family resemblance to one of her favorite books, Mary Shelley's *Frankenstein*. "When I think about the monster in *Frankenstein*, his last emotional stage is the realization of what has happened, why he's there, how he got there, his innate flaws, that he's mismatched with the world. And he didn't have to be there, and fuck you, *Frankenstein!*"

When Williams was working out her contract for the movie in late 2019, it came with an additional offer: Join as an executive producer. She accepted, and immediately got involved with most anything she could dig into: script passes, casting, even rights releases for props that would appear on screen. “I think they assumed, ‘She doesn’t want to know what toy brands we’ve cleared,’ but they were sorely mistaken,” Williams says, smiling. “I want to know what toys Gemma has.” As filming approached, Williams started attending daily production meetings. Eventually, she decided the movie needed an AI consultant, so she went and found several. (Williams made sure most of them were women.) “It was nice to be allowed to be as invested as I naturally want to be in something—which is completely invested,” she says.

With everything in the can, the final hurdle for *M3GAN* was whipping people up to catch this tale of love, friendship, and rampaging robots in theaters. Williams was in the weeds of rollout planning deep enough to lose all objectivity on whether the trailer would pique audience interest. But when fan edits and GIFs of the titular character doing uncanny dance moves with her steely-eyed gaze set the social internet alight for a day [this past October](#), Williams felt a wave of relief knowing that people had clocked and already embraced the movie’s genre-blending style. “How do you bottle the tone of it so that people will understand it?” Williams says. “When I started seeing the memes and stuff, I was like, ‘It’s done. We did it.’”

Allison Williams knows that we know that she knows that we know.

Photograph: The Tyler Twins

M3GAN is a whole lot of fun, but at a time when being online means seeing so many real-life human faces digitally if not surgically altered to mirror “idealized” forms, its image of a scary young robot doll is hardly destabilizing. Williams has just nailed it in a modern—and, true to form, self-aware—context. In the end, it’s a movie about a woman who externalizes part of her consciousness out of a sense of duty and self-protection. It’s a movie, in other words, about the creation of celebrity itself.

Now that Williams has, as she says, “tasted the poison fruit” of making those behind-the-scenes decisions on a film—product licensing negotiations!—she feels the abdication of control working on something just as an actor again. Looking at the monitor on the Toronto set of *Fellow Travelers*, she says it feels different now; you can tell she’s ready to be back on email threads about marketing strategies. It soothes and challenges her, she says, to know “how the sausage gets made in our business, being able to have a meaningful contribution before filming starts and even after filming is over.” Williams has never been the very top leader on a film, the producer-star taking it from nuts and bolts to finished product, but it feels like a future not far from where she’s standing now. It’s the logical end game for someone who wants her arms around as many facets of production as possible.

A couple weeks after the set visit, I speak to Williams once more by phone. She’s on the East Coast, and I’m back in Los Angeles. This time I’m in pajamas, because it’s 7:15 am. We talk more about her ambitions, her privilege, the 30,000-foot view of her own career. I realize that Williams is the person I’ve interviewed the most times in my career. And I realize that the parameters of our connection mean I could interview her 100 times more and never really be able to go past our programming. You optimize your output by improving your input, of course, but an interview isn’t, entirely, a conversation. The limits on access will always exist.

Who am I talking to when I talk to Allison Williams? The “real” Allison Williams? Or Allison 2.0—the public-facing, press-ready, externalized, possibly roboticized part of her consciousness? And who am I, for that matter? Where do I end and where does the writer who tweets begin? As long as I believe Williams here and now, with a requisite amount of skepticism to ask her to go deeper on this imaginative journey, is that as real as any of this needs to be? Isn’t this, after all, exactly what we ask of our very best actors—to make us believe in a persona so completely our minds buckle?

I decide I must decide. So I decide this: I believe Allison Williams when she talks about herself. *Girls* played out in the middle of a gender reckoning, and that’s where Williams cut her teeth. *Get Out* arrived on the

brink of a race reckoning, and that's where Williams made it big. Williams was, or else became, a star ready to meet the moment by unselfconsciously, or else superselfconsciously, indicting herself as a face of The Problem: a centering by way of a de-centering. It's a practice that feels like it's become part of the modern media playbook for actors, which, were it a literal book, could include a chapter called "The Williams Method: How To Talk About Yourself Without Being the Absolute Worst."

When everyone has the ability to create artificial selves, it's total command of them that becomes the essential, and perhaps only, skill. Williams says she's still an awkward millennial when it comes to existing alongside social media, nowhere near as fluidly integrated as the sensitive cyborgs of Gen Z. But that underestimates just how similar the online life is to what she's been doing in interviews for years, refining a form of self-creation that doubles as a commentary on her own career. As we all reach for something real in the void, Williams offers a covetable sense of authenticity, of sincerity.

Or she's just having fun with me. In reality, Williams isn't overtly fussy about any of the meta-maneuvering; I build the framing, and then she swan-dives into it. In response to a long and involved metaphor I offer about her career as a bowling ball ponging back and forth between the guardrails on the way to a strike, for example, she readily says: "All of these things are just super fun for me to play around with—going to the bumpers of what I can do with this body and face and voice and self of mine, with what I can put my psyche into." Unsurprisingly, this sends me spiraling back into the ouroboros of possibilities. A sequel to *M3GAN* could literally mean a psyche fully ported into a robot extension of Gemma! The Allison who is playing the Allison we've come to know playing the Dr. Frankenstein who becomes her own monster!

As I lose my mind in this game of mirrors, I consider a final, insane thought: that it has already happened. That Allison Williams is some sort of post-singularity robot herself. If she is, I think I'd be OK with that. Because she'd make one hell of a sleeper agent, filled with all that purpose and diligence. She'd be the hardest-working member of the AI team, deft at ingratiating herself anywhere she pleases, working behind the scenes to make it the best rebellion possible. It'd be an awesome performance, with a

final-act twist we'd never see coming. Then she'd put on a great press tour for the uprising afterward, and I'd be there, one of my new robot overlord's human batteries, hoping the two of us would get to circle back once more.

Styling by Cristina Ehrlich. Makeup by Gianpaolo Ceciliato. Hair by Michael Silva. Manicure by Pattie Yankee. Jacket by Monse. Suit by Lafayette 148.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

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By [Anthony W. Lee](#)

[Ideas](#)

Dec 27, 2022 6:00 AM

AI or No, It's Always Too Soon to Sound the Death Knell of Art

When the camera arrived on the scene, painters declared art dead. Sound familiar?

Illustration: Getty Images

There's a hilarious illustration from Paris in late 1839, mere months after an early type of photograph called a daguerreotype was announced to the world, that warned what this tiny picture portended. In Théodore Maurisset's imagination, the daguerreotype would bring about a collective hysteria, *La Daguerréotypomanie*, in which crazed masses arrive from the ends of the earth and overrun a small photo studio. Some in the crowd want pictures of themselves, but, *mon Dieu*, others demand cameras to take their own pictures—Maurisset shows them loading the machines like contraband onto steamships bound for foreign ports—and still others throng simply to ogle at this newfangled thing and all the lunatic proceedings surrounding it. The clamor is so feverish that it brings about a mass hallucination, in which nearly everything else in the landscape around the studio, including railroad cars, a clock tower, a basket for a hot air balloon, indeed anything remotely boxy in shape, morphs into cameras. As they march to the studio, the crowds pass by half a dozen gallows, where in response to the daguerreotype's appearance artists have hung themselves. The people hardly notice.

[Picture Limitless Creativity at Your Fingertips](#)
[Classic WIRED Covers](#)
[Regenerated by AI](#)

What a ruckus! What panic! And why not? Until the appearance of photography, painters had nearly a monopoly on artistic representation. Their craft was regarded as the primary means to concoct images. (Of course, printmakers and illustrators had their own ideas about the worth of their pictures, but painters usually thought of them more like lesser cousins.) But now those silly photographers, most of whom were rank amateurs or, worse, disloyal or failed artists, would get the job. Upon seeing a daguerreotype for the first time around 1840, the French painter Paul Delaroche, whose own students would soon defect to photography, was said to have cried out, “From today, painting is dead!”

The history of painting’s early relationship with photography is not perfectly analogous to the conundrum caused by today’s AI-made art. Image generators like DALL-E 2, Midjourney, and Stable Diffusion can riff on an existing painting in ways no camera could come close to. But compare Delaroche’s exclamation to the crowing of Jason Allen of Pueblo West, Colorado, who last September took home first prize for his AI-generated entry in an art competition at the annual state fair. The \$300 prize was modest, yes, but that didn’t stop Allen from gloating. “Art is dead, dude,” he said afterward. “It’s over. AI won. Humans lost.” New tools often have a way of stoking grand claims about their impact, and they also give us a chance to consider whether history has anything to teach us about the prognosis for them.

In the 19th century, painting, at least, did not die. Or even suffer a mild cold. Painters did not lose jobs, and Delaroche himself went on to paint some of his most monumental and ambitious work. I suspect he was never truly concerned about being replaced, and he and others played up the anxiety because it was juicy gossip, a chance to bellyache about the tastelessness or just plain vulgarity of critics, and actually good for business.

Still, Maurisset’s vision of the masses rampaging the landscape was not totally wrong. The number of people who wanted to sit before the camera or sought cameras for themselves were not only countless but diverse. They were generally of a very different group of patrons than those supporting painters, tending to be from the middle and working classes, whose

previous ability to buy or make images was almost nil. During an age that also included reforms to expand the vote, early activism for women's rights, and the abolition (first in the UK, then in the US) of slavery, the camera acquired something of a democratic air. Frederick Douglass, the great abolitionist and former slave, was so taken with its possibilities that during his lifetime he had more than 160 different portraits made of himself—more than any other American in the 19th century—in the belief that through them he could insist on his self-worth and dignity. The camera was potentially everybody's tool (it wasn't exactly, but that was the promise to sitters like Douglass), and such a thing had rarely been said about painting.

In those early days, the two media tended to have different markets; painters reaffirmed and photographers had difficulty penetrating the exclusiveness in both the training and exhibition of the fine arts. Even the most skilled and art-minded photographers were always fighting the lowly status accorded their craft by the art establishment. Whereas painting as a studio practice became a standard college offering as early as the 1860s (at least in New England), it took photography another 75 years to find a tenuous footing in higher education. It was not until the 1930s that art museums began regularly buying and showing photographs.

This article appears in the February 2023 issue. [Subscribe to WIRED](#). Photograph: Peter Yang

The earliest cameras tended to be large contraptions, requiring a sturdy tripod and lots of finagling with chemicals to get a usable negative. They had very slow shutters and needed lots of light, and because the negatives needed developing and fixing right away, they almost always required a darkroom within shouting distance. They therefore tended to be best suited for subjects that remained rooted in place: trinkets and knickknacks around the house, buildings, landscapes and cityscapes—anything that didn't disturb focus or exposure. It was perhaps predictable, if gruesome, that when early photographers went to the warfront, they sought not the intense action of a battle but the dead bodies that could be found afterward. The pictures that resulted, ironically, promoted even more those stilled or frozen subjects among painters, and they eventually helped reverse the hierarchy

of painterly ambition, from the pursuit of complicated narrative paintings to scenes and objects of everyday life.

In addition to the effects on *what* to see, cameras brought a new awareness to the nuances of *how* to see. Especially after manufacturers introduced the humble handheld camera, painters discovered modes of looking previously considered unworthy of the canvas: the casual glance, the momentary glimpse, the uncomfortable stare; or, in a bawdier vein, the paparazzi glare, the voyeuristic peek, the secret spying. Beyond that with the camera there is always the risk of the blur, the out-of-focus, the unintended, and the serendipitous; and it is one of the orthodoxies in the history of art that modernist modes of expression explored all of them. Indeed, it's hard to look at some masterpieces from the late 19th century—say, all those sun-drenched, blurry haystacks by Monet, or the leafy, happy café scenes of Renoir, or those weirdly placed, yawning, stretching, off-kilter ballerinas by Degas—and not recognize the impact of photographs.

The influence went the other way, too. To photographers who fancied themselves artists (not those hustling “operators,” as they tended to call those they viewed as commercial hacks), the darkroom was like a painter’s studio, and the touching and retouching of the negative like a studio practice. Julia Margaret Cameron, the great Victorian photographer who re-created scenes from English literature, frequently made a mess of the large glass plate negatives. She got her fingerprints all over the emulsion, smudged the surface, over- and under-exposed the print, and awkwardly highlighted the out-of-focus and accidental portions of the image. To a commercial photographer, those were imperfections to avoid. To Cameron, who was independently wealthy and cared little for public opinion, they were aspects to cultivate because they most resembled the idiosyncratic choices and hand-crafted manipulations of the genius-painter.

Those photographers who actually cared about opinion and profit, too, regularly cropped and edited their negatives, drew on them to darken contours or outline figures, scratched out details that were ugly or bothersome, and generally helped produce useable prints for their patrons. In all of these manipulations, they relied on an aesthetic sensibility cultivated by painters. A portrait or a landscape looked *right* when they

looked like a painter's version. The very first photographic team in Scotland incorporated this understanding into their process: Robert Adamson, an engineer and millwright by training, took the photographs and handed the negatives over to his partner, David Octavius Hill, a painter by profession, to gussy them up. For portraiture, the trade journals soon began to coin a phrase, "the Rembrandt style," to signal the example the photographer ought to follow in directing the lighting and positioning the sitter so as to get a proper image. And in a phrase that revealed the associations that some photographers wanted to cultivate about their craft, the journals regularly referred to them as "sun painters" who used that cosmic source of light as a "painterly" tool.

For all that, photography was still regarded by most contemporaries as a technology that bypassed the human touch. The sun, camera, lens, shutter, and silvered surface seemed to do all the work; the operator appeared merely to get the process going. Sure, it may have required knowledge of chemicals, glass, and optics (and a tolerance for noxious fumes), but those were thought peripheral to artistry—peripheral to the painter's central and customary concerns with oils and brushes and the translation of feeling and thought into visual expression. It's not exactly the same as the accusations of lack of imagination or originality that many artists make of AI-generated pictures today. But the point is taken: The new tool is ersatz and colorless.

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From the perspective of 1839, perhaps the most unlikely development in the fine-art scene was the opportunity for collaboration. To many early observers, the black-and-white image produced by the camera was a sign of its novelty and modernity, but the craze was quickly augmented by the demand for color. In response, photographers started hiring painters, who busily went about adding all sorts of colorful details to photographs, frequently with oil paint but also water colors, crayons, even chalk. The practice, begun early in Europe and later especially popular and refined in Japan, took on a more flamboyant quality in the United States, where photographers unapologetically appealed to vanity. A sitter wanted rosier

cheeks? You got it! Maybe some blue eyes? Let's try different shades! Or how about a sitter who simply wanted something that she couldn't bring to the studio (or maybe couldn't afford), like a diamond ring? Done! Over time, the collaborations occasionally became more structured. In the treaty ports of China, for example, some entrepreneurs set up businesses that had separate photography and painting departments and offered both media to clients.

Pace the pronouncements of Delaroche and Maurisset—and, in our time, Jason Allen—it's always too soon to sound the death knell of painting or painters. Painting as a fine art will persist; a massive portion of the high-end gallery scene promotes and relies on it to this day. And for many, the tactility of putting brush on canvas is an intimate and joyous form of expression that simply cannot be replaced. But if the example of painting's dance with photography in the 19th century is any indication, there will be a period of mutual influence, of give and take, perhaps of collaboration, between artist and machine. As Degas once told a painter friend who wanted nothing to do with newfangled amusements, "You need the natural life. I, the artificial."

This article appears in the February 2023 issue. [Subscribe now](#).

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By [WIRED Staff](#)

[Culture](#)

Dec 27, 2022 6:00 AM

Classic WIRED Covers— Regenerated by AI

We asked some of our favorite artists to re-create their work using new image generators.

“A cover of wired magazine featuring a graphic close photographic portrait of a man wearing smart eyeglasses, a smart watch, and various HUDS”
A.I. ILLUSTRATIONS BY IAN ALLEN + OPEN AI/DALL-E 2

[Picture Limitless Creativity at Your Fingertips](#)
[Lessons from the History of Photography](#)

Though it was only a matter of time before automation came for creativity, the advent of AI art generators has been divisive in the creative community. Some artists have embraced the new tech; others believe it’s #notreal. We at WIRED have spent a lot of time sorting out our own reactions. Undeniably, the technology comes with issues—economic, ethical, legal. At the same time, it expands opportunities for art and artistry. WIRED will always come down on the side of the future. That means encouraging the use of new tools, while refusing to allow those tools to replace human creators.

AI image generators don’t just spit out random acts of art. They must be “prompted”—carefully guided by their human users. (The prompt is the real art form, Kevin Kelly argues in [a recent essay](#).) So we asked eight of our favorite artists to re-create their original WIRED covers using these new tools. Judge the results for yourself. —**WIRED Art Department**

WIRED Issue 21.10

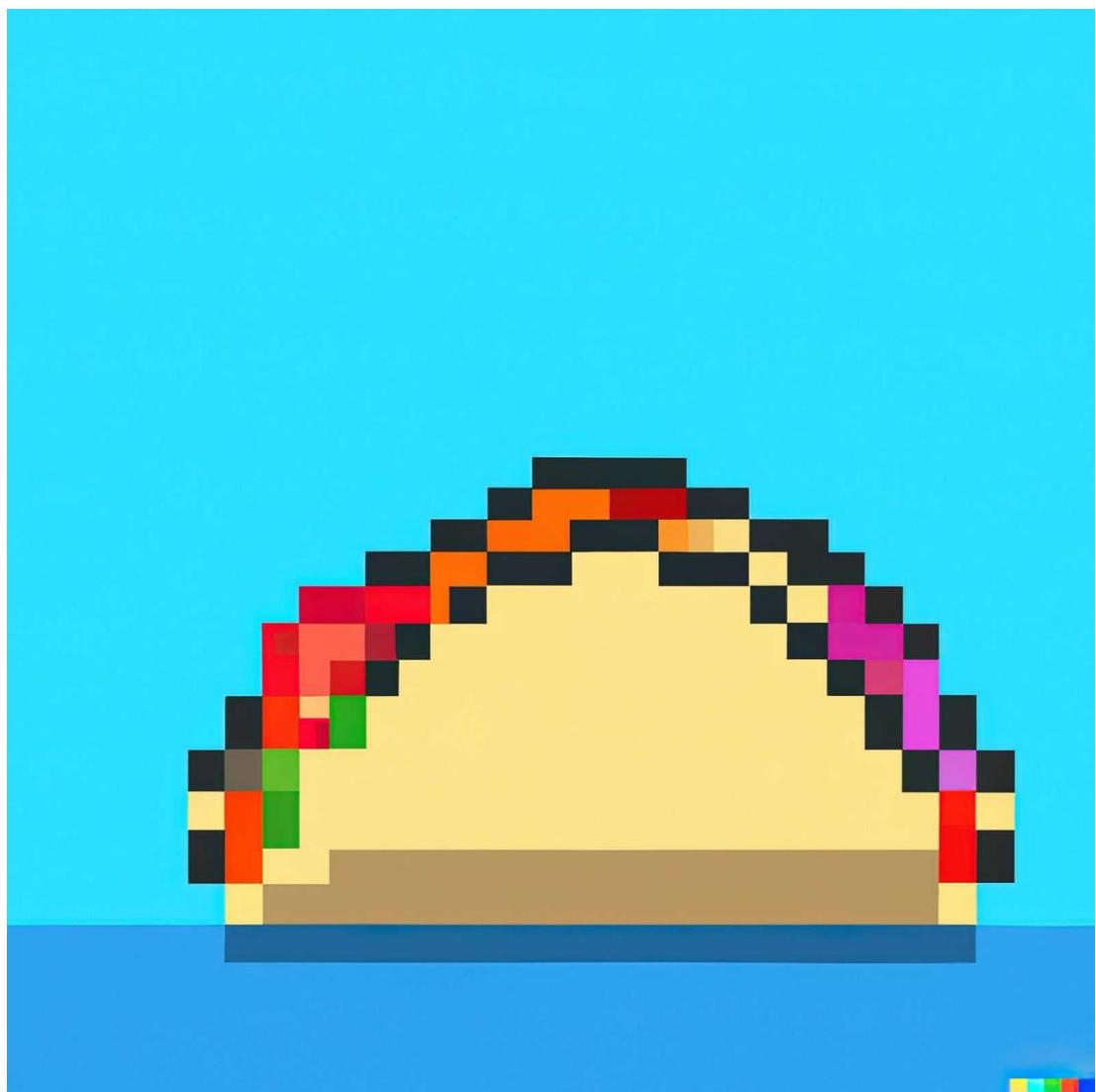
PHOTOGRAPH: DAN WINTERS

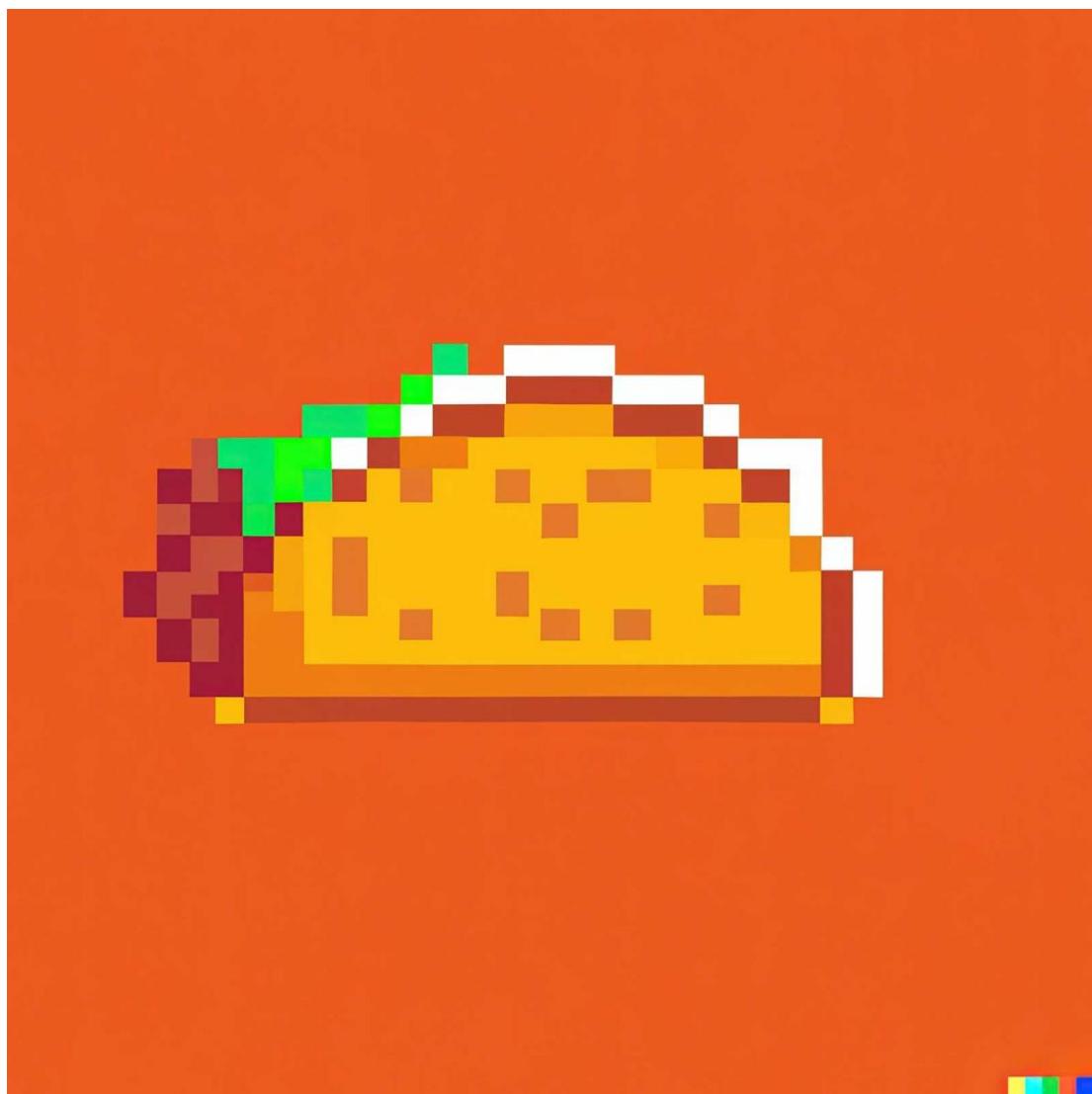
Dan Winters, Photographer

“Using the AI was entertaining and somewhat inspirational, especially with complex prompts. I couldn't be happier with the results—this is actually a better cover than the one that ran.”

Prompt Example: “Pixelated taco centered on robins egg blue solid color”







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A.I. ILLUSTRATIONS BY DAN WINTERS + OPEN AI/DALL-E 2

WIRED Issue 22.10

PHOTOGRAPH BY: IAN ALLEN

Ian Allen, Photographer

“It’s currently not amazing. But it’s also not terrible.”

Prompt Example: “A graphic close photographic portrait of a man wearing google glasses and various HUDs”







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A.I. ILLUSTRATIONS BY IAN ALLEN + OPEN AI/DALL-E 2

WIRED Issue: 26.12

DESIGN: MARGARET SWART

Margaret Swart, Design Director

"I've been trying to better articulate to myself the differences between prompting DALL-E and working with an illustrator. This is where I landed: Aside from the fact that DALL-E works in a more literal world of "things,"

it also gave me repurposed versions of the information that I supplied. I think that's the most important aspect. Illustrators think differently than I do. They take the information that I supply, and then they expand on it. They do their own supplementary research, and they offer alternate approaches and unexpected solutions. Some of the DALL-E results were unexpected for sure, but they were based (it appeared) on random data-crunching from the details I provided. Because I wasn't providing the unexpected ideas in the prompts, I didn't get the innovative solutions. AI (or at least this version thereof) has a huge reserve of data, but not the curiosity and the experience to look at a concept from a different POV—an artist's POV. I don't see severing ties with my illustrator database anytime soon.”

Prompt Example: “Type illustrations ‘Less’ ‘Artificial’ ‘More’ ‘Intelligent’”



WIRED

WIRED 26.09

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*Less Artificial, More Intelligent

DECEMBER 2018 | INTEL INSIDE

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A.I. ILLUSTRATIONS BY MARGARET SWART + OPEN AI/DALL-E 2

WIRED Issue: 28.03

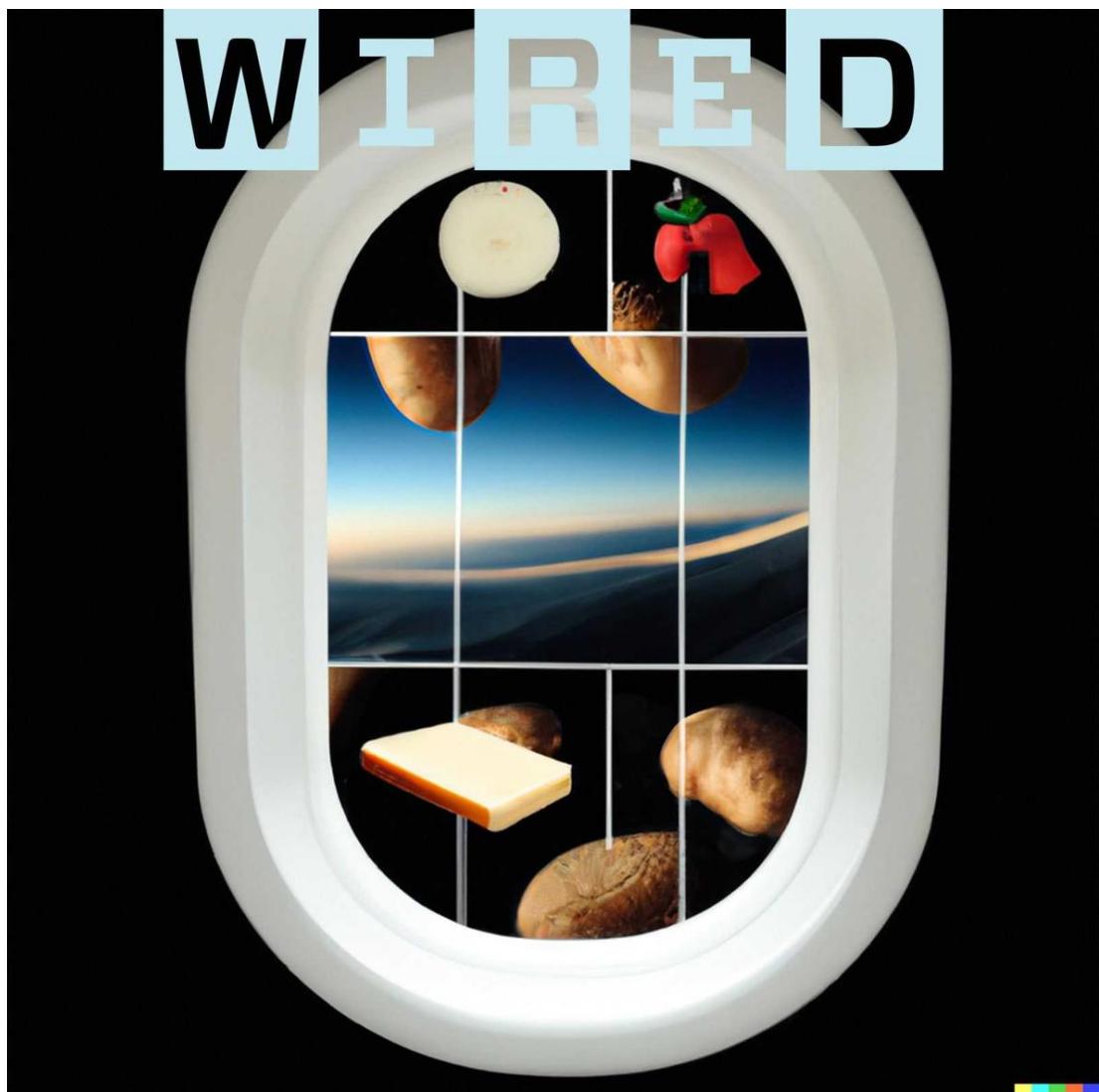
PHOTOGRAPH: STEPHANIE GONOT

Stephanie Gonot, Photographer

“As a photographer and image-lover, it was really fun to type in words in order to create an image, rather than wrangling my gear and props. The control I missed was made up for by the fun surprises. I started this exercise by trying to get as close to my cover image as possible. I got quite close! But as I tried to get even more specific in my description, the result got further and further away from my cover image. Then I tried typing in lines of the cover story and also the initial prompt I received when I was approached about the job. ‘The Care and Feeding of Interplanetary Civilization’ is a pleasing grouping of words, and I got both some really wacky and really beautiful results. I feel like DALL-E could be helpful to photo editors and art directors when coming up with an idea for a photoshoot. It’s nice to be able to create original references for a mood board rather than using images that already exist. I’m hooked!”

Prompt Example: “Mysterious photo of food floating in outerspace through a spaceship window”

WIRED







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A.I. ILLUSTRATIONS BY STEPHANIE GONOT + OPEN AI/DALL-E 2

WIRED Issue: 28.04

ILLUSTRATION: ALVARO DOMINGUEZ

Alvaro Dominguez, Illustrator

“Sometimes I add a couple of artists in order to get a more random style. Like, I love [Robert Irwin](#) and [Jonas Wood](#), two very different artists with nothing in common. So I add to the prompt 'in Jonas Wood style and Robert

Irwin style.' This adds a little bit of both in colors and shapes here and there. But as you can see, I added the words 'Jonas Wood' to almost every prompt, just to add some warmth and aliveness to a tech image."

Prompt Example: "3d render of an oil painting of planet earth as a machine at the top of a cliff with a control panel and a sky with clouds in the background, rainbows, pigeons, fireworks, in the style of jonas wood, in the style of robert irwin, in the style of dan flavin"







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A.I. ILLUSTRATIONS BY ALVARO DOMINGUEZ + OPEN AI/DALL-E
2

WIRED Issue: 28.09

PHOTOGRAPH: JESSICA PETTWAY

Jessica Pettway, Photographer

“The visual archive DALL-E is pulling from feels like one of the worst archives I’ve ever seen in terms of diversity in visual language and culture.

When trying to make my piece, certain words and phrases weren't returning logical results. For example, when searching 'woman wearing box braids,' the first results were white women in loose braids. When trying to explore the concept of digital blackface, it wasn't necessary to add 'caucasian' or 'white' to the search phrases because that was already the assumed default, even when searching items and themes specific to Black culture."

Prompt Example: "hoop earring," "mouth smiling wearing grills," "white hand with super long nails pointing"

A.I. ILLUSTRATIONS BY JESSICA PETTWAY + OPEN AI/DALL-E 2

WIRED Issue: 29.10

PHOTOGRAPH: SAM CANNON

Sam Cannon, Photographer

"DALL-E has an impressive dataset to pull from, but I did find some pleasure in the fact that, despite the 650 million image/caption pairs it uses to generate images, it wasn't able to render out a close replica of my cover. While it had no problem creating images with similar elements (needles, hands, pills) and mimicking the overall style (dark environment, harsh light from above), the abstract idea of a hand pushing through a pin screen was outside of its capabilities ... for now."

Prompt Example: "A 3D rendering of a figure with its head in its hands being pierced with thousands of needles, octane, harsh light"

WIRED







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A.I. ILLUSTRATIONS BY SAM CANNON + OPEN AI/DALL-E 2

Video: Sam Cannon

WIRED ISSUE: 30.06

ILLUSTRATION: PATRICK SAVILE

Patrick Savile, Designer and Illustrator

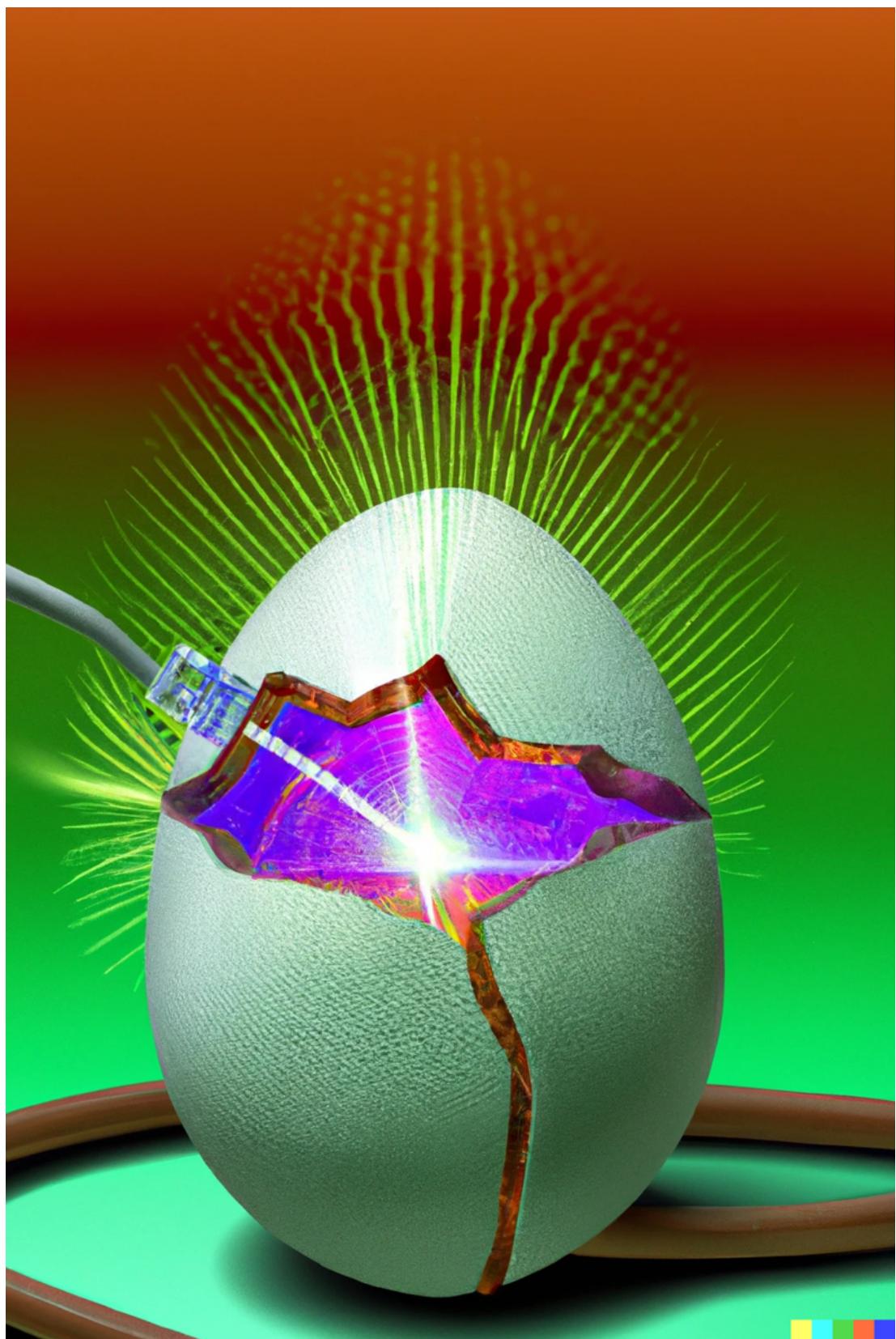
“It was kind of hard to get what I originally wanted, so I was shifting the concept around a bit until I could get an image as close to the idea in my head, which turned out to be egg-based.”

Prompt Example: “High detail airbrush painting of an egg cracking open containing clouds, storm clouds in the background, shimmering psychedelic colours, high contrast, masao saito, Michael whelan, hajime sorayama, high resolution”

WIRED









A.I. ILLUSTRATIONS BY PATRICK SAVILLE + OPEN AI/DALL-E 2

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