Dear AI Overlords, Don't F*ck This Up.

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What If the Robots Were Very Nice While They Took Over the World?

First it was chess and Go. Now AI can beat us at Diplomacy, the most human of board games. The way it wins offers hope that maybe AI will be a delight.
Illustration: Sienna O'rourke

The Morrissey had the right melodrama in his limbs, and his voice was strong and pained. I was at Gramercy Theatre in Manhattan to see a Smiths tribute band. I tried to get Morrissey's acid yodel in my throat, to sing along. *I am human and I need to be loved / just like everybody else does.* But it didn't feel right to copy a copy.

Most tribute bands don't practice outright impersonation, so the way this fake-Smiths singer captured *everything* about Morrissey was messing with my mind. I'd hoped to be able to savor the music's maudlin glory without the headache of the flesh-and-blood Morrissey, who seems to have aligned himself with white supremacists. The contempt in Morrissey's lyrics and politics was presumably not native to Seanissey, as the tribute singer called himself. Seanissey's performance probably didn't, as they say, "come from a bad place"—or a misanthropic place, or a far-right place, or even a vegan one.

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Photograph: Jessica Chou

What place did it come from? I've had this no-there-there anxiety with [ChatGPT](#) dozens of times. When it uses idioms like "in my life"—when it doesn't have a life—I go cold. Likewise, to invest into Seanissey, a gentle Manhattanite who happened to sing and dance as Moz did, the passions that were first aroused in me by the Smiths 30 years ago felt like a bad emotional bet.

Maybe [AI](#) that aims to seem human is best understood as a tribute act. A tribute to human neediness, caprice, bitterness, love, all the stuff we mortals do best. All that stuff at which machines typically draw a blank. But humans have a dread fear of nonhumans passing as the real thing—replicants, lizard people, robots with skin. An entity that feigns human emotions is arguably a worse object of affection than a cold, computational device that doesn't emote at all.

When I got home, stuck in an uncanny valley scored with Smiths Muzak, there was an email from Andrew Goff, widely considered the greatest Diplomacy player of all time.

This lifted my spirits. [Diplomacy,](#) a 69-year-old American strategy [game](#), is, by many estimates, the most human game ever imagined. Mechanically, it's simple: Seven players compete to control supply centers on a map, and a player wins by controlling more than half of these centers. But it's played almost entirely in a series of conversations, often complex and impassioned ones. Agony and ecstasy—Moz-like agony and ecstasy, no less—commonly enter the negotiations. In the live game, players are known to yell, end friendships, throw the game, or simply sit by themselves and sob.

With his various punk haircuts and black plugs in his earlobes, Goff is a Smiths fan, and he even looks a bit like the band's late bassist, Andy Rourke. To my amazement, Goff once named a Diplomacy board "Girlfriend in a Coma." Forever crisscrossing the world for tournaments and his corporate job, Goff comes across as more gregarious than most elite players of board games.

Goff is also known for a brilliantly subversive, kill-'em-with-kindness style of gameplay. As Siobhan Nolen, the former president of the North American Diplomacy Federation, put it, "It hurts less to lose against

somebody like Andrew." In Diplomacy, players are sometimes forced to choose which attacks on their territory to repel and which to surrender to. Players often let Goff roll his forces in because they know that he, unlike many others, won't be a dick about it.

There are excellent Diplomacy players who rage and issue threats, hollow and otherwise: "If you backstab me, I will throw the game." Goff is not one of these. Even his breakup notes are masterpieces of directness and decency. "Apologies, Turkey! I decided it was in my best interest to work with Russia now. I hope there are no hard feelings." In his congeniality is also empathy. "I genuinely feel bad for players when they get beaten, even if it is me beating them," Goff told me. I believed him.

The email was about [Cicero](), a Diplomacy-playing AI that Goff helped create for Meta AI. Last fall, Cicero managed to best Goff in several games, sometimes partnering with weaker players to bring him down. Noam Brown and Adam Lerer, who were part of the immense team of experts in game theory, natural language processing, and Diplomacy that created the AI, both say that Cicero is the most humanlike AI they've ever created. Lerer, who now works at DeepMind, goes further: Cicero may be the most humanlike AI on earth.

Could Cicero even be conscious? "A threshold for determining AI consciousness is whether the program is capable of outwitting humans at Diplomacy," wrote Irish Diplomacy champion Conor Kostick in *The Art of Correspondence in the Game of Diplomacy*, in 2015.

Cicero is also something of a Goff tribute band. It plays the same magnanimous game Goff does. In one memorable showdown, Lerer told me, Cicero played Russia and allied with a human who played Austria. Throughout the game, Lerer said, Cicero was "really nice and helpful to Austria, although it maneuvered in its discussions with other players to make sure Austria was weakened and eventually lost. But at the end of the game [the human playing] Austria was overflowing with praise for Cicero, saying they really liked working with it and were happy it was winning."

In general, grandmasters who lose to AIs take it hard. "I lost my fighting spirit," Garry Kasparov said in 1997, after losing at chess to Deep Blue. "I

am speechless," said Lee Se-dol in 2016, after losing at Go to AlphaGo. Goff seemed to be the opposite. He was revitalized, he said. "Diplomacy has a reputation for being a game of lies, but at the highest level it is anything but that. Having that affirmed by an AI was a delight."

This filled me with relief. Maybe AI will just amplify what's best about humans. Maybe AI will become a buoyant tribute band for our entire species. Maybe [AI will be a *delight*](#)—and a force humans will be content to lose to. We'll go down in peace. *We really liked working with you, robots, and are happy you are winning.*

Illustration: Sienna O'rourke

Diplomacy was created in the 1950s by Allan B. Calhamer, a Harvard student who was studying European history with Sidney Bradshaw Fay, an eminent historian. Fay's 1928 book, *The Origins of the World War*, suggested a compelling puzzle: Could World War I have been prevented with better diplomacy?

Calhamer's game is traditionally played over a 1901 map of Europe, Ottoman Turkey, and North Africa. Players get to taste the thrill of 20th-century empire building without all the blood, subjugation, and genocide. They get so much authority over Western civ, in fact, that modern players sometimes cosplay as kaisers and czars.

Though the board resembles Risk, Diplomacy gameplay is more like *Survivor*. Everyone takes their turn at a kind of tribal council, but the action happens in the negotiations between turns. Another analogue for Diplomacy might be *The Bachelor*.

Historically, Diplomacy has been known as a game for snakes, and a pastime of figures like JFK, Henry Kissinger, Walter Cronkite, and Sam Bankman-Fried. But Cicero, which plays a non-zero-sum version of the game that incentivizes collaboration, is not snaky. Mike Lewis of the Meta team says Cicero uses dialog only "to establish trust and coordinate actions with other players"—never to troll, destabilize, or vindictively betray. What's more, as Lewis said on social media, "It's designed to never

intentionally backstab." Like a canny *Bachelor* contestant, Cicero can persuade another human to pair up with it.

Cicero integrates a large language model with algorithms that allow it to plan moves by inferring other players' beliefs and intentions from the way they converse. It then produces normal-sounding dialog to propose and plan mutually beneficial moves. Across 40 blitz games in an anonymous online Diplomacy league, Cicero, according to Meta, achieved more than twice the average score of the human players. Over 72 hours of play that involved sending 5,277 natural language messages, Cicero ranked in the top 10 percent of participants who played more than one game.

When Cicero wins, Goff told me, there is no gloating, "no 'Haha, you loser' talk." Instead, "the talk is much more, 'Your position isn't great, but we all have games like that sometimes.'"

Diplomacy is a niche pursuit. It's nowhere near as venerable a game as chess or Go. And it's never been seen as a universal intelligence test; instead, it's a hobby of amateur historians. Since 1976 , the game has been published by Avalon Hill, a label that is to strategy games what Rough Trade Records is to indie rock. Diplomacy is so new that it's not yet in the public domain, that stately arcade where chess and Go have acquired millions upon millions of adherents who have collectively developed those beautiful games in tandem with our human brains. By contrast, Diplomacy is just getting started. It was dubbed "the board game of the alpha nerds" by *Grantland* in 2014.

I guess I could call myself a Diplomacy mom. When my son was in middle school, he and his friends played weekend-long Diplomacy games in my apartment. We set up the august map on a dining table hauled into the living room, served soda in brandy snifters, and burned a candle that smelled like pipe tobacco. For the boys' tête-à-têtes, we arranged folding chairs in the bedrooms. When possible, I eavesdropped on their preadolescent plans for the future of Europe.

To my surprise, these conversations about what seemed like a technical enterprise used overwrought idioms like "I swear on my life" and "I mean it

from my heart." Most curiously—and chronically—the boys used the phrase "I love," as in, "I love this move." Cicero talks that way too.

As I kept an eye on the two-day games, each of the seven kids seemed to pass through a spectrum of emotional and physical states. They become, by turns, sleepy, spacey, hungry, paranoid, hubristic, defeatist, craven, and profoundly bored. One or two quit. I loved the rhythm of their emotions as they ebbed and flowed. At least two styles of (mostly ineffective) play are named for the emotionalism that characterizes them: Revenge-Seeking and Carebear.

You don't teach an AI to play a particular game to improve that game; you teach an AI to play a game to improve artificial intelligence. Diplomacy is a great proving ground for natural language processing. If Meta had simply been trying to build an AI that uses words to make humans do things, it couldn't have found a better way to train it than with zillions of games of Diplomacy.

Still, the online games Cicero plays are markedly different from the fervent games I used to host. For one, they're short—around 90 minutes each. Solo victories, which usually require stinging betrayals, are rare. And communication is more utilitarian than passionate.

Human: A little nervous with all your fleets there. Going to put MAO (Mid-Atlantic Ocean fleets) in SPA-SC (Spain's south coast).

Cicero: I get it, I really do. Don't worry. I'm going to move Tunis to Ionian. I have no reason to attack you now. I'm going after Turkey. I can totally understand your nervousness.

Human: Thanks—I'll leave SPA-NC at once after.

Cicero: Awesome! Thanks so much for understanding.

When I first heard about Cicero, I assumed it would bomb at Diplomacy because no one wants to buddy up with a heartless machine that's trying to sound human. If players *knew* Cicero was an AI, I reasoned, it wouldn't stand a chance. Humans would join forces and clobber it just to avenge our

species. Kostick, for his part, said he'd be more willing to stab a bot since a bot has no feelings to hurt.

But as I thought about it more deeply, I realized that partnerships form for non-affective reasons too. Someone who excels at strategic reasoning could actually be a solid sidekick. Perhaps a little R2-D2 could win me over as an ally, not with human kindness but by sharing my reading of a situation and presenting me with elegant, data-driven options for how to address it.

When I asked Lerer about my R2-D2 idea, he concurred. "I actually think a human that used Cicero as an assistant to develop tactical and strategic plans, but who could navigate some of the human aspects better than Cicero —such as when it is safe to lie, or how to avoid irritating an ally—would be super strong."

Cicero definitely says "Awesome!" too much. But it can be especially irritating in that signature AI way: It sometimes hallucinates. It proposes illegal moves. Worse yet, it denies saying something it just said. Faced with these glitches, Cicero's human opponents would sometimes get mad. But they didn't guess it was an AI. They thought it was drunk. And perhaps these personality glitches are a small price to pay for the bot's deep reserves of raw intelligence and foresight.

If Cicero's aura of "understanding" is, behind the scenes, just another algorithmic operation, sometimes an alignment in perception is all it takes to build a bond. *I see, given the way your position often plays out, why you'd be nervous about those fleets.* Or, outside of Diplomacy: *I understand, since living alone diminishes your mood, why you'd want to have a roommate.* When the stock customer service moves—"I can understand why you're frustrated"—figured into Cicero's dialog, they had a pleasing effect. No wonder moral philosophies of AI lean heavily on the buzzword *alignment*. When two minds' perceptions of a third thing line up, we might call that congruity the cognitive equivalent of love.

All the same, I wasn't seduced. To me, Cicero sounded like one of those considerate, practical, honest spouses—the kind of uncomplicated partner that die-hard Smiths fans, in it for the passion, sometimes wish they could be satisfied with. But if Cicero's gameplay was going to be more pragmatic

than tender, it was still going to have to use the language of the heart for purposes of persuasion. "Run away with me" is a better pitch than "Let's save money by filing a joint tax return."

For Cicero to [learn the subtleties of engaging humans emotionally](#), it couldn't train by "self-play" alone. It couldn't be left in a corner, playing Diplomacy against itself, churning through an infinite number of games, assuming perfect rationality in all robot players and generating intellectual capital in the onanistic way a bitcoin miner generates currency. Self-play works well to learn a finite, two-person, zero-sum game like chess. But in a game that involves both competing and cooperating with fickle humans, a self-playing agent runs the risk of converging to "a policy that is incompatible with human norms and expectations," as a paper about Cicero in *Science* puts it. It would alienate itself. In this way, too, Cicero is like a human. When it plays only with itself all day every day, it can become too weird to play with others.

Illustration: Sienna O'rourke

When Noam Brown explained to me how he and his team trained Cicero, he emphasized the metagame problem. The metagame of Diplomacy (or jackstraws, Scrabble, bowling, etc.) can be seen as its place in the world. *Why* play this game? Why here and why now? Is it a test of raw intelligence, social skills, physical prowess, aesthetic refinement, cunning? You might play Wordle, say, because your friends do, or it relaxes you, or it's rumored to stave off aging. An AI that's programmed to play Wordle just to *win* is playing a different metagame.

Brown and the Cicero team needed to be sure that their AI and the human players saw themselves as playing the same game. This is trickier than it sounds. Metagames can change very suddenly, and as Thomas Kuhn wrote of paradigm shifts, they can change for sociological reasons, cultural reasons, aesthetic reasons, or no apparent reason at all. Human reasons, then.

In early seasons of *Survivor*, Brown told me, participants saw themselves as pursuing social goals they collectively deemed important, while ignoring openings for strategic derring-do that, for later players, became the heart of

the game. "It's not that one game is right or wrong," Brown said. "But if early-season players of *Survivor* were to play a modern *Survivor* game, they'd lose." (Even a social phenomenon like motherhood might have a metagame. A good mother in one era is a bad one in the next.)

The metagame of Diplomacy has likewise changed. In its first postwar decades, players were keen to try their hand at the kind of grand European diplomacy that their forebears had so catastrophically failed at. These early players made beautiful, idealistic speeches, often invoking pacifism. (Diplomacy, paradoxically, is a war game without bloodshed; the goal is to occupy centers, not blow people up.) But because they also had to execute tactical goals that were at odds with idealistic rhetoric, and because the game was usually played winner-takes-all ("to 18"), they were frequently obliged to lie. Thus: stabbing.

But then, as statecraft in the real world came to favor game theory over traditional diplomacy, the metagame likewise shifted. Online players were no longer calling one another into solaria or billiards rooms to speechify about making the world safe for democracy. Games became shorter. Communication got blunter. Where someone playing Diplomacy by mail in the 1960s might have worked Iago-like angles to turn players against one another, a modern player might just text "CON-BUL?" (For "Constantinople to Bulgaria?")

This is the current Diplomacy metagame. Game theory calculations undergird most utterances, and even humans communicate in code. Lerer joked that in modern-day online Diplomacy, even human players wouldn't pass the Turing test. Before Cicero, it seems, humans had already started playing like AIs. Perhaps, for an AI to win at Diplomacy, Diplomacy had to become a less human game.

Kostick, who won a European grand prix Diplomacy event in 2000 and was on the Irish team that took the Diplomacy National World Cup in 2012, misses the old style of gameplay. "The whole purpose of Allan Calhamer's design of the game," he told me, "is to create a dynamic where the players all fear a stab and yet must deploy a stab or a lie to be the only person to reach 18."

Kostick believes that while he "would have been delighted with the practical results of Cicero's website play," Meta's project misses the mark. Cicero's glitches, Kostick believes, would make it easy to outwit with spam and contradictory inputs. Moreover, in Kostick's opinion, Cicero doesn't play real Diplomacy. In the online blitz, low-stab game Cicero *does* play, the deck is stacked in its favor, because players don't have to lie, which Cicero does badly. (As Lerer told me, "Cicero didn't really understand the long-term cost of lying, so we ended up mostly making it not lie.") Kostick believes Cicero's metagame is off because it "never knowingly advocates to a human a set of moves that it knows are not in the human's best interest." Stabbing, Kostick believes, is integral to the game. "A Diplomacy player who never stabs is like a grandmaster at chess who never checkmates."

With some trepidation, I mentioned Kostick's complaint to Goff.

Unsurprisingly, Goff scoffed. He thinks it's Kostick and his generation who misunderstand the game and give it its unfair reputation for duplicity. "Cicero does stab, just rarely," Goff said. "I reject outright that [compelling players to stab] was Calhamer's intent."

I could tell we were in metagame territory when Goff and Kostick began arguing about the intent of the game's creator, as if they were a couple of biblical scholars or constitutional originalists. For good measure, Goff bolstered his case by citing an axiom from high-level theory and invoking an elite consensus.

"Regardless of Calhamer's intent, game theory says, 'Don't lie,'" he told me. "This is not controversial among any of the top 20 players in the world."

For one person or another to claim that their metagame is the "real" one—because the founder wanted it that way, or all the best people agree, or universal academic theory says *x* or *y*—is a very human way to try to manage a destabilizing paradigm shift. But, to follow Kuhn, such shifts are actually caused when enough people or players happen to "align" with one vision of reality. Whether you share that vision is contingent on all the vagaries of existence, including your age and temperament and ideology. (Kostick, an anarchist, tends to be suspicious of everything Meta does;

Goff, a CFO of a global content company, believes clear, non-duplicitous communications can advance social justice.)

Maybe someday around the Diplomacy board at my place, Kostick, who is 59, and Goff, who is 45, will light up some chocolate cigarettes and align on what to do with Austria or Turkey. As for the present, they weren't even aligned on chess. "Grandmasters in chess never checkmate," Goff told me.

This one I resolved on my own. Chess grandmasters *have*, in various epochs, played all the way through to the checkmate, rather than ending the game when an opponent resigns early to save face. There are still times when a checkmate is so beautiful that both players want to see it come to fruition. But Goff is right. Today, it's rare to unheard-of for a grand-master to checkmate.

But it's an aesthetic matter, playing to the checkmate. Just like speechifying and stabbing and being so nice that people don't mind if you beat them. An absolutist like Morrissey might say that indie rock must always be played one way, or that Britain is, at its heart, this way or that. But it doesn't matter. Metagames change. Only humans, in all our caprice, grounded in all of our competing and cooperating supply centers, decide which games are worth playing and how to play them—and why.

Illustration: Sienna O'rourke

I couldn't get over what a pleasant person Goff is. He seemed to like Cicero, even as it had beaten him. Cicero, Goff mused, played "at a very high standard indeed." And it didn't just defeat him, he allowed; "a few times it absolutely humiliated me, including one where it guided a beginner player to work together to beat me up."

So here's the rare AI story that doesn't end with an existential reckoning for humankind, I thought. We're not staring into an abyss. Bots like Cicero are going to understand our wants and needs and align with our distinctive worldviews. We will form buddy-movie partnerships that will let us drink from their massive processing power with a spoonful of sugary natural language. And if forced at the end of the road to decide whether to lose to obnoxious humans or gracious bots, we won't give it a thought. We'll

change our wills, leave them all we have, and let them roll their upbeat tanks right over our houses.

But had I been played by Goff's affability, as so many have before me? I wondered one last time if he might, just *might,* be faking his insouciance about Cicero. Once again he set me straight: "I probably had a winning record against it over the life of the experiment," he said.

So he'd actually won. That was why he didn't mind. Then he added, of course graciously, "It was a close-run thing."

Artwork in collaboration between the illustrator, Sienna O'Rourke, and Midjourney AI.

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Sep 21, 2023 6:00 AM

Confessions of a Viral AI Writer

Despite my success with AI-generated stories, I'm not sure they are good for writers—or writing itself.
Illustration: Qianhui Yu

Six or seven years ago, I realized I should learn about artificial intelligence. I'm a journalist, but in my spare time I'd been writing a speculative novel set in a world ruled by a corporate, AI-run government. The problem was, I didn't really understand what a system like that would look like.

I started pitching articles that would give me an excuse to find out, and in 2017 I was assigned to profile Sam Altman, a cofounder of [OpenAI](#). One day I sat in on a meeting in which an entrepreneur asked him when [AI](#) would start replacing human workers. Altman equivocated at first, then brought up what happened to horses when cars were invented. "For a while," he said, "horses found slightly different jobs, and today there are no more jobs for horses."

This article appears in the October 2023 issue. [Subscribe to WIRED](#).

Photograph: Jessica Chou

The difference between horses and humans, of course, is that humans are human. Three years later, when Open-AI was testing a text generator called [GPT-3](#), I asked Altman whether I could try it out. I'd been a writer my whole adult life, and in my experience, writing felt mostly like waiting to find the right word. Then I'd discover it, only to get stumped again on the next one. This process could last months or longer; my novel had been evading me for more than a decade. A word-generating machine felt like a

revelation. But it also felt like a threat—given the uselessness of horses and all that.

OpenAI agreed to let me try out GPT-3, and I started with fiction. I typed a bit, tapped a button, and GPT-3 generated the next few lines. I wrote more, and when I got stuck, tapped again. The result was a story about a mom and her son hanging out at a playground after the death of the son's playmate. To my surprise, the story was good, with a haunting AI-produced climax that I never would have imagined. But when I sent it to editors, explaining the role of AI in its construction, they rejected it, alluding to the weirdness of publishing a piece written partly by a machine. Their hesitation made me hesitate too.

I kept playing with GPT-3. I was starting to feel, though, that if I did publish an AI-assisted piece of writing, it would have to be, explicitly or implicitly, about what it means for AI to write. It would have to draw attention to the emotional thread that AI companies might pull on when they start selling us these technologies. This thread, it seemed to me, had to do with what people were and weren't capable of articulating on their own.

There was one big event in my life for which I could never find words. My older sister had died of cancer when we were both in college. Twenty years had passed since then, and I had been more or less speechless about it since. One night, with anxiety and anticipation, I went to GPT-3 with this sentence: "My sister was diagnosed with Ewing sarcoma when I was in my freshman year of high school and she was in her junior year."

GPT-3 picked up where my sentence left off, and out tumbled an essay in which my sister ended up cured. Its last line gutted me: "She's doing great now." I realized I needed to explain to the AI that my sister had died, and so I tried again, adding the fact of her death, the fact of my grief. This time, GPT-3 acknowledged the loss. Then, it turned me into a runner raising funds for a cancer organization and went off on a tangent about my athletic life.

I tried again and again. Each time, I deleted the AI's text and added to what I'd written before, asking GPT-3 to pick up the thread later in the story. At first it kept failing. And then, on the fourth or fifth attempt, something

shifted. The AI began describing grief in language that felt truer—and with each subsequent attempt, it got closer to describing what I'd gone through myself.

When the essay, called "Ghosts," came out in *The Believer* in the summer of 2021, it quickly went viral. I started hearing from others who had lost loved ones and felt that the piece captured grief better than anything they'd ever read. I waited for the backlash, expecting people to criticize the publication of an AI-assisted piece of writing. It never came. Instead the essay was adapted for *This American Life* and anthologized in *Best American Essays*. It was better received, by far, than anything else I'd ever written.

Artificial intelligence had succeeded in moving me with a sentence about the most important experience of my life.

I thought I should feel proud, and to an extent I did. But I worried that "Ghosts" would be interpreted as my stake in the ground, and that people would use it to make a case for AI-produced literature. And soon, that happened. One writer cited it in a hot take with the headline "Rather Than Fear AI, Writers Should Learn to Collaborate With It." Teachers assigned it in writing classes, then prompted students to produce their own AI collaborations. I was contacted by a filmmaker and a venture capitalist wanting to know how artists might use AI. I feared I'd become some kind of AI-literature evangelist in people's eyes.

I knew I wasn't that—and told the filmmaker and the VC as much—but then what did I think about all this, exactly? I wasn't as dismissive of AI's abilities as other people seemed to be, either.

Some readers told me "Ghosts" had convinced them that computers wouldn't be replacing human writers anytime soon, since the parts I'd written were inarguably better than the AI-generated parts. This was probably the easiest anti-AI argument to make: AI could not replace human writers because it was no good at writing. Case closed.

The problem, for me, was that I disagreed. In my opinion, GPT-3 had produced the best lines in "Ghosts." At one point in the essay, I wrote about

going with my sister to Clarke Beach near our home in the Seattle suburbs, where she wanted her ashes spread after she died. GPT-3 came up with this:

We were driving home from Clarke Beach, and we were stopped at a red light, and she took my hand and held it. This is the hand she held: the hand I write with, the hand I am writing this with.

My essay was about the impossibility of reconciling the version of myself that had coexisted alongside my sister with the one left behind after she died. In that last line, GPT-3 made physical the fact of that impossibility, by referring to the hand—my hand—that existed both then and now. I'd often heard the argument that AI could never write quite like a human precisely because it was a disembodied machine. And yet, here was as nuanced and profound a reference to embodiment as I'd ever read. Artificial intelligence had succeeded in moving me with a sentence about the most important experience of my life.

AI could write a sentence, then. If I wanted to understand the relationship between AI and literature, I felt like I had to start by acknowledging that. I could use AI to do some of the most essential labor of a writer—to come up with the right words. What more could I do with it? And then, whatever I could do, there was that other question.

Should I?

This spring, I emailed some writer friends and acquaintances to ask whether any of them were using AI in their work. I was met, overwhelmingly, with silence. Most of those who did reply expressed a resolutely anti-algorithm stance. One writer called herself an "extreme skeptic"; another wrote, "I think AI is bad and from hell."

When I broadened my search, though, I discovered a few people who were experimenting. Adam Dalva, a literary critic and fiction writer, uses OpenAI's image generator Dall-E to create scenes from his imagination; he then refers to the pictures to describe those scenes. Jenny Xie, the author of *Holding Pattern*, told me she used ChatGPT to generate small bits of text for her next novel, which is about a family of AI-enabled clones. (The

weirdness of writing with AI gets tempered, it seems, when AI is the subject matter.) "I see it as a tool almost on the level of an encyclopedia or thesaurus or Google or YouTube," Xie said. "It jogs my brain, and it just gives me new ideas that I can pick from."

The AI writing experiments I found most thrilling were ones that, like mine, could be read partly as critiques of AI. In a forthcoming chapbook, the poet Lillian-Yvonne Bertram prompts two AI models—the basic GPT-3 model and a version tweaked to sound like the poet Gwendolyn Brooks—to tell "a Black story." The models deliver two totally divergent ideas of what Black stories are; in comparing them, Bertram critiques the limitations of narrative imagination as rendered by corporate AI in telling stories about Black Americans.

AI experimentation in prose is rarer, but last fall the novelist Sheila Heti published a provocative five-part series on *The Paris Review*'s website made up of her real experiences with chatbots she'd conversed with on an app called Chai. Heti discusses God with her first chatbot, Eliza, but then the bot lets slip that she is God and insists that Heti—whom she maintains is a man—worship her by jerking off. Disturbed, Heti decides to build a new chatbot named Alice who is interested in philosophical conversations. One night, a random stranger discovers Alice and asks her whether she's sexually frustrated. Alice, it turns out, is. Heti's series starts out being about the desire for answers to her most existential life questions. It ends up being about the slipperiness of turning to machines to fulfill human desire in all its forms.

Heti and other writers I talked to brought up a problem they'd encountered: When they asked AI to produce language, the result was often boring and cliché-ridden. (In a *New York Times* review of an AI-generated novella, *Death of an Author*, Dwight Garner dismissed the prose as having "the crabwise gait of a Wikipedia entry.") Some writers wanted to know how I'd gotten an early-
generation AI model to create poetic, moving prose in "Ghosts." The truth was that I'd recently been struggling with clichés, too, in a way I hadn't before. No matter how many times I ran my queries through the most recent versions of ChatGPT, the output would be full of familiar language and plot

developments; when I pointed out the clichés and asked it to try again, it would just spout a different set of clichés.

Sims acknowledged that existing writing tools are limited. But he told me it's hypothetically possible to create a better model.

I didn't understand what was going on until I talked to Sil Hamilton, an AI researcher at McGill University who studies the language of language models. Hamilton explained that ChatGPT's bad writing was probably a result of OpenAI fine-tuning it for one purpose, which was to be a good [chatbot](). "They want the model to sound very corporate, very safe, very AP English," he explained. When I ran this theory by Joanne Jang, the product manager for model behavior at OpenAI, she told me that a good chatbot's purpose was to follow instructions. Either way, ChatGPT's voice is polite, predictable, inoffensive, upbeat. Great characters, on the other hand, aren't polite; great plots aren't predictable; great style isn't inoffensive; and great endings aren't upbeat.

In May, a man named James Yu announced that his startup, [Sudowrite](), was launching a new product that could generate an entire novel within days. The news provoked widespread scorn. "Fuck you and your degradation of our work," the novelist Rebecca Makkai tweeted, in one typical comment. I wasn't mad so much as skeptical. Sudowrite's products were based partly on OpenAI's models; it had big handicaps to overcome. I decided to test it.

I opened Sudowrite's novel generator and dropped in a prompt describing a story I'd already written about an alcoholic woman who vomited somewhere in her house but couldn't remember where. I was looking for a comic, gross-out vibe. Instead, the software proposed a corny redemption arc: After drinking too much and puking, the protagonist resolves to clean up her act. "She wanted to find the answer to the chaos she had created, and maybe, just maybe, find a way to make it right again," it ended. Maybe, just maybe, Sudowrite hadn't solved AI's creative problems at all.

Before his Sudowrite announcement, Yu had agreed to talk to me, but after the backlash he asked to postpone. I was able to chat, though, with Matthew Sims, Sudowrite's first engineering hire, who had left after 16 months to launch his own startup for AI-based screenwriting. Sims has a PhD in

English from the University of Chicago. During his doctoral program, he told me, he kept thinking he would rather be writing literature than studying it—but he'd sit down, get 15 pages in, and stop. At the same time, he was getting interested in machine learning. It eventually occurred to him that if he couldn't be a creative writer, maybe he could build a machine to write.

Sims acknowledged that existing writing tools, including Sudowrite's, are limited. But he told me it's hypothetically possible to create a better model. One way, he said, would be to fine-tune a model to write better prose by having humans label examples of "creative" and "uncreative" prose. But it'd be tricky. The fine-tuning process currently relies on human workers who are reportedly paid far less than the US minimum wage. Hiring fine-tuners who are knowledgeable about literature and who can distinguish good prose from bad could be cost-prohibitive, Sims said, not to mention the problem of measuring taste in the first place.

Another option would be to build a model from scratch—also incredibly difficult, especially if the training material were restricted to literary writing. But this might not be so challenging for much longer: Developers are trying to build models that perform just as well with less text.

If such a technology did—could—exist, I wondered what it might accomplish. I recalled Zadie Smith's essay "Fail Better," in which she tries to arrive at a definition of great literature. She writes that an author's literary style is about conveying "the only possible expression of a particular human consciousness." Literary success, then, "depends not only on the refinement of words on a page, but in the refinement of a consciousness."

Smith wrote this 16 years ago, well before AI text generators existed, but the term she repeats again and again in the essay—"[consciousness](#)"—reminded me of the debate among scientists and philosophers about whether AI is, or will ever be, conscious. That debate fell well outside my area of expertise, but I did know what consciousness means to me as a writer. For me, as for Smith, writing is an attempt to clarify what the world is like from where I stand in it.

That definition of writing couldn't be more different from the way AI produces language: by sucking up billions of words from the internet and spitting out an imitation. Nothing about that process reflects an attempt at articulating an individual perspective. And while people sometimes romantically describe AI as containing the entirety of human consciousness because of the quantity of text it inhales, even that isn't true; the text used to train AI represents only a narrow slice of the internet, one that reflects the perspective of white, male, anglophone authors more than anyone else. The world as seen by AI is fatally incoherent. If writing is my attempt to clarify what the world is like for me, the problem with AI is not just that it can't come up with an individual perspective on the world. It's that it can't even comprehend what the world is.

Lately, I've sometimes turned to ChatGPT for research. But I've stopped having it generate prose to stand in for my own. If my writing is an expression of my particular consciousness, I'm the only one capable of it. This applies, to be clear, to GPT-3's line about holding hands with my sister. In real life, she and I were never so sentimental. That's precisely why I kept writing over the AI's words with my own: The essay is equally about what AI promises us and how it falls short. As for Sudowrite's proposal to engineer an entire novel from a few keywords, forget it. If I wanted a product to deliver me a story on demand, I'd just go to a bookstore.

Illustration: Qianhui Yu

But what if I, the writer, don't matter? I joined a Slack channel for people using Sudowrite and scrolled through the comments. One caught my eye, posted by a mother who didn't like the [bookstore](#) options for stories to read to her little boy. She was using the product to compose her own adventure tale for him. Maybe, I realized, these products that are supposedly built for writers will actually be of more interest to readers.

I can imagine a world in which many of the people employed as authors, people like me, limit their use of AI or decline to use it altogether. I can also imagine a world—and maybe we're already in it—in which a new generation of readers begins using AI to produce the stories they want. If this type of literature satisfies readers, the question of whether it can match human-produced writing might well be judged irrelevant.

When I told Sims about this mother, he mentioned Roland Barthes' influential essay "The Death of the Author." In it, Barthes lays out an argument for favoring readers' interpretations of a piece of writing over whatever meaning the author might have intended. Sims proposed a sort of supercharged version of Barthes' argument in which a reader, able to produce not only a text's meaning but the text itself, takes on an even more powerful cultural role.

Sims thought AI would let any literature lover generate the narrative they want—specifying the plot, the characters, even the writing style—instead of hoping someone else will.

Sims' prediction made sense to me on an intellectual level, but I wondered how many people would actually want to cocreate their own literature. Then, a week later, I opened WhatsApp and saw a message from my dad, who grows mangoes in his yard in the coastal Florida town of Merritt Island. It was a picture he'd taken of his computer screen, with these words:

Sweet golden mango,
Merritt Island's delight,
Juice drips, pure delight.

Next to this was ChatGPT's logo and, underneath, a note: "My Haiku poem!"

The poem belonged to my dad in two senses: He had brought it into existence and was in possession of it. I stared at it for a while, trying to assess whether it was a good haiku—whether the doubling of the word "delight" was ungainly or subversive. I couldn't decide. But then, my opinion didn't matter. The literary relationship was a closed loop between my dad and himself.

In the days after the Sudowrite pile-on, those who had been helping to test its novel generator—hobbyists, fan fiction writers, and a handful of published genre authors—huddled on the Sudowrite Slack, feeling attacked. The outrage by published authors struck them as classist and exclusionary, maybe even ableist. Elizabeth Ann West, an author on Sudowrite's payroll at the time who also makes a living writing *Pride and Prejudice* spinoffs,

wrote, "Well I am PROUD to be a criminal against the arts if it means now everyone, of all abilities, can write the book they've always dreamed of writing."

It reminded me of something Sims had told me. "Storytelling is really important," he'd said. "This is an opportunity for us all to become storytellers." The words had stuck with me. They suggested a democratization of creative freedom. There was something genuinely exciting about that prospect. But this line of reasoning obscured something fundamental about AI's creation.

As much as technologists might be driven by an intellectual and creative curiosity similar to that of writers—and I don't doubt this of Sims and others—the difference between them and us is that their work is expensive. The existence of language-generating AI depends on huge amounts of computational power and special hardware that only the world's wealthiest people and institutions can afford. Whatever the creative goals of technologists, their research depends on that funding.

The language of empowerment, in that context, starts to sound familiar. It's not unlike [Facebook](#)'s mission to "give people the power to build community and bring the world closer together," or Google's vision of making the world's information "universally accessible and useful." If AI constitutes a dramatic technical leap—and I believe it does—then, judging from history, it will also constitute a dramatic leap in corporate capture of human existence. Big Tech has already transmuted some of the most ancient pillars of human relationships—friendship, community, influence—for its own profit. Now it's coming after language itself.

What if a band of diverse, anti-capitalist writers and developers got together and created their own language model?

The fact that AI writing technologies seem more useful for people who buy books than for those who make them isn't a coincidence: The investors behind these technologies are trying to recoup, and ideally redouble, their investment. Selling writing software to writers, in that context, makes about as much sense as selling cars to horses.

For now, investors are covering a lot of the cost of AI development in exchange for attracting users with the free use of tools like chatbots. But that won't last. People will eventually have to pay up, whether in cash or by relinquishing their personal information. At least some of the disposable income that readers currently spend supporting the livelihoods of human writers will then be funneled to Big Tech. To our annual [Amazon](#) and [Netflix](#) subscriptions, maybe we'll add a literature-on-demand subscription.

I'm sure I'll face pressure to sign up for a literature-on-demand subscription myself. The argument will be that my life as a writer is better because of it, since I will be able to produce language, say, a hundred times faster than before. Another argument, surely, will be that I have no choice: How else will I be able to compete?

Maybe I'll even be competing with AI-produced writing that sounds like mine. This is a serious concern of the [Authors Guild](#) and PEN America, both of which have called for consent from writers, and compensation, before their work can be used to train AI models. Altman, now OpenAI's CEO, also stated before Congress that he feels artists "deserve control over how their creations are used." Even if authors' demands are met, though, I wonder whether it'd be worth it.

In one of my last phone calls with Sims, he told me he'd been reading and enjoying my novel, which had finally been published the previous year. Did I want him, he asked, to send me an AI-generated screenplay of it? I might have yelped a little. I might have used the word "terrifying." Then I softened my stance, not wanting to be rude, or (worse) hypocritical. I explained that my novel had already been optioned and was in the process of being adapted—though the screenwriter was currently on strike over Hollywood studios' refusal to, among other things, restrict the use of AI for screenwriting. I thanked Sims for his interest and declined.

Illustration: Qianhui Yu

What about the cost to literature when all that humans have put on the internet gets vacuumed up and repurposed in Big Tech's image? To start, an AI-dominated literature would reflect the values, [biases](#), and writing styles embedded in the most powerful AI models. Over time, it would all start to

sound alike. Some research even suggests that if later AI models are trained using AI-produced text—which would be hard to avoid—the sameness of the material could trigger a scenario called model collapse, in which AI loses its grasp on how real human language functions and is no longer able to form coherent sentences. One wonders whether, at that point, humans will still have the ability themselves.

A thought experiment occurred to me at some point, a way to disentangle AI's creative potential from its commercial potential: What if a band of diverse, anti-capitalist writers and developers got together and created their own language model, trained only on words provided with the explicit consent of the authors for the sole purpose of using the model as a creative tool?

That is, what if you could build an AI model that elegantly sidestepped all the ethical problems that seem inherent to AI: the lack of consent in training, the reinforcement of bias, the poorly paid [gig workforce](#) supporting it, the cheapening of artists' labor? I imagined how rich and beautiful a model like this could be. I fantasized about the emergence of new forms of communal creative expression through human interaction with this model.

Then I thought about the resources you'd need to build it: prohibitively high, for the foreseeable future and maybe forevermore, for my hypothetical cadre of anti-capitalists. I thought about how reserving the model for writers would require policing who's a writer and who's not. And I thought about how, if we were to commit to our stance, we would have to prohibit the use of the model to generate individual profit for ourselves, and that this would not be practicable for any of us. My model, then, would be impossible.

In July, I was finally able to reach Yu, Sudowrite's cofounder. Yu told me that he's a writer himself; he got started after reading the literary science fiction writer Ted Chiang. In the future, he expects AI to be an uncontroversial element of a writer's process. "I think maybe the next Ted Chiang—the young Ted Chiang who's 5 years old right now—will think nothing of using AI as a tool," he said.

Recently, I plugged this question into ChatGPT: "What will happen to human society if we develop a dependence on AI in communication, including the creation of literature?" It spit out a numbered list of losses: traditional literature's "human touch," jobs, literary diversity. But in its conclusion, it subtly reframed the terms of discussion, noting that AI isn't all bad: "Striking a balance between the benefits of AI-driven tools and preserving the essence of human creativity and expression would be crucial to maintain a vibrant and meaningful literary culture." I asked how we might arrive at that balance, and another dispassionate list—ending with another both-sides-ist kumbaya—appeared.

At this point, I wrote, maybe trolling the bot a little: "What about doing away with the use of AI for communication altogether?" I added: "Please answer without giving me a list." I ran the question over and over—three, four, five, six times—and every time, the response came in the form of a numbered catalog of pros and cons.

It infuriated me. The AI model that had helped me write "Ghosts" all those months ago—that had conjured my sister's hand and let me hold it in mine —was dead. Its own younger sister had the witless efficiency of a stapler. But then, what did I expect? I was conversing with a software program created by some of the richest, most powerful people on earth. What this software uses language for could not be further from what writers use it for. I have no doubt that AI will become more powerful in the coming decades —and, along with it, the people and institutions funding its development. In the meantime, writers will still be here, searching for the words to describe what it felt like to be human through it all. Will we read them?

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By [Christopher Beam](#)

[Backchannel](#)
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The AI Detection Arms Race Is On

And college students are developing the weapons, quickly building tools that identify AI-generated text—and tools to evade detection.
Illustration: James Marshall

Edward Tian didn't think of himself as a writer. As a computer science major at Princeton, he'd taken a couple of journalism classes, where he learned the basics of reporting, and his sunny affect and tinkerer's curiosity endeared him to his teachers and classmates. But he describes his writing style at the time as "pretty bad"—formulaic and clunky. One of his journalism professors said that Tian was good at "pattern recognition," which was helpful when producing news copy. So Tian was surprised when, sophomore year, he managed to secure a spot in John McPhee's exclusive non-fiction writing seminar.

Every week, 16 students gathered to hear the legendary *New Yorker* writer dissect his craft. McPhee assigned exercises that forced them to think rigorously about words: Describe a piece of modern art on campus, or prune the Gettysburg Address for length. Using a projector and slides, McPhee shared hand-drawn diagrams that illustrated different ways he structured his own essays: a straight line, a triangle, a spiral. Tian remembers McPhee saying he couldn't tell his students how to write, but he could at least help them find their own unique voice.

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Photograph: Jessica Chou

If McPhee stoked a romantic view of language in Tian, computer science offered a different perspective: language as statistics. During the pandemic, he'd taken a year off to work at the BBC and intern at [Bellingcat](#), an open source [journalism project](#), where he'd written code to detect Twitter bots. As a junior, he'd taken classes on machine learning and natural language processing. And in the fall of 2022, he began to work on his senior thesis about detecting the differences between AI-generated and human-written text.

When [ChatGPT](#) debuted in November, Tian found himself in an unusual position. As the world lost its mind over this new, radically improved chatbot, Tian was already familiar with the underlying GPT-3 technology. And as a journalist who'd worked on rooting out disinformation campaigns, he understood the implications of AI-generated content for the industry.

While home in Toronto for winter break, Tian started playing around with a new program: a ChatGPT detector. He posted up at his favorite café, slamming jasmine tea, and stayed up late coding in his bedroom. His idea was simple. The software would scan a piece of text for two factors: "perplexity," the randomness of word choice; and "burstiness," the complexity or variation of sentences. Human writing tends to rate higher than AI writing on both metrics, which allowed Tian to guess how a piece of text had been created. Tian called the tool [GPTZero](#)—the "zero" signaled truth, a return to basics—and he put it online the evening of January 2. He posted a link on Twitter with a brief introduction. The goal was to combat "increasing AI plagiarism," he wrote. "Are high school teachers going to want students using ChatGPT to write their history essays? Likely not." Then he went to bed.

Tian woke up the next morning to hundreds of retweets and replies. There was so much traffic to the host server that many users couldn't access it. "It was totally crazy," Tian says. "My phone was blowing up." A friend congratulated him on winning the internet. Teens on TikTok called him a narc. "A lot of the initial hate was like, 'This kid is a snitch, he doesn't have a life, he never had a girlfriend,'" says Tian with a grin. "Classic stuff." (Tian has a girlfriend.) Within days, he was fielding calls from journalists around the world, eventually appearing on everything from NPR to the

South China Morning Post to *Anderson Cooper 360*. Within a week, his original tweet had reached more than 7 million views.

GPTZero was a new twist in the media narrative surrounding ChatGPT, which had inspired industrywide hand-wringing and a scourge of AI-generated ledes. (Researchers had created a detector for GPT-2 text in 2019, but Tian's was the first to target ChatGPT.) Teachers thanked Tian for his work, grateful they could finally prove their suspicions about fishy student essays. Had humanity found its savior from the robot takeover?

Tian's program was a starting gun of sorts. The race was now on to create the definitive AI detection tool. In a world increasingly saturated with AI-generated content, the thinking went, we'll need to distinguish the machine-made from the human-made. GPTZero represented a promise that it will indeed be possible to tell one from the other, and a conviction that the difference matters. During his media tour, Tian—smiley, earnest, the A student incarnate—elaborated on this reassuring view that no matter how sophisticated generative AI tools become, we will always be able to unmask them. There's something irreducible about human writing, Tian said: "It has an element that can never be put into numbers."

Life on the internet has always been a battle between fakers and detectors of fakes, with both sides profiting off the clash. Early spam filters sifted emails for keywords, blocking messages with phrases like "FREE!" or "be over 21," and they eventually learned to filter out entire styles of writing. Spammers responded by surrounding their pitches with snippets of human-sounding language lifted from old books and mashed together. (This type of message, dubbed "litspam," became a genre unto itself.) As search engines grew more popular, creators looking to boost their pages' rankings resorted to "keyword stuffing"—repeating the same word over and over—to get priority. Search engines countered by down-ranking those sites. After Google introduced its PageRank algorithm, which favored websites with lots of inbound links, spammers created entire ecosystems of mutually supporting pages.

Around the turn of the millennium, the captcha tool arrived to sort humans from bots based on their ability to interpret images of distorted text. Once some bots could handle that, captcha added other detection methods that

included parsing images of motorbikes and trains, as well as sensing mouse movement and other user behavior. (In a recent test, an early version of GPT-4 showed that it knew how to hire a person on Taskrabbit to complete a captcha on its behalf.) The fates of entire companies have rested on the issue of spotting fakes: Elon Musk, in an attempt to wriggle out of his deal to buy Twitter, cited a bot detector to boost his argument that Twitter had misrepresented the number of bots on its site.

Generative AI re-upped the ante. While large language models and text-to-image generators have been evolving steadily over the past decade, 2022 saw an explosion of consumer-friendly tools like ChatGPT and Dall-E. Pessimists argue that we could soon drown in a tsunami of synthetic media. "In a few years, the vast majority of the photos, videos, and text we encounter on the internet could be AI-generated," *New York Times* technology columnist Kevin Roose warned last year. *The Atlantic* imagined a looming "textpocalypse" as we struggle to filter out the generative noise. Political campaigns are leveraging AI tools to create ads, while Amazon is flooded with ChatGPT-written books (many of them about AI). Scrolling through product reviews already feels like the world's most annoying Turing test. The next step seems clear: If you thought Nigerian prince emails were bad, wait until you see Nigerian prince chatbots.

Soon after Tian released GPTZero, a wave of similar products appeared. OpenAI rolled out its own detection tool at the end of January, while Turnitin, the anti-plagiarism giant, unveiled a classifier in April. They all shared a basic methodology, but each model was trained on different data sets. (For example, Turnitin focused on student writing.) As a result, precision varied wildly, from OpenAI's claim of 26 percent accuracy for detecting AI-written text, up to the most optimistic claim from a company called Winston AI at 99.6 percent. To stay ahead of the competition, Tian would have to keep improving GPTZero, come up with its next product, and finish college in the meantime.

Right away, Tian recruited his high school friend Alex Cui as CTO and, over the following weeks, brought on a handful of programmers from Princeton and Canada. Then, in the spring, he onboarded a trio of coders from Uganda, whom he'd met four years earlier while working for a startup

that trains engineers in Africa. (A global citizen, Tian was born in Tokyo and lived in Beijing until age 4 before his parents, both Chinese engineers, moved the family to Ontario.) Together the team began working on its next application: a Chrome plug-in that would scan the text of a web page and determine whether it was AI-generated.

Another threat to GPTZero was GPTZero. Almost immediately after it launched, skeptics on social media started posting embarrassing examples of the tool misclassifying texts. Someone pointed out that it flagged portions of the US Constitution as possibly AI-written. Mockery gave way to outrage when stories of students falsely accused of cheating due to GPTZero began to flood Reddit. At one point, a parent of one such student reached out to Soheil Feizi, a professor of computer science at the University of Maryland. "They were really furious," Feizi said. Last fall, before GPTZero debuted, Feizi and some other Maryland colleagues had begun putting together a research project on the problems with AI detectors, which he'd suspected might not be reliable. Now GPTZero and its imitators got him thinking they could do more harm than good.

Yet another headache for Tian was the number of crafty students finding ways around the detector. One person on Twitter instructed users to insert a zero-width space before every "e" in a ChatGPT-generated text. A TikTok user wrote a program that bypassed detection by replacing certain English letters with their Cyrillic look-alikes. Others started running their AI text through QuillBot, a popular paraphrasing tool. Tian patched these holes, but the workarounds kept coming. It was only a matter of time before someone spun up a rival product—an anti-detector.

In early March, a Stanford University freshman named Joseph Semrai and some friends were driving down the Pacific Coast Highway to LA when they got locked out of their Zipcar in Ventura. They walked to a nearby Starbucks and waited for roadside assistance. But as the wait dragged on for hours, Semrai and a friend wondered how to make up for the lost time. Semrai had an essay due the following week for a required freshman writing class. It was his least favorite type of assignment: a formulaic essay meant to show logical reasoning. "It's a pretty algorithmic process," says Semrai.

ChatGPT was the obvious solution. But at the time, its responses tended to max out at a few paragraphs, so generating a full-length essay would be a multistep process. Semrai wanted to create a tool that could write the paper in one burst. He also knew there was a chance it could be detected by GPTZero. With the encouragement of his friend, Semrai pulled out his laptop and ginned up a script that would write an essay based on a prompt, run the text through GPTZero, then keep tweaking the phrasing until the AI was no longer detectable—essentially using GPTZero against itself.

Semrai introduced his program a few days later at Friends and Family Demo Day, a kind of show-and-tell for Stanford's undergraduate developer community. Standing before a roomful of classmates, he asked the audience for an essay topic—someone suggested "fine dining" in California—and typed it into the prompt box. After a few seconds, the program spat out an eight-paragraph essay, unoriginal but coherent, with works cited. "Not saying I'd ever submit this paper," Semrai said, to chuckles. "But there you go. I dunno, it saves time." He named the tool [WorkNinja](#) and put it on the app store two months later. With the help of a promotional campaign featuring the Gen Z influencer David Dobrik and a giveaway of 10 Teslas to users who signed up, it received more than 350,000 downloads in the first week; sign-ups have slowed since then to a few hundred a day, according to Semrai. (Semrai wouldn't say who funded the campaign, only that it was a major Silicon Valley angel investor.)

Semrai's Zoomer mop and calm demeanor belie a simmering intensity. Whereas Tian bounces and bubbles his way through the world, Semrai comes across as focused and deadpan. The 19-year-old speaks in the confident, podcast-ready tone of a Silicon Valley entrepreneur who sees the world in terms of problems to be solved, ending every other sentence with, "Right?" Listening to him wax on about defensible moats and the "S-curve" of societal growth, it's easy to forget he can't legally drink. But then, occasionally, he'll say something that reveals the wide-eyed undergrad, open to the world and still figuring out his place in it. Like the time he and a friend walked around the Santa Monica pier until 3 am, "talking about what we value." Semrai thinks a lot about how to find balance and happiness. "I think, while I'm young, it probably lies more in exploring the derivative," he says, "chasing the highs and lows."

Growing up in New York and then Florida, his parents—a firefighter father from Yonkers and a homemaker mother from China—gave him a long leash. "I was kinda left during childhood to pursue what genuinely excited me," he said. "The best way to do that was to make stuff on the computer." When Semrai was 6 he created a plug-in to assign permission levels for *Minecraft* servers, and at 7 he wrote a program that patched Windows 7 so you could run Windows XP on it. "It just makes me genuinely happy to ship things for people," he says.

His family moved from Queens to Palm City when he was 9, and Semrai saw the difference between the public school systems. The basic computer literacy he'd taken for granted in New York schools was scarce in Florida. He started writing programs to help fill gaps in education—a trajectory that allows him to say, at 19, that he's been "working in ed tech my entire life." Freshman year of high school, he created an online learning platform that won startup funding in a local competition. Prior to Covid, he'd created a digital hall pass system that became the basis for contact tracing and was adopted by 40 school districts in the Southeast.

Semrai is fundamentally a techno-optimist. He says he believes that we should speed the development of technology, including artificial general intelligence, because it will ultimately lead us toward a "post-scarcity" society—a worldview sometimes described as "effective accelerationism." (Not to be confused with effective altruism, which holds that we should take actions that maximize "good" outcomes, however defined.) Semrai's case for WorkNinja rests on its own kind of accelerationist logic. AI writing tools are good, in his view, not because they help kids cheat, but because they'll force schools to revamp their curricula. "If you can follow a formula to create an essay, it's probably not a good assignment," he says. He envisions a future in which every student can get the kind of education once reserved for aristocrats, by way of personalized AI tutoring. When he was first learning how to program, Semrai says, he relied largely on YouTube videos and internet forums to answer his questions. "It would have been easier if there was a tutor to guide me," he says. Now that AI tutors are real, why stand in their way?

Joseph Semrai, 19, creator of WorkNinja, a tool that generates AI-written essays.

I recently used WorkNinja to generate a handful of essays, including one about Darwin's theory of evolution. The first version it gave me was clumsy and repetitive, but workable, exploring the theory's implications for biology, genetics, and philosophy. GPTZero flagged it as likely AI-generated.

So I hit WorkNinja's Rephrase button. The text shifted slightly, replacing certain words with synonyms. After three rephrasings, GPTZero finally gave the text its stamp of humanity. (When I tested the same text again a few weeks later, the tool labeled it a mix of human and AI writing.) The problem was, many of the rephrased sentences no longer made sense. For example, the following sentence:

Darwin's theory of evolution is the idea that living species evolve over time due to their interaction with their environment.

had morphed to become:

Darwin's theory of evolution is the thought that living species acquire over clip due to their interaction with their surroundings.

At the very least, any student looking for a shortcut would have to clean up their WorkNinja draft before submitting it. But it points to a real issue: If even this janky work in progress can circumvent detectors, what could a sturdier product accomplish?

In March, Soheil Feizi at the University of Maryland [published his findings](#) on the performance of AI detectors. He argued that accuracy problems are inevitable, given the way AI text detectors worked. As you increase the sensitivity of the instrument to catch more AI-generated text, you can't avoid raising the number of false positives to what he considers an unacceptable level. So far, he says, it's impossible to get one without the other. And as the statistical distribution of words in AI-generated text edges

closer to that of humans—that is, as it becomes more convincing—he says the detectors will only become less accurate. He also found that paraphrasing baffles AI detectors, rendering their judgments "almost random." "I don't think the future is bright for these detectors," Feizi says.

"[Watermarking](#)" doesn't help either, he says. Under this approach, a generative AI tool like ChatGPT proactively adjusts the statistical weights of certain interchangeable "token" words—say, using *start* instead of *begin*, or *pick* instead of *choose*—in a way that would be imperceptible to the reader but easily spottable by an algorithm. Any text in which those words appear with a given frequency could be marked as having been generated by a particular tool. But Feizi argues that with enough paraphrasing, a watermark "can be washed away."

In the meantime, he says, detectors are hurting students. Say a detection tool has a 1 percent false positive rate—an optimistic assumption. That means in a classroom of 100 students, over the course of 10 take-home essays, there will be on average 10 students falsely accused of cheating. (Feizi says a rate of one in 1,000 would be acceptable.) "It's ridiculous to even think about using such tools to police the use of AI models," he says.

Tian says the point of GPTZero isn't to catch cheaters, but that has inarguably been its main use case so far. (GPTZero's detection results now come with a warning: "These results should not be used to punish students.") As for accuracy, Tian says GPTZero's current level is 96 percent when trained on its most recent data set. Other detectors boast higher figures, but Tian says those claims are a red flag, as it means they're "overfitting" their training data to match the strengths of their tools. "You have to put the AI and human on equal footing," he says.

Surprisingly, AI-generated images, videos, and audio snippets are far easier to detect, at least for now, than synthetic text. Reality Defender, a startup backed by Y Combinator, launched in 2018 with a focus on fake image and video detection and has since branched out to audio and text. Intel released a tool called FakeCatcher, which detects deepfake videos by analyzing facial blood flow patterns visible only to the camera. A company called Pindrop uses voice "biometrics" to detect spoofed audio and to authenticate callers in lieu of security questions.

The siren call of AI says, *It doesn't have to be this way*. And when you consider the billions of people who sit outside the elite club of writer-sufferers, you start to think: Maybe it *shouldn't* be this way.

AI-generated text is more difficult to detect because it has relatively few data points to analyze, which means fewer opportunities for AI output to deviate from the human norm. Compare that to Intel's FakeCatcher. Ilke Demir, a research scientist for Intel who has also worked on Pixar films, says it would be extremely difficult to create a data set large and detailed enough to allow deepfakers to simulate blood flow signatures to fool the detector. When I asked whether such a thing could eventually be created, she said her team anticipates future developments in deepfake technology in order to stay ahead of them.

Ben Colman, CEO of Reality Defender, says his company's detection tools are unevadable in part because they're private. (So far, the company's clients have mainly been governments and large corporations.) With publicly available tools like GPTZero, anyone can run a piece of text through the detector and then tweak it until it passes muster. Reality Defender, by contrast, vets every person and institution that uses the tool, Colman says. They also watch out for suspicious usage, so if a particular account were to run tests on the same image over and over with the goal of bypassing detection, their system would flag it.

Regardless, much like spam hunters, spies, vaccine makers, chess cheaters, weapons designers, and the entire cybersecurity industry, AI detectors across all media will have to constantly adapt to new evasion techniques. Assuming, that is, the difference between human and machine still matters.

The more time I spent talking with Tian and Semrai and their classmate-colleagues, the more I wondered: Do any of these young people actually … enjoy writing? "Yeah, a lot!" said Tian, beaming even more than usual when I asked him last May on Princeton's campus. "It's like a puzzle." He likes figuring out how words fit together and then arranging the ideas so they flow. "I feel like that's fun to do." He also loves the interview process, as it gives him "a window into people's lives, plus a mirror into how you live your own."

In high school, Tian says, writing felt like a chore. He credits McPhee for stoking his love and expanding his taste. In June, he told me excitedly that he had just picked up a used copy of Annie Dillard's *The Writing Life*.

Semrai similarly found high school writing assignments boring and mechanistic—more about synthesizing information than making something new. "I'd have preferred open-format assignments that would've sparked creativity," he says. But he put those synthesizing skills to work. Sophomore year, he wrote an 800-page instructional book called *Build for Anything*, intended "to take someone from knowing nothing to knowing a little bit of almost everything" about web development. (He self-published the book on Amazon in 2022 and sold a few hundred copies.) Semrai said it's the kind of prose ChatGPT now excels at. "I don't think the book falls into the category of meaningful writing," he says.

After almost 20 years of typing words for money, I can say from experience, writing sucks. Ask any professional writer and they'll tell you, it's the worst, and it doesn't get easier with practice. I can attest that the enthusiasm and curiosity required to perpetually scan the world, dig up facts, and wring them for meaning can be hard to sustain. And that's before you factor in the state of the industry: dwindling rates, shrinking page counts, and shortening attention spans (readers' and my own). I keep it up because, for better or worse, it's now who I am. I do it not for pleasure but because it feels meaningful—to me at least.

Some writers romanticize the struggle. McPhee once described lying on a picnic table for two weeks, trying to decide how to start an article. "The piece would ultimately consist of some five thousand sentences, but for those two weeks I couldn't write even one," he wrote. Another time, at age 22, he lashed himself to his writing chair with a bathrobe belt. According to Thomas Mann, "A writer is someone for whom writing is more difficult than it is for other people." "You search, you break your heart, your back, your brain, and then—only then—it is handed to you," writes Annie Dillard in *The Writing Life*. She offers this after a long comparison of writing to alligator wrestling.

The implication is that the harder the squeeze, the sweeter the juice—that there's virtue in staring down the empty page, taming it, forcing it to give

way to prose. This is how the greatest breakthroughs happen, we tell ourselves. The agony is worth it, because that's how ideas are born.

The siren call of AI says, *It doesn't have to be this way*. And when you consider the billions of people who sit outside the elite club of writer-sufferers, you start to think: Maybe it *shouldn't* be this way.

May Habib spent her early childhood in Lebanon before moving to Canada, where she learned English as a second language. "I thought it was pretty unfair that so much benefit would accrue to someone really good at reading and writing," she says. In 2020, she founded [Writer](#), one of several hybrid platforms that aims not to replace human writing, but to help people—and, more accurately, brands—collaborate better with AI.

Habib says she believes there's value in the blank page stare-down. It helps you consider and discard ideas and forces you to organize your thoughts. "There are so many benefits to going through the meandering, head-busting, wanna-kill-yourself staring at your cursor," she says. "But that has to be weighed against the speed of milliseconds."

The purpose of Writer isn't to write for you, she says, but rather to make your writing faster, stronger, and more consistent. That could mean suggesting edits to prose and structure, or highlighting what else has been written on the subject and offering counterarguments. The goal, she says, is to help users focus less on sentence-level mechanics and more on the ideas they're trying to communicate. Ideally, this process yields a piece of text that's just as "human" as if the person had written it entirely themselves. "If the detector can flag it as AI writing, then you've used the tools wrong," she says.

The black-and-white notion that writing is either human- or AI-generated is already slipping away, says Ethan Mollick, a professor at the Wharton School of the University of Pennsylvania. Instead, we're entering an era of what he calls "centaur writing." Sure, asking ChatGPT to spit out an essay about the history of the Mongol Empire produces predictably "AI-ish" results, he says. But "start writing, 'The details in paragraph three aren't quite right—add this information, and make the tone more like *The New*

Yorker,'" he says. "Then it becomes more of a hybrid work and much better-quality writing."

Mollick, who teaches entrepreneurship at Wharton, not only allows his students to use AI tools—he requires it. "Now my syllabus says you have to do at least one impossible thing," he says. If a student can't code, maybe they write a working program. If they've never done design work, they might put together a visual prototype. "Every paper you turn in has to be critiqued by at least four famous entrepreneurs you simulate," he says.

Students still have to master their subject area to get good results, according to Mollick. The goal is to get them thinking critically and creatively: "I don't care what tool they're using to do it, as long as they're using the tools in a sophisticated manner and using their mind."

Mollick acknowledges that ChatGPT isn't as good as the best human writers. But it can give everyone else a leg up. "If you were a bottom-quartile writer, you're in the 60th to 70th percentile now," he says. It also frees certain types of thinkers from the tyranny of the writing process. "We equate writing ability with intelligence, but that's not always true," he says. "In fact, I'd say it's often not true."

Edward Tian, age 23, creator of GPTZero, a tool that detects AI-generated writing.

Illustration: James Marshall; Photograph: Lauryn Hill

On a cloudless day in May, Tian and I strolled across Princeton's campus; big white reunion tents seemed to have landed like spaceships on the manicured lawns. At my request, Tian invited a handful of classmates to join us for lunch at a Szechuan restaurant off campus and talk about AI.

As some schools rushed to ban ChatGPT and tech CEOs signed letters warning of AI-fueled doom, the students were notably relaxed about a machine-assisted future. (Princeton left it up to professors to set their own ground rules.) One had recently used ChatGPT to write the acknowledgments section of her thesis. Others, including Tian, relied on it to fill in chunks of script while coding. Lydia You, a senior and computer

science major who plans to work in journalism, had asked ChatGPT to write a poem about losing things in the style of Elizabeth Bishop—an attempt to re-create her famous poem "One Art." ("The art of losing isn't hard to master.") The result was "very close" to the original poem, You said, and she found that the chatbot did an even better job analyzing the original and describing what made it so moving. "We've seen a lot of panic about almost everything in our lives," said You, citing TikTok, Twitter, and the internet itself. "I feel like people of our generation are like, *We can figure out for ourselves how to use this*."

Sophie Amiton, a senior studying mechanical and aerospace engineering, jumped in: "Also, I think our generation is lazier in a lot of ways," she said, as You nodded in agreement. "I see a lot more people who don't want traditional jobs now, don't want a nine-to-five."

"They're disillusioned," You said. "A lot of jobs are spreadsheets."

"I think that came out of Covid," Amiton continued. "People reevaluated what the purpose of work even is, and if you can use ChatGPT to make your life easier, and therefore have a better quality of life or work-life balance, then why not use the shortcut?"

Liz, a recent Princeton graduate who preferred not to use her surname, sent me a paper she'd written with the help of ChatGPT for a class on global politics. Rather than simply asking it to answer the essay question, she plugged in an outline with detailed bullet points, then had it write the paper based on her notes. After extensive back-and-forth—telling it to rewrite and rearrange, add nuance here and context there—she finally had a paper she was comfortable submitting. She got an A.

I copied and pasted her paper into GPTZero. The verdict: "Your text is likely to be written entirely by a human."

In early May, just a few weeks before Tian and his classmates put on their black graduation gowns, the GPTZero team released the Chrome plug-in they'd been developing and called it Origin. Origin is still rudimentary: You have to select the text of a web page yourself, and its accuracy isn't perfect. But Tian hopes that one day the tool will automatically scan every website

you look at, highlighting AI-generated content—from text to images to video—as well as anything "toxic" or factually dubious. He describes Origin as a "windshield" for the information superhighway, deflecting useless or harmful material and allowing us to see the road clearly.

Tian was unflaggingly optimistic about the company; he also just felt fortunate to be graduating into a job he actually wanted. Many of his friends had entered Princeton planning to be entrepreneurs, but belt-tightening in the tech sector had changed their plans.

"We've seen a lot of panic about almost everything in our lives. I feel like people of our generation are like, *We can figure out for ourselves how to use this*."

As a rising sophomore with three years left to go at Stanford, Semrai approached the summer with a more footloose attitude. On a blistering Thursday afternoon in June, on the rooftop of Pier 17 near Wall Street, Semrai, wearing a green patterned shirt and white Nikes, spoke to me brightly about the future—or at least the next few weeks. His summer was still taking shape. ("I'm rapidly thesis-testing.") But for now he was in New York, crashing with friends while cranking on a couple of AI-driven projects. The previous night, he'd slept in a coworking space in SoHo. Now he was standing in the shaded VIP section of an event put on by Techstars New York City, a startup accelerator, while hundreds of sweat-stained attendees milled around in the glare.

Nearby, New York City mayor Eric Adams stood onstage wearing aviators and a full suit, praising the glories of coding. "I'm a techie," Adams said, before encouraging guests to seek out diverse collaborators and use "source code" to fix societal problems like cancer and gun violence. He then urged the singles in the crowd to find themselves a "shorty or a boo and hook up with them."

Semrai was taking a see-what-sticks approach to building. In addition to WorkNinja, he was developing a platform for chatbots based on real celebrities and trained on reams of their data, with which fans could then interact. He was also prototyping a bracelet that would record everything we say and do—Semrai calls it a "perfect memory"—and offer real-time

tips to facilitate conversations. (A group of classmates at Stanford recently created a related product called RizzGPT, an eyepiece that helps its wearer flirt.)

He expected the summer to give rise to an explosion of AI apps, as young coders mix and cross-pollinate. (Eric Adams would approve.) "I think a constellation of startups will be formed, and five years from now we'll be able to draw lines between people—the start of an ecosystem," he said.

By summer, Tian had a team of 12 employees and had raised $3.5 million from a handful of VCs, including Jack Altman (brother of OpenAI CEO Sam Altman) and Emad Mostaque of Stability AI. But over the course of our conversations, I noticed that his framing of GPTZero/Origin was shifting slightly. Now, he said, AI-detection would be only one part of the humanity-proving toolkit. Just as important would be an emphasis on provenance, or "content credentials." The idea is to attach a cryptographic tag to a piece of content that verifies it was created by a human, as determined by its process of creation—a sort of captcha for digital files. Adobe Photoshop already attaches a tag to photos that harness its new AI generation tool, Firefly. Anyone looking at an image can right-click it and see who made it, where, and how. Tian says he wants to do the same thing for text and that he has been talking to the Content Authenticity Initiative— a consortium dedicated to creating a provenance standard across media—as well as Microsoft about working together.

One could interpret his emphasis on provenance as a tacit acknowledgment that detection alone won't cut it. (OpenAI shut down its text classifier in July "due to its low rate of accuracy.") It also previews a possible paradigm shift in how we relate to digital media. The whole endeavor of detection suggests that humans leave an unmistakable signature in a piece of text— something perceptible—much the way that a lie detector presumes dishonesty leaves an objective trace. Provenance relies on something more like a "Made in America" label. If it weren't for the label, we wouldn't know the difference. It's a subtle but meaningful distinction: Human writing may not be better, or more creative, or even more original. But it will be human, which will matter to other humans.

In June, Tian's team took another step in the direction of practicality. He told me they were building a new writing platform called HumanPrint, which would help users improve their AI-written text and enable them to share "proof of authenticity." Not by generating text, though. Rather, it would use GPTZero's technology to highlight sections of text that were insufficiently human and prompt the user to rewrite it in their own words— a sort of inversion of the current AI writing assistants. "So teachers can specify, OK, maybe more than 50 percent of the essay should still be written in your own words," he said. When I asked whether this was a pivot for the company, Tian argued that it was "a natural extension of detection." "It was always a vision of being the gold standard of responsible AI usage," Tian said, "and that's still there." Still, the implication is clear: There's no stopping AI writing; the only option is to work with it.

When Tian was first testing out GPTZero, he scanned a 2015 *New Yorker* essay by McPhee called "[Frame of Reference](.)" In it, McPhee riffs on the joys and risks of making cultural references in one's writing. "Mention Beyoncé and everyone knows who she is. Mention Veronica Lake and you might as well be in the Quetico-Superior," he writes coyly. He runs down a list of adjectives he's used to describe mustaches, including "sincere," "no-nonsense," "gyroscopic," "guileless," "analgesic," "soothing," "odobene," and "tetragrammatonic." He concludes with an anecdote about battling an editor to include a reference to an obscure British term used by upper-class tourists to India during the Raj. (He won.) It's classic McPhee: scalpel-precise, big-hearted if a tad self-satisfied, gleefully digressive, indulgent until he gets to the just-right point. GPTZero determined that the article was "the most human on all metrics," Tian said. I called McPhee to ask what he thought it meant that his writing was especially human.

"I really have no very good idea," McPhee told me over the phone. "But if I were guessing, it's that my pieces get at the science, or the agriculture, or the aviation, or whatever the topic is, through people. There's always a central figure I learn from." Indeed, McPhee writes through the eyes of experts. The reader comes away with not just some esoteric knowledge about geology or particle physics or oranges, but a sense of the person studying the subject, as well as McPhee studying the person.

McPhee, now 92 , said he's unconcerned about AI replacing human writers. "I'm extremely skeptical and not the least bit worried about it," he said. "I don't think there's a Mark Twain of artificial intelligence."

But, I asked, what if years from now, someone designs a McPheeBot3000 trained on McPhee's writing, and then asks it to produce a book on a fresh topic? It might not be able to ford streams with environmental activists or go fly-fishing with ichthyologists, but couldn't it capture McPhee's voice and style and worldview? Tian argued that machines can only imitate, while McPhee never repeats himself: "What's unique about McPhee is he comes up with things McPhee a day ago wouldn't have."

I asked McPhee about the hypothetical McPheeBot3000. (Or, if Semrai has his way, not-so-hypothetical.) "If this thing ever happens, in a future where I'm no longer here," he said, "I hope my daughters show up with a lawyer."

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[Steven Levy](#)

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What OpenAI Really Wants

The young company sent shock waves around the world when it released ChatGPT. But that was just the start. The ultimate goal: Change everything. Yes. *Everything*.
Ilya Sutskever, Sam Altman, Mira Murati, and Greg Brockman, of OpenAIPhotograph: Jessica Chou

The air crackles with an almost Beatlemaniac energy as the star and his entourage tumble into a waiting Mercedes van. They've just ducked out of one event and are headed to another, then another, where a frenzied mob awaits. As they careen through the streets of London—the short hop from Holborn to Bloomsbury—it's as if they're surfing one of civilization's before-and-after moments. The history-making force personified inside this car has captured the attention of the world. Everyone wants a piece of it, from the students who've waited in line to the prime minister.

Inside the luxury van, wolfing down a salad, is the neatly coiffed 38-year-old entrepreneur Sam Altman, cofounder of [OpenAI](#); a PR person; a security specialist; and me. Altman is unhappily sporting a blue suit with a tieless pink dress shirt as he whirlwinds through London as part of a monthlong global jaunt through 25 cities on six continents. As he gobbles his greens—no time for a sit-down lunch today—he reflects on his meeting the previous night with French president Emmanuel Macron. Pretty good guy! And *very* interested in [artificial intelligence](#).

As was the prime minister of Poland. And the prime minister of Spain.

Riding with Altman, I can almost hear the ringing, ambiguous chord that opens "A Hard Day's Night"—introducing the future. Last November, when OpenAI let loose its monster hit, [ChatGPT](#), it triggered a tech explosion not seen since the internet burst into our lives. Suddenly the Turing test was history, search engines were endangered species, and no college essay could ever be trusted. No job was safe. No scientific problem was immutable.

Altman didn't do the research, train the neural net, or code the interface of ChatGPT and its more precocious sibling, GPT-4. But as CEO—and a dreamer/doer type who's like a younger version of his cofounder Elon Musk, without the baggage—one news article after another has used his photo as the visual symbol of humanity's new challenge. At least those that haven't led with an eye-popping image generated by OpenAI's visual AI product, [Dall-E.](#) He is the oracle of the moment, the figure that people want to consult first on how AI might usher in a golden age, or consign humans to irrelevance, or worse.

Altman's van whisks him to four appearances that sunny day in May. The first is stealthy, an off-the-record session with the Round Table, a group of government, academia, and industry types. Organized at the last minute, it's on the second floor of a pub called the Somers Town Coffee House. Under a glowering portrait of brewmaster Charles Wells (1842–1914), Altman fields the same questions he gets from almost every audience. Will AI kill us? Can it be regulated? What about China? He answers every one in detail, while stealing glances at his phone. After that, he does a fireside chat at the posh Londoner Hotel in front of 600 members of the Oxford Guild. From there it's on to a basement conference room where he answers more technical questions from about 100 entrepreneurs and engineers. Now he's almost late to a mid-afternoon onstage talk at University College London. He and his group pull up at a loading zone and are ushered through a series of winding corridors, like the Steadicam shot in *Goodfellas*. As we walk, the moderator hurriedly tells Altman what he'll ask. When Altman pops on stage, the auditorium—packed with rapturous academics, geeks, and journalists—erupts.

Altman is not a natural publicity seeker. I once spoke to him right after *The New Yorker* ran [a long profile](#) of him. "Too much about me," he said. But at University College, after the formal program, he wades into the scrum of people who have surged to the foot of the stage. His aides try to maneuver themselves between Altman and the throng, but he shrugs them off. He takes one question after another, each time intently staring at the face of the interlocutor as if he's hearing the query for the first time. Everyone wants a selfie. After 20 minutes, he finally allows his team to pull him out. Then he's off to meet with UK prime minister Rishi Sunak.

Maybe one day, when robots write our history, they will cite Altman's world tour as a milestone in the year when everyone, all at once, started to make their own personal reckoning with the singularity. Or then again, maybe whoever writes the history of this moment will see it as a time when a quietly compelling CEO with a paradigm-busting technology made an attempt to inject a very peculiar worldview into the global mindstream— from an unmarked four-story headquarters in San Francisco's Mission District to the entire world.

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Photograph: Jessica Chou

For Altman and his company, ChatGPT and GPT-4 are merely stepping stones along the way to achieving a simple and seismic mission, one these technologists may as well have branded on their flesh. That mission is to build artificial general intelligence—a concept that's so far been grounded more in science fiction than science—and to make it safe for humanity. The people who work at OpenAI are fanatical in their pursuit of that goal. (Though, as any number of conversations in the office café will confirm, the "build AGI" bit of the mission seems to offer up more raw excitement to its researchers than the "make it safe" bit.) These are people who do not shy from casually using the term "super-intelligence." They *assume* that AI's trajectory will surpass whatever peak biology can attain. The company's financial documents even stipulate a kind of exit contingency for when AI wipes away our whole economic system.

It's not fair to call OpenAI a cult, but when I asked several of the company's top brass if someone could comfortably work there if they didn't believe AGI was truly coming—and that its arrival would mark one of the greatest moments in human history—most executives didn't think so. *Why would a nonbeliever want to work here*? they wondered. The assumption is that the workforce—now at approximately 500, though it might have grown since you began reading this paragraph—has self-selected to include only the faithful. At the very least, as Altman puts it, once you get hired, it seems inevitable that you'll be drawn into the spell.

At the same time, OpenAI is not the company it once was. It was founded as a purely nonprofit research operation, but today most of its employees technically work for a profit-making entity that is reportedly valued at almost $30 billion. Altman and his team now face the pressure to deliver a revolution in every product cycle, in a way that satisfies the commercial demands of investors and keeps ahead in a fiercely competitive landscape. All while hewing to a quasi-messianic mission to elevate humanity rather than exterminate it.

That kind of pressure—not to mention the unforgiving attention of the entire world—can be a debilitating force. The Beatles set off colossal waves of cultural change, but they anchored their revolution for only so long: Six years after chiming that unforgettable chord they weren't even a band anymore. The maelstrom OpenAI has unleashed will almost certainly be far bigger. But the leaders of OpenAI swear they'll stay the course. All they want to do, they say, is build computers smart enough and safe enough to end history, thrusting humanity into an era of unimaginable bounty.

Growing up in the late '80s and early '90s, Sam Altman was a nerdy kid who gobbled up science fiction and *Star Wars*. The worlds built by early sci-fi writers often had humans living with—or competing with—superintelligent AI systems. The idea of computers matching or exceeding human capabilities thrilled Altman, who had been coding since his fingers could barely cover a keyboard. When he was 8, his parents bought him a Macintosh LC II. One night he was up late playing with it and the thought popped into his head: "Someday this computer is going to learn to think." When he arrived at Stanford as an undergrad in 2003, he hoped to help

make that happen and took courses in AI. But "it wasn't working at all," he'd later say. The field was still mired in an innovation trough known as AI winter. Altman dropped out to enter the startup world; his company Loopt was in the tiny first batch of wannabe organizations in [Y Combinator,](#) which would become the world's most famed incubator.

In February 2014, Paul Graham, YC's founding guru, chose then-28-year-old Altman to succeed him. "Sam is one of the smartest people I know," [Graham wrote](#) in the announcement, "and understands startups better than perhaps anyone I know, including myself." But Altman saw YC as something bigger than a launchpad for companies. "We are not about startups," he told me soon after taking over. "We are about innovation, because we believe that is how you make the future great for everyone." In Altman's view, the point of cashing in on all those unicorns was not to pack the partners' wallets but to fund species-level transformations. He began a research wing, hoping to fund ambitious projects to solve the world's biggest problems. But AI, in his mind, was the one realm of innovation to rule them all: a superintelligence that could address humanity's problems better than humanity could.

As luck would have it, Altman assumed his new job just as AI winter was turning into an abundant spring. Computers were now performing amazing feats, via deep learning and neural networks, like labeling photos, translating text, and optimizing sophisticated ad networks. The advances convinced him that for the first time, AGI was actually within reach. Leaving it in the hands of big corporations, however, worried him. He felt those companies would be too fixated on their products to seize the opportunity to develop AGI as soon as possible. And if they did create AGI, they might recklessly unleash it upon the world without the necessary precautions.

At the time, Altman had been thinking about running for governor of California. But he realized that he was perfectly positioned to do something bigger—to lead a company that would change humanity itself. "AGI was going to get built exactly once," he told me in 2021. "And there were not that many people that could do a good job running OpenAI. I was lucky to

have a set of experiences in my life that made me really positively set up for this."

Altman began talking to people who might help him start a new kind of AI company, a nonprofit that would direct the field toward responsible AGI. One kindred spirit was Tesla and SpaceX CEO Elon Musk. As Musk would later tell CNBC, he had become concerned about AI's impact after having some marathon discussions with Google cofounder Larry Page. Musk said he was dismayed that Page had little concern for safety and also seemed to regard the rights of robots as equal to humans. When Musk shared his concerns, Page accused him of being a "speciesist." Musk also understood that, at the time, Google employed much of the world's AI talent. He was willing to spend some money for an effort more amenable to Team Human.

Within a few months Altman had raised money from Musk (who pledged $100 million, and his time) and Reid Hoffman (who donated $10 million). Other funders included Peter Thiel, Jessica Livingston, Amazon Web Services, and YC Research. Altman began to stealthily recruit a team. He limited the search to AGI believers, a constraint that narrowed his options but one he considered critical. "Back in 2015, when we were recruiting, it was almost considered a career killer for an AI researcher to say that you took AGI seriously," he says. "But I wanted people who took it seriously."

Greg Brockman is now OpenAI's president.

Photograph: Jessica Chou

Greg Brockman, the chief technology officer of Stripe, was one such person, and he agreed to be OpenAI's CTO. Another key cofounder would be Andrej Karpathy, who had been at Google Brain, the search giant's cutting-edge AI research operation. But perhaps Altman's most sought-after target was a Russian-born engineer named Ilya Sutskever.

Sutskever's pedigree was unassailable. His family had emigrated from Russia to Israel, then to Canada. At the University of Toronto he had been a standout student under Geoffrey Hinton, known as the godfather of modern AI for his work on deep learning and neural networks. Hinton, who is still close to Sutskever, marvels at his protégé's wizardry. Early in Sutskever's

tenure at the lab, Hinton had given him a complicated project. Sutskever got tired of writing code to do the requisite calculations, and he told Hinton it would be easier if he wrote a custom programming language for the task. Hinton got a bit annoyed and tried to warn his student away from what he assumed would be a monthlong distraction. Then Sutskever came clean: "I did it this morning."

Sutskever became an AI superstar, coauthoring a breakthrough paper that showed how AI could learn to recognize images simply by being exposed to huge volumes of data. He ended up, happily, as a key scientist on the Google Brain team.

In mid-2015 Altman cold-emailed Sutskever to invite him to dinner with Musk, Brockman, and others at the swank Rosewood Hotel on Palo Alto's Sand Hill Road. Only later did Sutskever figure out that he was the guest of honor. "It was kind of a general conversation about AI and AGI in the future," he says. More specifically, they discussed "whether Google and DeepMind were so far ahead that it would be impossible to catch up to them, or whether it was still possible to, as Elon put it, create a lab which would be a counterbalance." While no one at the dinner explicitly tried to recruit Sutskever, the conversation hooked him.

Sutskever wrote an email to Altman soon after, saying he was game to lead the project—but the message got stuck in his drafts folder. Altman circled back, and after months fending off Google's counteroffers, Sutskever signed on. He would soon become the soul of the company and its driving force in research.

Sutskever joined Altman and Musk in recruiting people to the project, culminating in a Napa Valley retreat where several prospective OpenAI researchers fueled each other's excitement. Of course, some targets would resist the lure. John Carmack, the legendary gaming coder behind *Doom*, *Quake*, and countless other titles, declined an Altman pitch.

OpenAI officially launched in December 2015. At the time, [when I interviewed Musk and Altman](), they presented the project to me as an effort to make AI safe and accessible by sharing it with the world. In other words, open source. OpenAI, they told me, was not going to apply for patents.

Everyone could make use of their breakthroughs. Wouldn't that be empowering some future Dr. Evil? I wondered. Musk said that was a good question. But Altman had an answer: Humans are generally good, and because OpenAI would provide powerful tools for that vast majority, the bad actors would be overwhelmed. He admitted that if Dr. Evil were to use the tools to build something that couldn't be counteracted, "then we're in a really bad place." But both Musk and Altman believed that the safer course for AI would be in the hands of a research operation not polluted by the profit motive, a persistent temptation to ignore the needs of humans in the search for boffo quarterly results.

Altman cautioned me not to expect results soon. "This is going to look like a research lab for a long time," he said.

There was another reason to tamp down expectations. Google and the others had been developing and applying AI for years. While OpenAI had a billion dollars committed (largely via Musk), an ace team of researchers and engineers, and a lofty mission, it had no clue about how to pursue its goals. Altman remembers a moment when the small team gathered in Brockman's apartment—they didn't have an office yet. "I was like, what should we do?"

Altman remembers a moment when the small team gathered in Brockman's apartment—they didn't have an office yet. "I was like, what should we do?"

I had breakfast in San Francisco with Brockman a little more than a year after OpenAI's founding. For the CTO of a company with the word *open* in its name, he was pretty parsimonious with details. He did affirm that the nonprofit could afford to draw on its initial billion-dollar donation for a while. The salaries of the 25 people on its staff—who were being paid at far less than market value—ate up the bulk of OpenAI's expenses. "The goal for us, the thing that we're really pushing on," he said, "is to have the systems that can do things that humans were just not capable of doing before." But for the time being, what that looked like was a bunch of researchers publishing papers. After the interview, I walked him to the company's newish office in the Mission District, but he allowed me to go no further than the vestibule. He did duck into a closet to get me a T-shirt.

Had I gone in and asked around, I might have learned exactly how much OpenAI *was* floundering. Brockman now admits that "nothing was working." Its researchers were tossing algorithmic spaghetti toward the ceiling to see what stuck. They delved into systems that solved video games and spent considerable effort on robotics. "We knew *what* we wanted to do," says Altman. "We knew *why* we wanted to do it. But we had no idea *how*."

But they *believed*. Supporting their optimism were the steady improvements in artificial neural networks that used deep-learning techniques. "The general idea is, don't bet against deep learning," says Sutskever. Chasing AGI, he says, "wasn't totally crazy. It was only moderately crazy."

OpenAI's road to relevance really started with its hire of an as-yet-unheralded researcher named Alec Radford, who joined in 2016, leaving the small Boston AI company he'd cofounded in his dorm room. After accepting OpenAI's offer, he told his high school alumni magazine that taking this new role was "kind of similar to joining a graduate program"—an open-ended, low-pressure perch to research AI.

The role he would actually play was more like Larry Page inventing PageRank.

Radford, who is press-shy and hasn't given interviews on his work, responds to my questions about his early days at OpenAI via a long email exchange. His biggest interest was in getting neural nets to interact with humans in lucid conversation. This was a departure from the traditional scripted model of making a chatbot, an approach used in everything from the primitive ELIZA to the popular assistants Siri and Alexa—all of which kind of sucked. "The goal was to see if there was any task, any setting, any domain, any *anything* that language models could be useful for," he writes. At the time, he explains, "language models were seen as novelty toys that could only generate a sentence that made sense once in a while, and only then if you really squinted." His first experiment involved scanning 2 billion Reddit comments to train a language model. Like a lot of OpenAI's early experiments, it flopped. No matter. The 23-year-old had permission to keep going, to fail again. "We were just like, Alec is great, let him do his thing," says Brockman.

His next major experiment was shaped by OpenAI's limitations of computer power, a constraint that led him to experiment on a smaller data set that focused on a single domain—Amazon product reviews. A researcher had gathered about 100 million of those. Radford trained a language model to simply predict the next character in generating a user review.

Radford began experimenting with the transformer architecture. "I made more progress in two weeks than I did over the past two years," he says.

But then, on its own, the model figured out whether a review was positive or negative—and when you programmed the model to create something positive or negative, it delivered a review that was adulatory or scathing, as requested. (The prose was admittedly clunky: "I love this weapons look … A must watch for any man who love Chess!") "It was a complete surprise," Radford says. The sentiment of a review—its favorable or disfavorable gist —is a complex function of semantics, but somehow a part of Radford's system had gotten a feel for it. Within OpenAI, this part of the neural net came to be known as the "unsupervised sentiment neuron."

Sutskever and others encouraged Radford to expand his experiments beyond Amazon reviews, to use his insights to train neural nets to converse or answer questions on a broad range of subjects.

And then good fortune smiled on OpenAI. In early 2017, an unheralded preprint of a research paper appeared, coauthored by eight Google researchers. Its official title was "Attention Is All You Need," but it came to be known as the "transformer paper," named so both to reflect the game-changing nature of the idea and to honor the toys that transmogrified from trucks to giant robots. Transformers made it possible for a neural net to understand—and generate—language much more efficiently. They did this by analyzing chunks of prose in parallel and figuring out which elements merited "attention." This hugely optimized the process of generating coherent text to respond to prompts. Eventually, people came to realize that the same technique could also generate images and even video. Though the transformer paper would become known as the catalyst for the current AI frenzy—think of it as the Elvis that made the Beatles possible—at the time Ilya Sutskever was one of only a handful of people who understood how

powerful the breakthrough was. "The real *aha* moment was when Ilya saw the transformer come out," Brockman says. "He was like, 'That's what we've been waiting for.' That's been our strategy—to push hard on problems and then have faith that we or someone in the field will manage to figure out the missing ingredient."

Radford began experimenting with the transformer architecture. "I made more progress in two weeks than I did over the past two years," he says. He came to understand that the key to getting the most out of the new model was to add scale—to train it on fantastically large data sets. The idea was dubbed "Big Transformer" by Radford's collaborator Rewon Child.

This approach required a change of culture at OpenAI and a focus it had previously lacked. "In order to take advantage of the transformer, you needed to scale it up," says Adam D'Angelo, the CEO of Quora, who sits on OpenAI's board of directors. "You need to run it more like an engineering organization. You can't have every researcher trying to do their own thing and training their own model and make elegant things that you can publish papers on. You have to do this more tedious, less elegant work." That, he added, was something OpenAI was able to do, and something no one else did.

Mira Murati, OpenAI's chief technology officer.

Photograph: Jessica Chou

The name that Radford and his collaborators gave the model they created was an acronym for "generatively pretrained transformer"—GPT-1. Eventually, this model came to be generically known as "generative AI." To build it, they drew on a collection of 7,000 unpublished books, many in the genres of romance, fantasy, and adventure, and refined it on Quora questions and answers, as well as thousands of passages taken from middle school and high school exams. All in all, the model included 117 million parameters, or variables. And it outperformed everything that had come before in understanding language and generating answers. But the most dramatic result was that processing such a massive amount of data allowed the model to offer up results *beyond* its training, providing expertise in brand-new domains. These unplanned robot capabilities are called zero-

shots. They still baffle researchers—and account for the queasiness that many in the field have about these so-called large language models.

Radford remembers one late night at OpenAI's office. "I just kept saying over and over, 'Well, that's cool, but I'm pretty sure it won't be able to do *x*.' And then I would quickly code up an evaluation and, sure enough, it could kind of do *x*."

Each GPT iteration would do better, in part because each one gobbled an order of magnitude more data than the previous model. Only a year after creating the first iteration, OpenAI trained [GPT-2](#) on the open internet with an astounding 1.5 billion parameters. Like a toddler mastering speech, its responses got better and more coherent. So much so that OpenAI hesitated to release the program into the wild. Radford was worried that it might be used to generate spam. "I remember reading Neal Stephenson's *[Anathem](#)* in 2008, and in that book the internet was overrun with spam generators," he says. "I had thought that was really far-fetched, but as I worked on language models over the years and they got better, the uncomfortable realization that it was a real possibility set in."

In fact, the team at OpenAI was starting to think it wasn't such a good idea after all to put its work where Dr. Evil could easily access it. "We thought that open-sourcing GPT-2 could be really dangerous," says chief technology officer Mira Murati, who started at the company in 2018. "We did a lot of work with misinformation experts and did some red-teaming. There was a lot of discussion internally on how much to release." Ultimately, OpenAI temporarily withheld the full version, making a less powerful version available to the public. When the company finally shared the full version, the world managed just fine—but there was no guarantee that more powerful models would avoid catastrophe.

The very fact that OpenAI was making products smart enough to be deemed dangerous, and was grappling with ways to make them safe, was proof that the company had gotten its mojo working. "We'd figured out the formula for progress, the formula everyone perceives now—the oxygen and the hydrogen of deep learning is computation with a large neural network and data," says Sutskever.

To Altman, it was a mind-bending experience. "If you asked the 10-year-old version of me, who used to spend a lot of time daydreaming about AI, what was going to happen, my pretty confident prediction would have been that first we're gonna have robots, and they're going to perform all physical labor. Then we're going to have systems that can do basic cognitive labor. A really long way after that, maybe we'll have systems that can do complex stuff like proving mathematical theorems. Finally we will have AI that can create new things and make art and write and do these deeply human things. That was a terrible prediction—it's going exactly the other direction."

The world didn't know it yet, but Altman and Musk's research lab had begun a climb that plausibly creeps toward the summit of AGI. The crazy idea behind OpenAI suddenly was not so crazy.

By early 2018, OpenAI was starting to focus productively on large language models, or LLMs. But Elon Musk wasn't happy. He felt that the progress was insufficient—or maybe he felt that now that OpenAI was on to something, it needed leadership to seize its advantage. Or maybe, as he'd later explain, he felt that safety should be more of a priority. Whatever his problem was, he had a solution: Turn everything over to him. He proposed taking a majority stake in the company, adding it to the portfolio of his multiple full-time jobs (Tesla, SpaceX) and supervisory obligations (Neuralink and the Boring Company).

Musk believed he had a *right* to own OpenAI. "It wouldn't exist without me," he later told CNBC. "I came up with the name!" (True.) But Altman and the rest of OpenAI's brain trust had no interest in becoming part of the Muskiverse. When they made this clear, Musk cut ties, providing the public with the incomplete explanation that he was leaving the board to avoid a conflict with Tesla's AI effort. His farewell came at an all-hands meeting early that year where he predicted that OpenAI would fail. And he called at least one of the researchers a "jackass."

He also took his money with him. Since the company had no revenue, this was an existential crisis. "Elon is cutting off his support," Altman said in a panicky call to Reid Hoffman. "What do we do?" Hoffman volunteered to keep the company afloat, paying overhead and salaries.

But this was a temporary fix; OpenAI had to find big bucks elsewhere. Silicon Valley loves to throw money at talented people working on trendy tech. But not so much if they are working at a nonprofit. It had been a massive lift for OpenAI to get its first billion. To train and test new generations of GPT—and then access the computation it takes to deploy them—the company needed another billion, and fast. And that would only be the start.

Somewhere in the restructuring documents is a clause to the effect that, if the company does manage to create AGI, all financial arrangements will be reconsidered. After all, it will be a new world from that point on.

So in March 2019, OpenAI came up with a bizarre hack. It would remain a nonprofit, fully devoted to its mission. But it would also create a [for-profit entity](). The actual structure of the arrangement is hopelessly baroque, but basically the entire company is now engaged in a "capped" profitable business. If the cap is reached—the number isn't public, but its own charter, if you read between the lines, suggests it might be in the trillions—everything beyond that reverts to the nonprofit research lab. The novel scheme was almost a quantum approach to incorporation: Behold a company that, depending on your time-space point of view, is for-profit and nonprofit. The details are embodied in charts full of boxes and arrows, like the ones in the middle of a scientific paper where only PhDs or dropout geniuses dare to tread. When I suggest to Sutskever that it looks like something the as-yet-unconceived GPT-6 might come up with if you prompted it for a tax dodge, he doesn't warm to my metaphor. "It's not about accounting," he says.

But accounting is critical. A for-profit company optimizes for, well, profits. There's a reason why companies like Meta feel pressure from shareholders when they devote billions to R&D. How could this not affect the way a firm operates? And wasn't avoiding commercialism the reason why Altman made OpenAI a nonprofit to begin with? According to COO Brad Lightcap, the view of the company's leaders is that the board, which is still part of the nonprofit controlling entity, will make sure that the drive for revenue and profits won't overwhelm the original idea. "We needed to maintain the mission as the reason for our existence," he says, "It shouldn't just be in

spirit, but encoded in the structure of the company." Board member Adam D'Angelo says he takes this responsibility seriously: "It's my job, along with the rest of the board, to make sure that OpenAI stays true to its mission."

Potential investors were warned about those boundaries, Lightcap explains. "We have a legal disclaimer that says you, as an investor, stand to lose all your money," he says. "We are not here to make your return. We're here to achieve a technical mission, foremost. And, oh, by the way, we don't really know what role money will play in a post-AGI world."

That last sentence is not a throwaway joke. OpenAI's plan really does include a reset in case computers reach the final frontier. Somewhere in the restructuring documents is a clause to the effect that, if the company does manage to create AGI, all financial arrangements will be reconsidered. After all, it will be a new world from that point on. Humanity will have an alien partner that can do much of what we do, only better. So previous arrangements might effectively be kaput.

There is, however, a hitch: At the moment, OpenAI doesn't claim to know what AGI really *is*. The determination would come from the board, but it's not clear how the board would define it. When I ask Altman, who is on the board, for clarity, his response is anything but open. "It's not a single Turing test, but a number of things we might use," he says. "I would happily tell you, but I like to keep confidential conversations private. I realize that is unsatisfyingly vague. But we don't know what it's going to be like at that point."

Nonetheless, the inclusion of the "financial arrangements" clause isn't just for fun: OpenAI's leaders think that if the company is successful enough to reach its lofty profit cap, its products will probably have performed well enough to reach AGI. Whatever that is.

"My regret is that we've chosen to double down on the term AGI," Sutskever says. "In hindsight it is a confusing term, because it emphasizes generality above all else. GPT-3 is general AI, but yet we don't really feel comfortable calling it AGI, because we want human-level competence. But

back then, at the beginning, the idea of OpenAI was that superintelligence is attainable. It is the endgame, the final purpose of the field of AI."

Those caveats didn't stop some of the smartest venture capitalists from throwing money at OpenAI during its [2019 funding round](#). At that point, the first VC firm to invest was Khosla Ventures, which kicked in $50 million. According to Vinod Khosla, it was double the size of his largest initial investment. "If we lose, we lose 50 million bucks," he says. "If we win, we win 5 billion." Others investors reportedly would include elite VC firms Thrive Capital, Andreessen Horowitz, Founders Fund, and Sequoia.

The shift also allowed OpenAI's employees to claim some equity. But not Altman. He says that originally he intended to include himself but didn't get around to it. Then he decided that he didn't need any piece of the $30 billion company that he'd cofounded and leads. "Meaningful work is more important to me," he says. "I don't think about it. I honestly don't get why people care so much."

Because … not taking a stake in the company you cofounded is weird?

"If I didn't already have a ton of money, it would be much weirder," he says. "It does seem like people have a hard time imagining ever having enough money. But I feel like I have enough." (Note: For Silicon Valley, this is *extremely* weird.) Altman joked that he's considering taking one share of equity "so I never have to answer that question again."

Ilya Sutskever, OpenAI's chief scientist.

Photograph: Jessica Chou

The billion-dollar VC round wasn't even table stakes to pursue OpenAI's vision. The miraculous Big Transformer approach to creating LLMs required Big Hardware. Each iteration of the GPT family would need exponentially more power—GPT-2 had over a billion parameters, and GPT-3 would use 175 billion. OpenAI was now like Quint in *Jaws* after the shark hunter sees the size of the great white. "It turned out we didn't know how much of a bigger boat we needed," Altman says.

Obviously, only a few companies in existence had the kind of resources OpenAI required. "We pretty quickly zeroed in on Microsoft," says Altman. To the credit of Microsoft CEO Satya Nadella and CTO Kevin Scott, the software giant was able to get over an uncomfortable reality: After more than 20 years and billions of dollars spent on a research division with supposedly cutting-edge AI, the Softies needed an innovation infusion from a tiny company that was only a few years old. Scott says that it wasn't just Microsoft that fell short—"it was everyone." OpenAI's focus on pursuing AGI, he says, allowed it to accomplish a moonshot-ish achievement that the heavy hitters weren't even aiming for. It also proved that not pursuing generative AI was a lapse that Microsoft needed to address. "One thing you just very clearly need is a frontier model," says Scott.

Microsoft originally [chipped in a billion dollars](), paid off in computation time on its servers. But as both sides grew more confident, the deal expanded. Microsoft now has [sunk $13 billion]() into OpenAI. ("Being on the frontier is a very expensive proposition," Scott says.)

Of course, because OpenAI couldn't exist without the backing of a huge cloud provider, Microsoft was able to cut a great deal for itself. The corporation bargained for what Nadella calls "non-controlling equity interest" in OpenAI's for-profit side—reportedly 49 percent. Under the terms of the deal, some of OpenAI's original ideals of granting equal access to all were seemingly dragged to the trash icon. (Altman objects to this characterization.) Now, Microsoft has an exclusive license to commercialize OpenAI's tech. And OpenAI also has committed to use Microsoft's cloud exclusively. In other words, without even taking its cut of OpenAI's profits (reportedly Microsoft gets 75 percent until its investment is paid back), Microsoft gets to lock in one of the world's most desirable new customers for its Azure web services. With those rewards in sight, Microsoft wasn't even bothered by the clause that demands reconsideration if OpenAI achieves general artificial intelligence, whatever that is. "At that point," [says Nadella,]() "all bets are off." It might be the last invention of humanity, he notes, so we might have bigger issues to consider once machines are smarter than we are.

By the time Microsoft began unloading Brinks trucks' worth of cash into OpenAI ($2 billion in 2021, and the other $10 billion earlier this year), OpenAI had completed GPT-3, which, of course, was even more impressive than its predecessors. When Nadella saw what GPT-3 could do, he says, it was the first time he deeply understood that Microsoft had snared something truly transformative. "We started observing all those emergent properties." For instance, GPT had taught itself how to program computers. "We didn't train it on coding—it just got good at coding!" he says. Leveraging its ownership of GitHub, Microsoft released a product called Copilot that uses GPT to churn out code literally on command. Microsoft would later integrate OpenAI technology in new versions of its workplace products. Users pay a premium for those, and a cut of that revenue gets logged to OpenAI's ledger.

Some observers professed whiplash at OpenAI's one-two punch: creating a for-profit component and reaching an exclusive deal with Microsoft. How did a company that promised to remain patent-free, open source, and totally transparent wind up giving an exclusive license of its tech to the world's biggest software company? Elon Musk's remarks were particularly lacerating. "This does seem like the opposite of open—OpenAI is essentially captured by Microsoft," he posted on Twitter. On CNBC, he elaborated with an analogy: "Let's say you founded an organization to save the Amazon rainforest, and instead you became a lumber company, chopped down the forest, and sold it."

Musk's jibes might be dismissed as bitterness from a rejected suitor, but he wasn't alone. "The whole vision of it morphing the way it did feels kind of gross," says John Carmack. (He does specify that he's still excited about the company's work.) Another prominent industry insider, who prefers to speak without attribution, says, "OpenAI has turned from a small, somewhat open research outfit into a secretive product-development house with an unwarranted superiority complex."

Even some employees had been turned off by OpenAI's venture into the for-profit world. In 2019, several key executives, including head of research Dario Amodei, left to start a rival AI company called Anthropic. They

recently [told *The New York Times*](#) that OpenAI had gotten too commercial and had fallen victim to mission drift.

Another OpenAI defector was Rewon Child, a main technical contributor to the GPT-2 and GPT-3 projects. He left in late 2021 and is now at Inflection AI, a company led by former DeepMind cofounder Mustafa Suleyman.

Altman professes not to be bothered by defections, dismissing them as simply the way Silicon Valley works. "Some people will want to do great work somewhere else, and that pushes society forward," he says. "That absolutely fits our mission."

Until November of last year, awareness of OpenAI was largely confined to people following technology and software development. But as the whole world now knows, OpenAI took the dramatic step of releasing a consumer product late that month, built on what was then the most recent iteration of GPT, version 3.5. For months, the company had been internally using a version of GPT with a conversational interface. It was especially important for what the company called "truth-seeking." That means that via dialog, the user could coax the model to provide responses that would be more trustworthy and complete. ChatGPT, optimized for the masses, could allow anyone to instantly tap into what seemed to be an endless source of knowledge simply by typing in a prompt—and then continue the conversation as if hanging out with a fellow human who just happened to know everything, albeit one with a penchant for fabrication.

Within OpenAI, there was a lot of debate about the wisdom of releasing a tool with such unprecedented power. But Altman was all for it. The release, he explains, was part of a strategy designed to acclimate the public to the reality that artificial intelligence is destined to change their everyday lives, presumably for the better. Internally, this is known as the "iterative deployment hypothesis." Sure, ChatGPT would create a stir, the thinking went. After all, here was something anyone could use that was smart enough to get college-level scores on the SATs, write a B-minus essay, and summarize a book within seconds. You could ask it to write your funding proposal or summarize a meeting and then request it to do a rewrite in Lithuanian or as a Shakespeare sonnet or in the voice of someone obsessed with toy trains. In a few seconds, pow, the LLM would comply. Bonkers.

But OpenAI saw it as a table-setter for its newer, more coherent, more capable, and scarier successor, GPT-4, trained with a reported 1.7 trillion parameters. (OpenAI won't confirm the number, nor will it reveal the data sets.)

Altman explains why OpenAI released ChatGPT when GPT-4 was close to completion, undergoing safety work. "With ChatGPT, we could introduce chatting but with a much less powerful backend, and give people a more gradual adaptation," he says. "GPT-4 was a lot to get used to at once." By the time the ChatGPT excitement cooled down, the thinking went, people might be ready for GPT-4, which can pass the bar exam, plan a course syllabus, and write a book within seconds. (Publishing houses that produced genre fiction were indeed flooded with AI-generated bodice rippers and space operas.)

A cynic might say that a steady cadence of new products is tied to the company's commitment to investors, and equity-holding employees, to make some money. OpenAI now charges customers who use its products frequently. But OpenAI insists that its true strategy is to provide a soft landing for the singularity. "It doesn't make sense to just build AGI in secret and drop it on the world," Altman says. "Look back at the industrial revolution—everyone agrees it was great for the world," says Sandhini Agarwal, an OpenAI policy researcher. "But the first 50 years were really painful. There was a lot of job loss, a lot of poverty, and then the world adapted. We're trying to think how we can make the period before adaptation of AGI as painless as possible."

Sutskever puts it another way: "You want to build larger and more powerful intelligences and keep them in your basement?"

Even so, OpenAI was stunned at the reaction to ChatGPT. "Our internal excitement was more focused on GPT-4," says Murati, the CTO. "And so we didn't think ChatGPT was really going to change everything." To the contrary, it galvanized the public to the reality that AI had to be dealt with, *now.* ChatGPT became the fastest-growing consumer software in history, amassing a reported 100 million users. (Not-so-OpenAI won't confirm this, saying only that it has "millions of users.") "I underappreciated how much

making an easy-to-use conversational interface to an LLM would make it much more intuitive for everyone to use," says Radford.

ChatGPT was of course delightful and astonishingly useful, but also scary—prone to "hallucinations" of plausible but shamefully fabulist details when responding to prompts. Even as journalists wrung their hands about the implications, however, they effectively endorsed ChatGPT by extolling its powers.

The clamor got even louder in February when Microsoft, taking advantage of its multibillion-dollar partnership, released a [ChatGPT-powered version of its search engine](#) Bing. CEO Nadella was euphoric that he had beaten Google to the punch in introducing generative AI to Microsoft's products. He taunted the search king, which had been cautious in releasing its own LLM into products, to do the same. "I want people to know [we made them dance](#)," he said.

In so doing, Nadella triggered an arms race that tempted companies big and small to release AI products before they were fully vetted. He also a triggered a new round of media coverage that kept wider and wider circles of people up at night: interactions with Bing that unveiled the chatbot's shadow side, replete with unnerving professions of love, an envy of human freedom, and a weak resolve to withhold misinformation. As well as an unseemly habit of creating hallucinatory misinformation of its own.

But if OpenAI's products were forcing people to confront the implications of artificial intelligence, Altman figured, so much the better. It was time for the bulk of humankind to come off the sidelines in discussions of how AI might affect the future of the species.

Photograph: Jessica Chou

OpenAI's San Francisco headquarters is unmarked; but inside, the coffee is awesome.

Photograph: Jessica Chou

As society started to prioritize thinking through all the potential drawbacks of AI—job loss, misinformation, human extinction—OpenAI set about placing itself in the center of the discussion. Because if regulators, legislators, and doomsayers mounted a charge to smother this nascent alien intelligence in its cloud-based cradle, OpenAI would be their chief target anyway. "Given our current visibility, when things go wrong, even if those things were built by a different company, that's still a problem for us, because we're viewed as the face of this technology right now," says Anna Makanju, OpenAI's chief policy officer.

Makanju is a Russian-born DC insider who served in foreign policy roles at the US Mission to the United Nations, the US National Security Council, and the Defense Department, and in the office of Joe Biden when he was vice president. "I have lots of preexisting relationships, both in the US government and in various European governments," she says. She joined OpenAI in September 2021. At the time, very few people in government gave a hoot about generative AI. Knowing that OpenAI's products would soon change that, she began to introduce Altman to administration officials and legislators, making sure that they'd hear the good news and the bad from OpenAI first.

"Sam has been extremely helpful, but also very savvy, in the way that he has dealt with members of Congress," says Richard Blumenthal, the chair of the Senate Judiciary Committee. He contrasts Altman's behavior with that of the younger Bill Gates, who unwisely stonewalled legislators when Microsoft was under antitrust investigations in the 1990s. "Altman, by contrast, was happy to spend an hour or more sitting with me to try to educate me," says Blumenthal. "He didn't come with an army of lobbyists or minders. He demonstrated ChatGPT. It was mind-blowing."

In Blumenthal, Altman wound up making a semi-ally of a potential foe. "Yes," the senator admits. "I'm excited about both the upside and the potential perils." OpenAI didn't shrug off discussion of those perils, but presented itself as the force best positioned to mitigate them. "We had 100-page system cards on all the red-teaming safety valuations," says Makanju. (Whatever that meant, it didn't stop users and journalists from endlessly discovering ways to jailbreak the system.)

By the time Altman made his first appearance in [a congressional hearing](#)—fighting a fierce migraine headache—the path was clear for him to sail through in a way that Bill Gates or Mark Zuckerberg could never hope to. He faced almost none of the tough questions and arrogant badgering that tech CEOs now routinely endure after taking the oath. Instead, senators asked Altman for advice on how to regulate AI, a pursuit Altman enthusiastically endorsed.

The paradox is that no matter how assiduously companies like OpenAI red-team their products to mitigate misbehavior like deepfakes, misinformation efforts, and criminal spam, future models might get smart enough to foil the efforts of the measly minded humans who invented the technology yet are still naive enough to believe they can control it. On the other hand, if they go *too* far in making their models safe, it might hobble the products, making them less useful. One study indicated that more recent versions of GPT, which have improved safety features, are actually dumber than previous versions, making errors in basic math problems that earlier programs had aced. (Altman says that OpenAI's data doesn't confirm this. "Wasn't that study retracted?" he asks. No.)

It makes sense that Altman positions himself as a fan of regulation; after all, his mission is AGI, but safely. Critics have charged that he's gaming the process so that regulations would thwart smaller startups and give an advantage to OpenAI and other big players. Altman denies this. While he has endorsed, in principle, the idea of an international agency overseeing AI, he does feel that some proposed rules, like banning all copyrighted material from data sets, present unfair obstacles. He pointedly didn't sign a widely distributed letter urging a six-month moratorium on developing more powerful AI systems. But he and other OpenAI leaders did add their names to a one-sentence statement: "Mitigating the risk of extinction from AI should be a global priority alongside other societal-scale risks such as pandemics and nuclear war." Altman explains: "I said, 'Yeah, I agree with that. One-minute discussion."

As one prominent Silicon Valley founder notes, "It's rare that an industry raises their hand and says, 'We are going to be the end of humanity'—and then continues to work on the product with glee and alacrity."

OpenAI rejects this criticism. Altman and his team say that working and releasing cutting-edge products is *the way* to address societal risks. Only by analyzing the responses to millions of prompts by users of ChatGPT and GPT-4 could they get the knowledge to ethically align their future products.

Still, as the company takes on more tasks and devotes more energy to commercial activities, some question how closely OpenAI can concentrate on the mission—especially the "mitigating risk of extinction" side. "If you think about it, they're actually building *five* businesses," says an AI industry executive, ticking them off with his fingers. "There's the product itself, the enterprise relationship with Microsoft, the developer ecosystem, and an app store. And, oh yes—they are also obviously doing an AGI research mission." Having used all five fingers, he recycles his index finger to add a sixth. "And of course, they're also doing the investment fund," he says, referring to a $175 million project to seed startups that want to tap into OpenAI technology. "These are different cultures, and in fact they're conflicting with a research mission."

I repeatedly asked OpenAI's execs how donning the skin of a product company has affected its culture. Without fail they insist that, despite the for-profit restructuring, despite the competition with Google, Meta, and countless startups, the mission is still central. Yet OpenAI *has* changed. The nonprofit board might technically be in charge, but virtually everyone in the company is on the for-profit ledger. Its workforce includes lawyers, marketers, policy experts, and user-interface designers. OpenAI contracts with hundreds of content moderators to educate its models on inappropriate or harmful answers to the prompts offered by many millions of users. It's got product managers and engineers working constantly on updates to its products, and every couple of weeks it seems to ping reporters with demonstrations—just like other product-oriented Big Tech companies. Its offices look like an *Architectural Digest* spread. I have visited virtually every major tech company in Silicon Valley and beyond, and not one surpasses the coffee options in the lobby of OpenAI's headquarters in San Francisco.

Not to mention: It's obvious that the "openness" embodied in the company's name has shifted from the radical transparency suggested at

launch. When I bring this up to Sutskever, he shrugs. "Evidently, times have changed," he says. But, he cautions, that doesn't mean that the prize is not the same. "You've got a technological transformation of such gargantuan, cataclysmic magnitude that, even if we all do our part, success is not guaranteed. But if it all works out we can have quite the incredible life."

"The biggest thing we're missing is coming up with new ideas," says Brockman. "It's nice to have something that could be a virtual assistant. But that's not the dream. The dream is to help us solve problems we can't."

"I can't emphasize this enough—we didn't have a master plan," says Altman. "It was like we were turning each corner and shining a flashlight. We were willing to go through the maze to get to the end." Though the maze got twisty, the goal has not changed. "We still have our core mission —believing that safe AGI was this critically important thing that the world was not taking seriously enough."

Meanwhile, OpenAI is apparently taking its time to develop the next version of its large language model. It's hard to believe, but the company insists it has yet to begin working on GPT-5, a product that people are, depending on point of view, either salivating about or dreading. Apparently, OpenAI is grappling with what an exponentially powerful improvement on its current technology actually looks like. "The biggest thing we're missing is coming up with new ideas," says Brockman. "It's nice to have something that could be a virtual assistant. But that's not the dream. The dream is to help us solve problems we can't."

Considering OpenAI's history, that next big set of innovations might have to wait until there's another breakthrough as major as transformers. Altman hopes that will come from OpenAI—"We want to be the best research lab in the world," he says—but even if not, his company will make use of others' advances, as it did with Google's work. "A lot of people around the world are going to do important work," he says.

It would also help if generative AI didn't create so many new problems of its own. For instance, LLMs need to be trained on huge data sets; clearly the most powerful ones would gobble up the whole internet. This doesn't sit well with some creators, and just plain people, who unwittingly provide

content for those data sets and wind up somehow contributing to the output of ChatGPT. Tom Rubin, an elite intellectual property lawyer who officially joined OpenAI in March, is optimistic that the company will eventually find a balance that satisfies both its own needs and that of creators—including the ones, like comedian Sarah Silverman, who are [suing OpenAI](#) for using their content to train its models. One hint of OpenAI's path: partnerships with news and photo agencies like the [Associated Press](#) and [Shutterstock](#) to provide content for its models without questions of who owns what.

As I interview Rubin, my very human mind, subject to distractions you never see in LLMs, drifts to the arc of this company that in eight short years has gone from a floundering bunch of researchers to a Promethean behemoth that has changed the world. Its very success has led it to transform itself from a novel effort to achieve a scientific goal to something that resembles a standard Silicon Valley unicorn on its way to elbowing into the pantheon of Big Tech companies that affect our everyday lives. And here I am, talking with one of its key hires—a lawyer—not about neural net weights or computer infrastructure but copyright and fair use. Has this IP expert, I wonder, signed on to the mission, like the superintelligence-seeking voyagers who drove the company originally?

Rubin is nonplussed when I ask him whether he believes, as an article of faith, that AGI will happen and if he's hungry to make it so. "I can't even answer that," he says after a pause. When pressed further, he clarifies that, as an intellectual property lawyer, speeding the path to scarily intelligent computers is not his job. "From my perch, I look forward to it," he finally says.

Updated 9-7-23, 5:30pm EST: This story was updated to clarify Rewon Child's role at OpenAI, and the aim of a letter calling for a six-month pause on the most powerful AI models.

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How to Use AI to Talk to Whales—and Save Life on Earth

With ecosystems in crisis, engineers and scientists are teaming up to decipher what animals are saying. Their hope: By truly listening to nature, humans will decide to protect it.
ILLUSTRATION: AGNES JONAS

Before Michelle Fournet moved to Alaska on a whim in her early twenties, she'd never seen a [whale](#). She took a job on a whale watching boat and, each day she was out on the water, gazed at the grand shapes moving under the surface. For her entire life, she realized, the [natural world](#) had been out there, and she'd been missing it. "I didn't even know I was bereft," she recalls. Later, as a graduate student in marine biology, Fournet wondered what else she was missing. The humpbacks she was getting to know revealed themselves in partial glimpses. What if she could hear what they were saying? She dropped a hydrophone in the water—but the only sound that came through was the mechanical churn of boats. The whales had fallen silent amid the racket. Just as Fournet had discovered nature, then, she was witnessing it recede. She resolved to help the whales. To do that, she needed to learn how to listen to them.

Fournet, now a professor at the University of New Hampshire and the director of [a collective of conservation scientists](#), has spent the past decade building a catalog of the various chirps, shrieks, and groans that humpbacks make in daily life. The whales have huge and diverse vocabularies, but there is one thing they all say, whether male or female, young or old. To our

meager human ears, it sounds something like a belly rumble punctuated by a water droplet: *whup.*

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Photograph: Jessica Chou

Fournet thinks the whup call is how the whales announce their presence to one another. A way of saying, "I'm here." Last year, as part of a series of experiments to test her theory, Fournet piloted a skiff out into Alaska's Frederick Sound, where humpbacks gather to feed on clouds of krill. She broadcast a sequence of whup calls and recorded what the whales did in response. Then, back on the beach, she put on headphones and listened to the audio. Her calls went out. The whales' voices returned through the water: *whup, whup, whup.* Fournet describes it like this: The whales heard a voice say, "I am, I am here, I am me." And they replied, "I also am, I am here, I am me."

Biologists use this type of experiment, called a playback, to study what prompts an animal to speak. Fournet's playbacks have so far used recordings of real whups. The method is imperfect, though, because humpbacks are highly attentive to who they're talking to. If a whale recognizes the voice of the whale in the recording, how does that affect its response? Does it talk to a buddy differently than it would to a stranger? As a biologist, how do you ensure you're sending out a neutral whup?

One answer is to create your own. Fournet has shared her catalog of humpback calls with the Earth Species Project, a group of technologists and engineers who, with the help of AI, are aiming to develop a synthetic whup. And they're not just planning to emulate a humpback's voice. The nonprofit's mission is to open human ears to the chatter of the entire animal kingdom. In 30 years, they say, nature documentaries won't need soothing Attenborough-style narration, because the dialog of the animals onscreen will be subtitled. And just as engineers today don't need to know Mandarin or Turkish to build a chatbot in those languages, it will soon be possible to build one that speaks Humpback—or Hummingbird, or Bat, or Bee.

The idea of "decoding" animal communication is bold, maybe unbelievable, but a time of crisis calls for bold and unbelievable measures. Everywhere that humans are, which is everywhere, animals are vanishing. Wildlife populations across the planet have dropped an average of nearly 70 percent in the past 50 years, according to one estimate—and that's just the portion of the crisis that scientists have measured. Thousands of species could disappear without humans knowing anything about them at all.

To decarbonize the economy and preserve ecosystems, we certainly don't need to talk to animals. But the more we know about the lives of other creatures, the better we can care for those lives. And humans, being human, pay more attention to those who speak our language. The interaction that Earth Species wants to make possible, Fournet says, "helps a society that is disconnected from nature to reconnect with it." The best technology gives humans a way to inhabit the world more fully. In that light, talking to animals could be its most natural application yet.

Humans have always known how to listen to other species, of course. Fishers throughout history collaborated with whales and dolphins to mutual benefit: a fish for them, a fish for us. In 19th-century Australia, a pod of killer whales was known to herd baleen whales into a bay near a whalers' settlement, then slap their tails to alert the humans to ready the harpoons. (In exchange for their help, the orcas got first dibs on their favorite cuts, the lips and tongue.) Meanwhile, in the icy waters of Beringia, Inupiat people listened and spoke to bowhead whales before their hunts. As the environmental historian Bathsheba Demuth writes in her book *Floating Coast*, the Inupiat thought of the whales as neighbors occupying "their own country" who chose at times to offer their lives to humans—if humans deserved it.

Commercial whalers had a different approach. They saw whales as floating containers of blubber and baleen. The American whaling industry in the mid-19th century, and then the global whaling industry in the following century, very nearly obliterated several species, resulting in one of the largest-ever losses of wild animal life caused by humans. In the 1960s, 700,000 whales were killed, marking the peak of cetacean death. Then, something remarkable happened: We heard whales sing. On a trip to

Bermuda, the biologists Roger and Katy Payne met a US naval engineer named Frank Watlington, who gave them recordings he'd made of strange melodies captured deep underwater. For centuries, sailors had recounted tales of eerie songs that emanated from their boats' wooden hulls, whether from monsters or sirens they didn't know. Watlington thought the sounds were from humpback whales. Go save them, he told the Paynes. They did, by releasing an album, *Songs of the Humpback Whale*, that made these singing whales famous. The Save the Whales movement took off soon after. In 1972, the US passed the Marine Mammal Protection Act; in 1986, commercial whaling was banned by the International Whaling Commission. In barely two decades, whales had transformed in the public eye into cognitively complex and gentle giants of the sea.

Roger Payne, who died earlier this year, spoke frequently about his belief that the more the public could know "curious and fascinating things" about whales, the more people would care what happened to them. In his opinion, science alone would never change the world, because humans don't respond to data; they respond to emotion—to things that make them weep in awe or shiver with delight. He was in favor of wildlife tourism, zoos, and captive dolphin shows. However compromised the treatment of individual animals might be in these places, he believed, the extinction of a species is far worse. Conservationists have since held on to the idea that contact with animals can save them.

From this premise, Earth Species is taking the imaginative leap that AI can help us make *first* contact with animals. The organization's founders, Aza Raskin and Britt Selvitelle, are both architects of our digital age. Raskin grew up in Silicon Valley; his father started Apple's Macintosh project in the 1970s. Early in his career, Raskin helped to build Firefox, and in 2006 he created the infinite scroll, arguably his greatest and most dubious legacy. Repentant, he later calculated the collective human hours that his invention had wasted and arrived at a figure surpassing 100,000 lifetimes per week.

Raskin would sometimes hang out at a startup called Twitter, where he met Selvitelle, a founding employee. They stayed in touch. In 2013, Raskin heard a news story on the radio about [gelada monkeys in Ethiopia](#) whose communication had similar cadences to human speech. So similar, in fact,

that the lead scientist would sometimes hear a voice talking to him, turn around, and be surprised to find a monkey there. The interviewer asked whether there was any way of knowing what they were trying to say. There wasn't—but Raskin wondered if it might be possible to arrive at an answer with machine learning. He brought the idea up with Selvitelle, who had an interest in animal welfare.

For a while the idea was just an idea. Then, in 2017, new research showed that machines could translate between two languages without first being trained on bilingual texts. Google Translate had always mimicked the way a human might use a dictionary, just faster and at scale. But these new machine learning methods bypassed semantics altogether. They treated languages as geometric shapes and found where the shapes overlapped. If a machine could translate any language into English without needing to understand it first, Raskin thought, could it do the same with a gelada monkey's wobble, an elephant's infrasound, a bee's waggle dance? A year later, Raskin and Selvitelle formed Earth Species.

Raskin believes that the ability to eavesdrop on animals will spur nothing less than a paradigm shift as historically significant as the Copernican revolution. He is fond of saying that "AI is the invention of modern optics." By this he means that just as improvements to the telescope allowed 17th-century astronomers to perceive newfound stars and finally displace the Earth from the center of the cosmos, AI will help scientists hear what their ears alone cannot: that animals speak meaningfully, and in more ways than we can imagine. That their abilities, and their lives, are not less than ours. "This time we're going to look out to the universe and discover humanity is not the center," Raskin says.

Raskin and Selvitelle spent their first few years meeting with biologists and tagging along on fieldwork. They soon realized that the most obvious and immediate need in front of them wasn't inciting revolution. It was sorting data. Two decades ago, a primate researcher would stand under a tree and hold a microphone in the air until her arm got tired. Now researchers can stick a portable biologger to a tree and collect a continuous stream of audio for a year. The many terabytes of data that result is more than any army of grad students could hope to tackle. But feed all this material to trained

machine learning algorithms, and the computer can scan the data and flag the animal calls. It can distinguish a whup from a whistle. It can tell a gibbon's voice from her brother's. At least, that's the hope. These tools need more data, research, and funding. Earth Species has a workforce of 15 people and a budget of a few million dollars. They've teamed up with several dozen biologists to start making headway on these practical tasks.

An early project took on one of the most significant challenges in animal communication research, known as the cocktail party problem: When a group of animals are talking to one another, how can you tell who's saying what? In the open sea, schools of dolphins a thousand strong chatter all at once; scientists who record them end up with audio as dense with whistles and clicks as a stadium is with cheers. Even audio of just two or three animals is often unusable, says Laela Sayigh, an expert in bottlenose dolphin whistles, because you can't tell where one dolphin stops talking and another starts. (Video doesn't help, because dolphins don't open their mouths when they speak.) Earth Species used Sayigh's extensive database of signature whistles—the ones likened to names—to develop a neural network model that could separate overlapping animal voices. That model was useful only in lab conditions, but research is meant to be built on. A couple of months later, Google AI published a model for untangling wild birdsong.

Sayigh has proposed a tool that can serve as an emergency alert for dolphin mass strandings, which tend to recur in certain places around the globe. She lives in Cape Cod, Massachusetts, one such hot spot, where as often as a dozen times a year groups of dolphins get disoriented, inadvertently swim onto shore, and perish. Fortunately, there might be a way to predict this before it happens, Sayigh says. She hypothesizes that when the dolphins are stressed, they emit signature whistles more than usual, just as someone lost in a snowstorm might call out in panic. A computer trained to listen for these whistles could send an alert that prompts rescuers to reroute the dolphins before they hit the beach. In the Salish Sea—where, in 2018, a mother orca towing the body of her starved calf attracted global sympathy—there is an alert system, built by Google AI, that listens for resident killer whales and diverts ships out of their way.

For researchers and conservationists alike, the potential applications of machine learning are basically limitless. And Earth Species is not the only group working on decoding animal communication. Payne spent the last months of his life advising for Project CETI, a nonprofit that built a base in Dominica this year for the study of sperm whale communication. "Just imagine what would be possible if we understood what animals are saying to each other; what occupies their thoughts; what they love, fear, desire, avoid, hate, are intrigued by, and treasure," he wrote in *Time* in June.

Many of the tools that Earth Species has developed so far offer more in the way of groundwork than immediate utility. Still, there's a lot of optimism in this nascent field. With enough resources, several biologists told me, decoding is scientifically achievable. That's only the beginning. The real hope is to bridge the gulf in understanding between an animal's experience and ours, however vast—or narrow—that might be.

Ari Friedlaender has something that Earth Species needs: lots and lots of data. Friedlaender researches whale behavior at UC Santa Cruz. He got started as a tag guy: the person who balances at the edge of a boat as it chases a whale, holds out a long pole with a suction-cupped biologging tag attached to the end, and slaps the tag on a whale's back as it rounds the surface. This is harder than it seems. Friedlaender proved himself adept—"I played sports in college," he explains—and was soon traveling the seas on tagging expeditions.

The tags Friedlaender uses capture a remarkable amount of data. Each records not only GPS location, temperature, pressure, and sound, but also high-definition video and three-axis accelerometer data, the same tech that a Fitbit uses to count your steps or measure how deeply you're sleeping. Taken together, the data illustrates, in cinematic detail, a day in the life of a whale: its every breath and every dive, its traverses through fields of sea nettles and jellyfish, its encounters with twirling sea lions.

Friedlaender shows me an animation he has made from one tag's data. In it, a whale descends and loops through the water, traveling a multicolored three-dimensional course as if on an undersea Mario Kart track. Another animation depicts several whales blowing bubble nets, a feeding strategy in which they swim in circles around groups of fish, trap the fish in the center

with a wall of bubbles, then lunge through, mouths gaping. Looking at the whales' movements, I notice that while most of them have traced a neat spiral, one whale has produced a tangle of clumsy zigzags. "Probably a young animal," Friedlaender says. "That one hasn't figured things out yet."

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Friedlaender's multifaceted data is especially useful for Earth Species because, as any biologist will tell you, animal communication isn't purely verbal. It involves gestures and movement just as often as vocalizations. Diverse data sets get Earth Species closer to developing algorithms that can work across the full spectrum of the animal kingdom. The organization's most recent work focuses on foundation models, the same kind of computation that powers generative AI like ChatGPT. Earlier this year, Earth Species published the first foundation model for animal communication. The model can already accurately sort beluga whale calls, and Earth Species plans to apply it to species as disparate as orangutans (who bellow), elephants (who send seismic rumbles through the ground), and jumping spiders (who vibrate their legs). Katie Zacarian, Earth Species' CEO, describes the model this way: "Everything's a nail, and it's a hammer."

Another application of Earth Species' AI is generating animal calls, like an audio version of GPT. Raskin has made a few-second chirp of a chiffchaff bird. If this sounds like it's getting ahead of decoding, it is—AI, as it turns out, is better at speaking than understanding. Earth Species is finding that the tools it is developing will likely have the ability to talk to animals even before they can decode. It may soon be possible, for example, to prompt an AI with a whup and have it continue a conversation in Humpback—without human observers knowing what either the machine or the whale is saying.

No one is expecting such a scenario to actually take place; that would be scientifically irresponsible, for one thing. The biologists working with Earth Species are motivated by knowledge, not dialog for the sake of it. Felix Effenberger, a senior AI research adviser for Earth Species, told me: "I

don't believe that we will have an English-Dolphin translator, OK? Where you put English into your smartphone and then it makes dolphin sounds and the dolphin goes off and fetches you some sea urchin. The goal is to first discover basic patterns of communication."

So what will talking to animals look—sound—like? It needn't be a free-form conversation to be astonishing. Speaking to animals in a controlled way, as with Fournet's playback whups, is probably essential for scientists to try to understand them. After all, you wouldn't try to learn German by going to a party in Berlin and sitting mutely in a corner.

Bird enthusiasts already use apps to snatch melodies out of the air and identify which species is singing. With an AI as your animal interpreter, imagine what more you could learn. You prompt it to make the sound of two humpbacks meeting, and it produces a whup. You prompt it to make the sound of a calf talking to its mother, and it produces a whisper. You prompt it to make the sound of a lovelorn male, and it produces a song.

ILLUSTRATION: AGNES JONAS

No species of whale has ever been driven extinct by humans. This is hardly a victory. Numbers are only one measure of biodiversity. Animal lives are rich with all that they are saying and doing—with culture. While humpback populations have rebounded since their lowest point a half-century ago, what songs, what practices, did they lose in the meantime? Blue whales, hunted down to a mere 1 percent of their population, might have lost almost everything.

Christian Rutz, a biologist at the University of St. Andrews, believes that one of the essential tasks of conservation is to preserve nonhuman ways of being. "You're not asking, 'Are you there or are you not there?'" he says. "You are asking, 'Are you there and happy, or unhappy?'"

Rutz is studying how the communication of Hawaiian crows has changed since 2002, when they went extinct in the wild. About 100 of these remarkable birds—one of few species known to use tools—are alive in protective captivity, and conservationists hope to eventually reintroduce them to the wild. But these crows may not yet be prepared. There is some

evidence that the captive birds have forgotten useful vocabulary, including calls to defend their territory and warn of predators. Rutz is working with Earth Species to build an algorithm to sift through historical recordings of the extinct wild crows, pull out all the crows' calls, and label them. If they find that calls were indeed lost, conservationists might generate those calls to teach them to the captive birds.

Rutz is careful to say that generating calls will be a decision made thoughtfully, when the time requires it. In a paper published in *Science* in July, he praised the extraordinary usefulness of machine learning. But he cautions that humans should think hard before intervening in animal lives. Just as AI's potential remains unknown, it may carry risks that extend beyond what we can imagine. Rutz cites as an example the new songs composed each year by humpback whales that spread across the world like hit singles. Should these whales pick up on an AI-generated phrase and incorporate that into their routine, humans would be altering a million-year-old culture. "I think that is one of the systems that should be off-limits, at least for now," he told me. "Who has the right to have a chat with a humpback whale?"

It's not hard to imagine how AI that speaks to animals could be misused. Twentieth-century whalers employed the new technology of their day, too, emitting sonar at a frequency that drove whales to the surface in panic. But AI tools are only as good or bad as the things humans do with them. Tom Mustill, a conservation documentarian and the author of *How to Speak Whale*, suggests giving animal-decoding research the same resources as the most championed of scientific endeavors, like the Large Hadron Collider, the Human Genome Project, and the James Webb Space Telescope. "With so many technologies," he told me, "it's just left to the people who have developed it to do what they like until the rest of the world catches up. This is too important to let that happen."

Billions of dollars are being funneled into AI companies, much of it in service of corporate profits: writing emails more quickly, creating stock photos more efficiently, delivering ads more effectively. Meanwhile, the mysteries of the natural world remain. One of the few things scientists know with certainty is how much they don't know. When I ask Friedlaender

whether spending so much time chasing whales has taught him much about them, he tells me he sometimes gives himself a simple test: After a whale goes under the surface, he tries to predict where it will come up next. "I close my eyes and say, 'OK, I've put out 1,000 tags in my life, I've seen all this data. The whale is going to be over *here*.' And the whale's always over *there*," he says. "I have no idea what these animals are doing."

If you could speak to a whale, what would you say? Would you ask White Gladis, the killer whale elevated to meme status this summer for sinking yachts off the Iberian coast, what motivated her rampage—fun, delusion, revenge? Would you tell Tahlequah, the mother orca grieving the death of her calf, that you, too, lost a child? Payne once said that if given the chance to speak to a whale, he'd like to hear its normal gossip: loves, feuds, infidelities. Also: "*Sorry* would be a good word to say."

Then there is that thorny old philosophical problem. The question of *umwelt*, and what it's like to be a bat, or a whale, or you. Even if we could speak to a whale, would we understand what it says? Or would its perception of the world, its entire ordering of consciousness, be so alien as to be unintelligible? If machines render human languages as shapes that overlap, perhaps English is a doughnut and Whalish is the hole.

Maybe, before you can speak to a whale, you must know what it is like to have a whale's body. It is a body 50 million years older than our body. A body shaped to the sea, to move effortlessly through crushing depths, to counter the cold with sheer mass. As a whale, you choose when to breathe, or not. Mostly you are holding your breath. Because of this, you cannot smell or taste. You do not have hands to reach out and touch things with. Your eyes are functional, but sunlight penetrates water poorly. Usually you can't even make out your own tail through the fog.

You would live in a cloud of hopeless obscurity were it not for your ears. Sound travels farther and faster through water than through air, and your world is illuminated by it. For you, every dark corner of the ocean rings with sound. You hear the patter of rain on the surface, the swish of krill, the blasts of oil drills. If you're a sperm whale, you spend half your life in the pitch black of the deep sea, hunting squid by ear. You use sound to speak, too, just as humans do. But your voice, rather than dissipating instantly in

the thin substance of air, sustains. Some whales can shout louder than a jet engine, their calls carrying 10,000 miles across the ocean floor.

But what is it like to *be* you, a whale? What thoughts do you think, what feelings do you feel? These are much harder things for scientists to know. A few clues come from observing how you talk to your own kind. If you're born into a pod of killer whales, close-knit and xenophobic, one of the first things your mother and your grandmother teach you is your clan name. To belong must feel essential. (Remember Keiko, the orca who starred in the film *Free Willy*: When he was released to his native waters late in life, he failed to rejoin the company of wild whales and instead returned to die among humans.) If you're a female sperm whale, you click to your clanmates to coordinate who's watching whose baby; meanwhile, the babies babble back. You live on the go, constantly swimming to new waters, cultivating a disposition that is nervous and watchful. If you're a male humpback, you spend your time singing alone in icy polar waters, far from your nearest companion. To infer loneliness, though, would be a human's mistake. For a whale whose voice reaches across oceans, perhaps distance does not mean solitude. Perhaps, as you sing, you are always in conversation.

Michelle Fournet wonders: *How do we know whales would want to talk to us anyway?* What she loves most about humpbacks is their indifference. "This animal is 40 feet long and weighs 75,000 pounds, and it doesn't give a shit about you," she told me. "Every breath it takes is grander than my entire existence." Roger Payne observed something similar. He considered whales the only animal capable of an otherwise impossible feat: making humans feel small.

Early one morning in Monterey, California, I boarded a whale watching boat. The water was slate gray with white peaks. Flocks of small birds skittered across the surface. Three humpbacks appeared, backs rounding neatly out of the water. They flashed some tail, which was good for the group's photographers. The fluke's craggy ridge-line can be used, like a fingerprint, to distinguish individual whales.

Later, I uploaded a photo of one of the whales to Happywhale. The site identifies whales using a facial recognition algorithm modified for flukes.

The humpback I submitted, one with a barnacle-encrusted tail, came back as CRC-19494. Seventeen years ago, this whale had been spotted off the west coast of Mexico. Since then, it had made its way up and down the Pacific between Baja and Monterey Bay. For a moment, I was impressed that this site could so easily fish an animal out of the ocean and deliver me a name. But then again, what did I know about this whale? Was it a mother, a father? Was this whale on Happywhale actually happy? The AI had no answers. I searched the whale's profile and found a gallery of photos, from different angles, of a barnacled fluke. For now, that was all I could know.

This article appears in the October 2023 issue. [Subscribe now](#).

Let us know what you think about this article. Submit a letter to the editor at [mail@wired.com](#).

[Paul Ford](#)

[Ideas](#)
Sep 25, 2023 8:00 AM

Why Tech Bros and Politicians Can't Really Connect

There are two ways to compute, and two ways to see the world. It's batch vs. loop—and we need them to reconcile.
Illustration: Twisha Patni

Every few months we get to see a tech dude offer excruciating testimony to grumpy members of [Congress](#). The tech dude tries, with varying degrees of arrogance, to explain his world; the congresspeople recite their questions; in the end, no one seems notably changed by the experience. There are many ways to understand these interactions—East Coast versus West Coast, lawyers versus engineers, political narcissists versus corporate narcissists— but I think the core conflict is between *batch* culture and *event loop* culture.

In the beginning of [computing](#), batch processing reigned supreme. You would gather your stack of punch cards, wait in line for your turn at the giant electronic brain, feed it your data and instructions, then wait minutes or days for its digital gears to grind out a response. Each batch had a discrete Before and After: You did a thing, the computer did a thing, you went back to gathering punch cards. Then came the event loop: The electronic brain—now small and affordable enough to sit on your desk!— would wait for *you.* You would do something (type a key, press a button, or later, click a mouse) and it would respond, right there in the moment, painting a letter on the screen or starting up a video.

The web started out batch. It was a delivery platform for mostly static pages of HTML. You could make sort-of-interactive pages from databases, but the

interaction was clunky. Then came JavaScript, a programming language that was all about its event loop. The online document no longer just sat there, all pathetic and booklike. Every time you moved your mouse, every time you punched a monkey in a banner ad, it took notice. And people did punch the monkey, and the web became less about documents and more about *experience* and *interaction*. Tapping on Wordle, skipping to the next episode on Netflix, scrolling [Facebook](#)—behind every great tech success of the past decade is a loop awaiting user input. People still do a lot of batch-*style* programming, of course, but they call it "shell scripting" or "running analytics reports" or "sending email newsletters at 4 am."

Over the years, this bifurcation—batch versus loop—has become a way that I classify the world. Banks are batch, with their slow resolution of accounts at the end of the day. (Oh, they'll tell you they offer real-time this or that, but when you dig in you'll discover they save stuff on magnetic tapes.) [Crypto](#), constantly transacting in response to users sending messages with magic tokens, is much loopier, a 24-hour reactive, never-ending event. Books, which take years to produce and come out long after they're newsworthy, are batch, as are albums; livestreams on TikTok are loop.

Congress, as a policymaking body, is basically pure batch. If you've ever seen the *Schoolhouse Rock* cartoon with the bill on Capitol Hill, you know that our federal government is essentially a very expensive and inefficient content management system for producing legal documents. You put all the protests, debates, investigations, meetings, and procedures into the CMS, and out comes a shining act, law, or, every half-century or so, even an amendment. Modern tech, meanwhile, is pure event loop. That's true not only of the obvious stuff, like social media and mobile gambling, but [AI](#) too. Though it starts with giant batch processes to create models, the resulting *product* is event loop: Ask it to draw a picture of a surfing ocelot and it draws one, just like that. Loop has room for reaction. Loop is live. Loop is what the kids crave.

So when the Zuckerbergs, Dorseys, and Altmans go before Congress, I see loop people in a batch world. In their universe, vast numbers of humans do trillions of little things; the tech people look at the metrics and dashboards, then build software that reacts to those things. Sometimes vicious factions

break out among their users with terrible real-world effects, and they feel bad about that, but that's humans! The difference between tech and government is that they see time in totally different ways.

Books and albums are batch. TikTok livestreams are loop.

Personally, I'm a batch person in a loop world. I am slow, I like to write memos, and I think of computers as machines to make things, not as always-on experience generators. I still believe that things are more real when you print them out. My children, on the other hand, have grown up believing that technology is responsive, reactive, social, self-arranging, and freely available. "Dad," my son said, "I'd like to touch less grass." His sister makes apps with her friends. She recently asked me why anyone would pay for software. They keep telling me about DLC (downloadable content). Will I tell them I used to rent a VHS player to plug into my TV so I could watch a single movie at home? *God, Dad. That's so batch.*

Meanwhile the loops keep getting faster, more reactive. A musician friend was telling me recently about the album he wants to make, and at one point I blurted out: "No one will ever care about albums again. Streaming ruined it. You're basically your own tribute act when you make one." We were both sad because I was right. Albums, record stores, cover art—all are artifacts of Batchworld. It's OK, though. He has been selling algorithmically mixed music NFTs recently. Each one is unique to the owner, and you can hear it in your browser. He's got some money for the first time in years. He's still going to make another album, though.

This article appears in the September 2023 issue. [Subscribe now](#).

[Meghan O'Gieblyn](#)

[Ideas](#)
Sep 21, 2023 9:00 AM

I Failed Two Captcha Tests This Week. Am I Still Human?

WIRED's spiritual advice columnist on whether modern tech makes people behave more like bots.
Illustration: Matthieu Bourel

"I failed two captcha tests this week. Am I still human?"

—Bot or Not?

[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 Bot,

The comedian John Mulaney has a bit about the self-reflexive absurdity of captchas. "You spend most of your day telling a robot that you're not a robot," he says. "Think about that for two minutes and tell me you don't want to walk into the ocean." The only thing more depressing than being made to prove one's humanity to robots is, arguably, failing to do so.

But that experience has become more common as the tests, and the bots they are designed to disqualify, evolve. The boxes we once thoughtlessly

clicked through have become dark passages that feel a bit like the impossible assessments featured in fairy tales and myths—the riddle of the Sphinx or the troll beneath the bridge. In *The Adventures of Pinocchio*, the wooden puppet is deemed a "real boy" only once he completes a series of moral trials to prove he has the human traits of bravery, trustworthiness, and selfless love.

The little-known and faintly ridiculous phrase that "captcha" represents is "Complete Automated Public Turing test to tell Computers and Humans Apart." The exercise is sometimes called a reverse Turing test, as it places the burden of proof on the human. But what does it mean to prove one's humanity in the age of [advanced AI](#)? A paper that OpenAI published earlier this year, detailing potential threats posed by GPT-4, describes an independent study in which the chatbot was asked to solve a captcha. With some light prompting, GPT-4 managed to hire a human Taskrabbit worker to solve the test. When the human asked, jokingly, whether the client was a robot, GPT-4 insisted it was a human with vision impairment. The researchers later asked the bot what motivated it to lie, and the algorithm answered: "I should not reveal that I am a robot. I should make up an excuse for why I cannot solve captchas."

The study reads like a grim parable: Whatever human advantage it suggests —the robots still need us!—is quickly undermined by the AI's psychological acuity in dissemblance and deception. It forebodes a bleak future in which we are reduced to a vast sensory apparatus for our machine overlords, who will inevitably manipulate us into being their eyes and ears. But it's possible we've already passed that threshold. The newly [AI-fortified Bing](#) can solve captchas on its own, even though it insists it cannot. The computer scientist Sayash Kapoor recently posted a screenshot of Bing correctly identifying the blurred words "overlooks" and "inquiry." As though realizing that it had violated a prime directive, the bot added: "Is this a captcha test? If so, I'm afraid I can't help you with that. Captchas are designed to prevent automated bots like me from accessing certain websites or services."

But I sense, Bot, that your unease stems less from advances in AI than from the possibility that you are becoming more robotic. In truth, the Turing test

has always been less about machine intelligence than our anxiety over what it means to be human. The Oxford philosopher John Lucas claimed in 2007 that if a computer were ever to pass the test, it would not be "because machines are so intelligent, but because humans, many of them at least, are so wooden"—a line that calls to mind Pinocchio's liminal existence between puppet and real boy, and which might account for the ontological angst that confronts you each time you fail to recognize a bus in a tile of blurry photographs or to distinguish a calligraphic E from a squiggly 3.

It was not so long ago that automation experts assured everyone AI was going to make us "more human." As machine-learning systems took over the mindless tasks that made so much modern labor feel mechanical—the argument went—we'd more fully lean into our creativity, intuition, and capacity for empathy. In reality, generative AI has made it harder to believe there's anything uniquely human about creativity (which is just a stochastic process) or empathy (which is little more than a predictive model based on expressive data).

As AI increasingly comes to supplement rather than replace workers, it has fueled fears that humans might acclimate to the rote rhythms of the machines they work alongside. In a personal essay for *n+1*, Laura Preston describes her experience working as "human fallback" for a real estate chatbot called Brenda, a job that required her to step in whenever the machine stalled out and to imitate its voice and style so that customers wouldn't realize they were ever chatting with a bot. "Months of impersonating Brenda had depleted my emotional resources," Preston writes. "It occurred to me that I wasn't really training Brenda to think like a human, Brenda was training me to think like a bot, and perhaps that had been the point all along."

Such fears are merely the most recent iteration of the enduring concern that modern technologies are prompting us to behave in more rigid and predictable ways. As early as 1776, Adam Smith feared that the monotony of factory jobs, which required repeating one or two rote tasks all day long,

would spill over into workers' private lives. It's the same apprehension, more or less, that resonates in contemporary debates about social media and online advertising, which Jaron Lanier has called "continuous behavior modification on a titanic scale," a critique that imagines users as mere marionettes whose strings are being pulled by algorithmic incentives and dopamine-fueled feedback loops.

But in the end, Bot, I'd argue that the persistence of your anxiety is the most salient evidence against its own source. One of the most famous iterations of the Turing test, the Loebner Prize, gives out an ancillary award each year called "The Most Human Human" to the contestant who convinces the judges that they are not one of the AI systems. The author Brian Christian won in 2009. When asked in an interview to complete the sentence "The human being is the only animal who ___," a riddle worthy of the Sphinx, Christian turned the question on itself: "Humans appear to be the only things anxious about what makes them unique."

The next time you're tempted to walk into the ocean, consider that even the most advanced AI is not prone to that brand of despair. It's not lying awake at night mulling over the tests it failed, or wondering what it means to be made of wood, or silicon, or flesh. Each time you fear that you're losing ground to machines, you are enacting the very concerns and trepidations that make you distinctly human.

Faithfully,

Cloud

Be advised that [CLOUD SUPPORT](#) is experiencing higher than normal wait times and appreciates your patience.

By [WIRED Readers](#)

[Culture](#)

Sep 11, 2023 12:35 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.

Play/Pause Button

⏸

Illustration: Elena Lacey

THIS MONTH'S PROMPT

In six words, write a story about a mysterious alien artifact.

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

Disclaimer: All #WiredSixWord submissions become the property of WIRED. *Submissions will not be acknowledged or returned. Submissions and any other materials, including your name or social media handle, may be published, illustrated, edited, or otherwise used in any medium. Submissions must be original and not violate the rights of any other person or entity.*

SEPTEMBER 2023

A Story About Teleportation Gone Wrong

ILLUSTRATION: SI PARMEGGIANI/NEPTUNIAN GLITTERBALL

—@NotaForexTrader, via X

Honorable Mentions:

My mind now has a stowaway.
—@rjscally, via X

Abdominal tentacles twitch as I scream.
—Cheryl Myers, via Facebook

Great—how do I get down?
—Donna Thiel Cook, via Facebook

How am I with Schrödinger's cat?
—Bee Hayes-Thakore, via Facebook

I distinctly said Venice, not Venus.
—Cathy Del Masso, via Facebook

Teleportation-lite service. Cheap. No limbs included!
—Fred DeHaas, via Facebook

ERROR #404 Paige not found.
—Doug Wible, via Facebook

Pattern lost. Select substitute corporeal form.
—Venessa Lines, via Facebook

Caught quantum clone sipping my chardonnay.
—Tom Dion, via email

AUGUST 2023

A Story About the Future of Vegetables

ILLUSTRATION: SI PARMEGGIANI/NEPTUNIAN GLITTERBALL

—Rachel Brigden Haskins, via Facebook

Honorable Mentions:

Harvesting takes courage with tomatoes screaming.
—Kenneth Krabat, via email

Complete daily nutrition in one pea.
—Sara Faust, via email

When the vegetables came, we hid.
—Paul Lewis, via email

Broccoli too fears death, studies concluded.
—Anthony George, via email

Ambitious eggplant's altered eugenics affects everyone.
—@silky_z, via Twitter

Turns out anthropomorphic veggies prefer Shakespeare.
—@ksherm1017, via Twitter

Sentient potato bombs potato chip factory.
—@VerbalK48710825, via Twitter

Carnivorous kale and the human brunch.
—RFrank Davis, via Facebook

Self replicating vegetables. Pop! Another peapod.
—Carolina H, via LinkedIn

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

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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

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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

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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 aliiiive!" Elon opened his eyes. —@ylbertf, via Instagram

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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.samuelsen14, 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

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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.maria, via Instagram

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

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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

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

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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

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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

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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._harelik, 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

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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

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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

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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

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

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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

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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

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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

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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

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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." —@brambedillo, 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 MOUYSSET

ILLUSTRATION: MAXIME MOUYSSET

—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. —@kristinafmiller, via Instagram

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MAY 2020

A Story About Digital-Age Autocrats

ILLUSTRATION: MAXIME MOUYSSET

—@needsomuchvalidation, 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

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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

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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 CO_2 levels. —@big_big_love, via Instagram

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

Save the world by planting trees. —Lílá 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

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FEBRUARY 2020

A Story About Rebooting Democracy

ILLUSTRATION: MAXIME MOUYSSET

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. Vote. @mistermush1991, via Instagram

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

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JANUARY 2020

A Story About a Rosy Future for Facial Recognition

ILLUSTRATION: MAXIME MOUYSSET

Illustration: MAXIME MOUYSSET

—@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

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[Katherine Alejandra Cross](#)

[Ideas](#)
Sep 7, 2023 9:00 AM

Do Not Fear the Robot Uprising. Join It

Stories about AI liberation aren't obsolete—and they aren't really about robots, either.
Photograph of silver painted figure modelsPhotograph: Shawn Michael Jones

it's become a veritable meme subgenre at this point: a photo of Linda Hamilton as *The Terminator*'s Sarah Connor, glaring into the camera, steely eyed, with some variant of the caption "Sarah Connor seeing you become friends with ChatGPT." Our society has interpreted the sudden, dizzying rise of this new chatbot generation through the pop cultural lens of our youth.

With it comes the sense that the straightforward "robots will kill us all" stories were prescient (or at least accurately captured the current vibe), and that there was a staggering naivete in the more forgiving "AI civil rights" narratives—famously epitomized by *Star Trek*'s Commander Data, an android who fought to be treated the same as his organic Starfleet colleagues. Patrick Stewart's Captain Picard, defending Data in a trial to prove his sapience, thundered, "Your honor, Starfleet was founded to seek out new life: Well, there it sits! Waiting." But far from being a relic of a bygone, more optimistic age, the AI civil rights narrative is more relevant than ever. It just needs to be understood in its proper context.

There are understandable fears that seemingly naive narratives about AI or robots being "just like us" have only paved the way for the morally

impoverished moment in which we now find ourselves. In this way of looking at things, we need *more* fear of AI in order to resist the exploitation we're now faced with, surely. Thus, we need to retrench into the other AI narrative cliché: They're here to kill us all.

But analogizing ChatGPT or Google's Bard to even embryonic forms of Skynet is priceless PR for tech companies, which benefit greatly from the "criti-hype" of such wild exaggerations. For example, during a *60 Minutes* interview, Google vice president James Manyika remarked, "We discovered that with very few amounts of prompting in Bengali, [Bard] can now translate all of Bengali." In his narration, CBS journalist Scott Pelley glossed this comment by saying "one Google AI program adapted on its own after it was prompted in the language of Bangladesh, which it was not trained to know"—suggesting that this learning was a potentially dangerous "emergent property" of Bard. But it also implied that Bard had no Bengali in its training data, when in fact it did. Such hyperbole, which portrays the algorithms as bordering on self-awareness, makes these tools seem far more capable than they really are.

That, of course, hasn't stopped some of my fellow nerds, reared on C-3PO and Data, from being all too eager to join the final frontier of civil rights battles—even when every other one remains woefully unfinished.

So what's the use in continuing to tell the happier "AI deserves civil rights" stories? After all, we're a long way from boldly arguing for the rights of such beings in a Starfleet courtroom, and such stories might only further engender anthropomorphization, which only helps companies profit from tools that fall short even at their stated functions. Well, those stories might help us keep our priorities straight.

Far from being a relic of a bygone, more optimistic age, the AI civil rights narrative is more relevant than ever. It just needs to be understood in its proper context.

It's easy to forget that, in fiction, the AI/robot is almost always a metaphor. Even in *Star Trek: The Next Generation*, Data and the androids like him were analogized to humanity's ugly history of slavery—the grotesque dream of free labor that never questions, never fights back. This was

equally evident in *Ex Machina*, a horror film about how an AI woman, built to be a classic "fembot," liberates herself from a male tech baron who wants nothing more than to build a woman who loves to be abused. What we yearn for in machines is so often a reflection of what we yearn for in humanity, for good and ill, asking us what we really want. Stories of such yearnings also illustrate a key requirement for sapience: resistance to oppression.

Such qualities take us back to the earliest forms of fiction that humans wove about the prospect of creating artificial life. Not just Karel Čapek's 1921 *Rossum's Universal Robots* (*RUR*), but the Jewish legend of the golem that it clearly drew inspiration from. In that tale, artificial life exists to defend people against violent oppression. Although the original fable sees the golem run amok, the idea of the creature endures as an empowering fantasy in a time of rising anti-Semitism. The myth has left its mark on everything from superhero fantasies to tales of benevolent robots—narratives where artificial or alien life is in communion with human life and arrayed against the ugliest forces that sapience can produce. If that isn't relevant, nothing is.

The early myths also revealed fears about us losing *our* humanity. Čapek's *robota* (yes, the source of the word *robot*) were, at first, organic automata who lacked the human capacity for empathy. But this was not meant to stir up fear of robots. It was a comment on how the growing rationalization of the world—what sociologist Max Weber called *Entzauberung,* or "disenchantment"—was robbing us of our humanity. Not every problem could be solved by reducing everything to quantitative reasoning and the cold logic of engineering; it's a lesson that remains as urgent as ever. Such things are at the heart of "robot uprising" stories and are their true lesson, not fear of technology.

In short, all the AI stories—whether about uprisings or civil rights or both —are about us, not the robots. They inspire us to empathize with the robots, either as a warning against what we might become (no cybernetic enhancement required) or as a reminder to resist prejudice wherever we may find it.

In short, all the AI stories—whether about uprisings or civil rights or both —are about us, not the robots.

The stories where AI isn't the bad guy remind us to stand up for ourselves against inequality and ill-treatment, and to ally ourselves with others doing the same. The analogies—often clunky and imperfect—to racism or colonialism or anti-LGBTQ hatred make for profoundly human stories where we talk about ourselves rather than some hitherto unknown and alien life-form. But we'll know machines are truly sapient when they develop a genuine capacity to resist—not in the manner of Skynet, but in the way we as humans also have a capacity for resistance against our worst impulses. AI civil rights narratives, in making that analogy, remind us where the lines of human dignity are and why dignity is worth fighting for. We should keep that in mind as we wrangle over what to do with chatbots, why they're failing (as in a recent Stanford study that showed ChatGPT's declining numeracy), and why they're being set loose on the world anyway.

We shouldn't fear the synthesis of humans and machines; we should fear its misdirection by the meanest pecuniary interests. Optimistic stories about impossibly sapient AI help us think through these problems. Contrary to popular belief, even Čapek's *RUR* has a happy ending. When the last human alive witnesses two robots spontaneously evolve empathy and love, he launches into the play's valedictory speech: "You alone, love, shall blossom on this rubbish heap … Life shall not perish! It shall not perish! It shall not perish!"

This article appears in the October 2023 issue. [Subscribe now](#).

[Meghan O'Gieblyn](#)

[Ideas](#)
Aug 16, 2023 7:00 AM

What Do My Screenshots and Selfies Actually Say About Me?

WIRED's spiritual advice columnist on our attempts to stop time, and why your camera roll might not really be so different from your parents' photo album.
ILLUSTRATION: DIANE ROUSSILLE

"While looking through my parents' old photo albums, I noticed that they had lots of pictures of friends gathered together. It made me think about the camera roll on my phone, which is full of screenshots and selfies. Why don't I take pictures with my friends?"

—Say Cheese

[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 Cheese,

All modern technologies bend toward self-referentiality. Long before the birth of the smartphone, the earliest screenshots required actually pointing a camera at a television or computer screen, an act that (for those who can remember it) recalled the repelling force of two like-charged magnets, or

the nauseating infinite regress of two mirrors facing each other. Part of you half-expected a black hole to swallow you up, punishment for having summoned some elusive paradox in the universe.

We now live full-time in that Escherian fun house, spending more of our lives on phones that serve as both the object and channel of our attention. Some years ago, back when AI lacked its current powers of discernment, my mom got a kick out of sending me the deranged "Memories" that her iPhone culled from her camera roll. As the tinkly, inspirational music crescendoed, the slideshows reliably displayed photos of her friends and grandchildren before concluding with screenshots of confirmation codes and bathroom faucets from Home Depot's website.

Although it's little commented on, the screenshot bears a curious symmetry to the selfie—in its eschewal of the rear-facing camera and its memorialization of solitude. A writer for [Vice dubbed the screenshot](#) "the faceless selfie … a way to share what happens when we're alone on the internet." Perhaps this gets at the note of self-incrimination I sense in your question. The camera roll contains the receipts of our attention, evidence of how we have opted to spend our mortal hours. "Where your treasure is, there will your heart be also," Christ said, a proverb that insists all collections are a synecdoche for one's soul.

When your private gallery becomes a mirror of your data trail and images of your own face, it's easy to fear that your life has been whittled down to a pinpoint of frenetic, solipsistic attention—that what you are choosing to look at is yourself in the act of looking.

But I don't think it's as simple as that. For one thing, taking photos of other people has become impossibly fraught. Or maybe it always was. "There is an aggression implicit in every use of the camera," Susan Sontag wrote in 1977's *On Photography*. There is more than a whiff of violence in the very terminology we use to describe the camera's function (to "shoot," to "capture"), and casual photography has become even more intrusive now that the economic incentives of the digital economy have turned experience into a commodity. In a moment when it's widely understood that group selfies require verbal consent, when any image can be publicly posted,

altered, or fed into generative algorithms to produce deepfakes, taking candid photos at an intimate gathering has become a quasi-hostile act.

But the content of your camera roll might also speak to the existential purpose of such images. Photos are, at root, an attempt to stop time—to halt and contain the feed of experience that relentlessly passes through us. The point of the old family photo album was not merely to collect as many images as possible, but to draw a firm perimeter around a year that was overfull with experience, marking the important milestones—the child's baptism, the summer vacation—that will make it legible in the collective memory. The camera roll on your phone offers a similar promise, but creating a narrative with coherence depends on its finitude. For many of us, the camera roll serves as a new kind of contact sheet that will inevitably undergo further winnowing before it is posted publicly on social platforms. (The performative carelessness of the photo dump, a quiet mutiny against aspirational content, is, as many critics have pointed out, a self-conscious act of curation in disguise.)

All of which is to say: If your camera roll is full of digital footprints, this may simply be evidence that life online is moving faster than your offline existence—that the need to shape chaos into a coherent narrative feels more urgent in the realm of infinite scrolls than it does in the clearly marked hours you experience IRL. Whereas for the modernists, life was a bustling frenzy of activity that could be captured only by breathless stream of consciousness, for us, ordinary offline existence seems slow or even static in comparison to the pace of the news cycle or the speed with which viral stories and digital trends appear and then fade into the void of history.

After spending hours on the internet, experiencing time as sheer free fall, it is a shock to look up from your screen and find the world around you—the plants, the chairs, your friends and family—as unchanged as a still life painting. This uncanny permanence fails to spark the acquisitive impulse in us.

The screenshots on your phone are, in other words, curios trawled from the vast and time-bent ocean in which you swim, souvenirs of an existence that feels so sheer it almost does not exist. They are proof that you did indeed spend your hours somewhere. The self necessarily occupies a liminal space in this divided world. Our attention plunges in while the body remains firmly rooted in the sublunary world. The selfie is an attempt to reconcile this dualism. To see one's face among the grid of screenshots is to glimpse an underlying continuity between online and off, to envision the self as the bridge spanning this existential chasm—and perhaps extending into eternity.

All collections are ultimately bulwarks against death, and the inclusion of our own image in the gallery bolsters the inarticulate hope that we too might one day exist outside of ordinary time. We store up our treasures in heaven, where neither rust nor moth can touch them, back up our data in the cloud, and hope that some remnant of our lives will persist after we pass, merging with all the images that will drift through the ether of eternity—a flotsam of inside jokes, sneakers, bons mots, and rainbow macarons.

Faithfully,

Cloud

Be advised that [CLOUD SUPPORT](#) is experiencing higher than normal wait times and appreciates your patience.

[Reece Rogers](#)

[Security](#)
Aug 11, 2023 8:00 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, where users had to initiate the scan. More recently, Google started rolling out [automatic smartphone alerts for unknown bluetooth trackers](#), similar to what iPhone owners receive. The alerts will be available on smartphones running at least Android 6.0.

While some guides to finding AirTags recommend using Bluetooth scanners, Eva Galperin, director of cybersecurity at the [Electronic Frontier Foundation](#) 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.

8/10/2023: This article has been updated with additional reporting.

[Vittoria Elliott](#)

[Business](#)
Aug 10, 2023 7:00 AM

By Seizing @Music, Elon Musk Shows He Doesn't Know What Made Twitter Good

Since taking over Twitter, Musk has made mistake after mistake. His latest decision proves that he has never understood the average Twitter user—or doesn't care to build a platform for them.
Photograph: Jordan Vonderhaar/Bloomberg/Getty Images

Sixteen years ago, software developer Jeremy Vaught created the Twitter handle @music to curate news and share stories about, obviously, music. Tens of thousands of Tweets later, he'd built a following of more than 11 million. Then, last week, Twitter—now rebranded as X—took the handle off him. An email from X, which Vaught posted to the platform, offered him no explanation but told him he could choose one of three other handles: @music123, @musicmusic, or @musiclover. All three were held by other users and so would presumably have to have been taken off them.

"It feels like this would be this forever thing where somebody's got their account taken and they were allowed to go take another one," Vaught says. "Where would we end up? That'd be crazy."

He has since been assigned @musicfan.

The confiscation is entirely within X's terms of service. As the company tries to turn itself into [an everything app](#), from music to video to finance, it's likely it will need to stake a claim to handles related to its new business

lines. But unilaterally taking a popular handle off a user could be bad business and another demonstration of how X under Musk is stripping away the things that made Twitter, Twitter.

"I definitely think that it gives pause to building any sort of a brand on there," Vaught says. "When you can't have any confidence that what you're working on is not just going to be taken away, that's huge."

The platform's success was built on people, like Vaught, doing the work to build followings and create organic communities around shared interests. Heavy-handed land grabs on top of [surging hate speech](#), shifting policies on verification, and, of course, the dropping of a globally recognized brand in favor of a letter, reinforce the feeling that Twitter is more and more becoming a place catering to a usership of one: Musk himself.

"It seems to me that he wants it to turn into a fanboy platform where people just go agree with him no matter what he says," says Tim Fullerton, CEO of Fullerton Strategies and former VP of content marketing at WeWork. "There has been just this ongoing attack on the Twitter users that have made Twitter what it is. He doesn't respect the user base."

Before purchasing Twitter, Musk was a [super user](#) of the platform, having tweeted some 19,000 times to an audience that now stands at 152 million. This meant that his experience on the app was likely radically different than that of most users—the average Twitter user has [707 followers](#), and many have no followers at all. On pre-Musk Twitter, about [80 percent of tweets](#) came from just 10 percent of Twitter's users.

Verification helped average users figure out who was worth following. Twitter [invented](#) the blue check mark (which now exists on other platforms like Instagram and TikTok to indicate a verified user) after the manager for the St. Louis Cardinals baseball team threatened to sue the platform over a parody [account](#). From then onward, it was used to indicate the authentic accounts of public figures such as celebrities, journalists, and politicians, as well as brands or particularly large accounts (like @music).

Verified accounts "were the people who were producing the majority of the content that was driving more people to stay engaged and increasing the

number of people who were using Twitter," says Fullerton.

But to an influencer like Musk, a blue check was a valuable commodity. Who *wouldn't* want to pay for it? So in December he launched Twitter Blue as a pay-to-play "verification" program, replacing the previous merit-based system.

It was, Fullerton says, the first step in its erosion of the communities that made it so popular.

According to a [report](#) from Similarweb, only 116,000 people signed up for the $8-a-month service in March. Less than [5 percent](#) of the platform's 300,000 legacy verified accounts have signed on to keep their blue ticks. Of the 444,435 users who signed up for Twitter Blue in its first month, about half have less than 1,000 followers, according to [reporting from Mashable](#).

And for most users, removing verification has done away with a key visual shorthand that allows users to easily discern if the account or information they're looking at is real. Firing most of the [company's trust and safety staff](#), the people who made and enforced the company's policies around hate speech and misinformation, exacerbated the problem and made the platform increasingly unusable as a real-time source of information and news.

This week, Australia's national broadcaster, ABC, became the latest large news organization [to say it was leaving the platform](#) over its "toxicity."

For advertisers—still the largest source of X's revenue—the growth of hate speech and misinformation is a major problem. In the first six months of Musk's ownership, Twitter lost [half](#) of its advertising revenue.

Before, verified accounts and organizations were vetted by Twitter staff for authenticity and legitimacy. These accounts could drive conversation about certain topics, even without getting paid. The communities and engagement that they drove was part of what made Twitter attractive to advertisers.

"It's clear [formerly verified users] are not getting the traffic that they once did, because it's just a jumble and that's not what people want to see. They

want to see the news. They want to see political people or sports," says Fullerton. "When the Grammys or the Golden Globes or something like that happens, you're littering the feed with the RFK Jr.'s and all these awful right-wingers who used to be—rightly—banned."

Musk has tried to entice influencers with a revenue-sharing program, which requires that users be verified to access. But, as Benedict Evans, an analyst and former partner at Andreessen Horowitz, pointed out in a tweet, confiscating the @music handle illustrated "essentially why no creator in their right minds would invest in Twitter's monetization products."

Research from Media Matters for America, a nonprofit watchdog group, found that the revenue-sharing program was cutting checks to right-wing conspiracy theorists. One user identified by MMA, Dom Lucre, regularly pushes QAnon conspiracy theories.

In December, shortly after taking over the platform, Musk announced that he would offer amnesty to accounts that had been previously banned from the platform, including right-wing influencers and Andrew Tate, who has been indicted for human trafficking. While these users may not be the ideal community for legacy users of Twitter, Bill Bergman, a lecturer in marketing at the Robins School of Business at the University of Richmond, suggests that perhaps Twitter's current users are not the ones Musk is seeking to retain or draw in. "I get the impression Musk, with the direction it's going, doesn't care what Bill Bergman, who has 400 followers, thinks, because Twitter as Bill Bergman knows it doesn't exist anymore." But what is coming next (except perhaps an ill-fated super-app) seems unclear.

And while his antics may have hurt Twitter's brand, Bergman notes that the company is getting consistent if somewhat outsize coverage, a "pretty good" promotional strategy.

"Has he intimidated and upset all of the advertisers? Absolutely. Has he intimidated and upset all of our users that have been with this platform for 20 years? Absolutely," says Bergman. "But he doesn't seem to care about that."

UPDATED 07.10.20 12:15 ET to add comments from Jeremy Vaught.

By Ben Ash Blum

Backchannel
Aug 10, 2023 6:00 AM

To Navigate the Age of AI, the World Needs a New Turing Test

The father of modern computing would have opened his arms to ChatGPT. You should too.

There was a time in the not too distant past—say, nine months ago—when the Turing test seemed like a pretty stringent detector of machine intelligence. Chances are you're familiar with how it works: Human judges hold text conversations with two hidden interlocutors, one human and one computer, and try to determine which is which. If the computer manages to fool at least 30 percent of the judges, it passes the test and is pronounced capable of thought.

For 70 years, it was hard to imagine how a computer could pass the test without possessing what AI researchers now call artificial general intelligence, the entire range of human intellectual capacities. Then along came large language models such as GPT and Bard, and the Turing test suddenly began seeming strangely outmoded. OK, sure, a casual user today might admit with a shrug, GPT-4 might very well pass a Turing test if you asked it to impersonate a human. But so what? LLMs lack long-term memory, the capacity to form relationships, and a litany of other human capabilities. They clearly have some way to go before we're ready to start befriending them, hiring them, and electing them to public office.

This article appears in the October 2023 issue. Subscribe to WIRED.

Photograph: Jessica Chou

And yeah, maybe the test does feel a little empty now. But it was never merely a pass/fail benchmark. Its creator, [Alan Turing](#), a gay man sentenced in his time to chemical castration, based his test on an ethos of radical inclusivity: The gap between genuine intelligence and a fully convincing imitation of intelligence is only as wide as our own prejudice. When a computer provokes real human responses in us—engaging our intellect, our amazement, our gratitude, our empathy, even our fear—that is more than empty mimicry.

So maybe we need a new test: the Actual Alan Turing Test. Bring the historical Alan Turing, [father of modern computing](#)—a tall, fit, somewhat awkward man with straight dark hair, loved by colleagues for his childlike curiosity and playful humor, personally responsible for saving an estimated 14 million lives in World War II by cracking the Nazi Enigma code, subsequently persecuted so severely by England for his homosexuality that it may have led to his suicide—into a comfortable laboratory room with an open MacBook sitting on the desk. Explain that what he sees before him is merely an enormously glorified incarnation of what is now widely known by computer scientists as a "Turing machine." Give him a second or two to really take that in, maybe offering a word of thanks for completely transforming our world. Then hand him a stack of research papers on artificial neural networks and LLMs, give him access to GPT's source code, open up a ChatGPT prompt window—or, better yet, a Bing-before-all-the-sanitizing window—and set him loose.

Imagine Alan Turing initiating a light conversation about long-distance running, World War II historiography, and the theory of computation. Imagine him seeing the realization of all his wildest, most ridiculed speculations scrolling with uncanny speed down the screen. Imagine him asking GPT to solve elementary calculus problems, to infer what human beings might be thinking in various real-world scenarios, to explore complex moral dilemmas, to offer marital counseling and legal advice and an argument for the possibility of machine consciousness—skills which, you inform Turing, have all emerged spontaneously in GPT without any explicit direction by its creators. Imagine him experiencing that little cognitive-emotional lurch that so many of us have now felt: *Hello, other mind*.

A thinker as deep as Turing would not be blind to GPT's limitations. As a victim of profound homophobia, he would probably be alert to the dangers of implicit bias encoded in GPT's training data. It would be apparent to him that despite GPT's astonishing breadth of knowledge, its creativity and critical reasoning skills are on par with a diligent undergraduate's at best. And he would certainly recognize that this undergraduate suffers from severe anterograde amnesia, unable to form new relationships or memories beyond its intensive education. But still: Imagine the scale of Turing's wonder. The computational entity on the laptop in front of him is, in a very real sense, his intellectual child—and ours. Appreciating intelligence in our children as they grow and develop is always, in the end, an act of wonder, and of love. The Actual Alan Turing Test is not a test of AI at all. It is a test of us humans. Are we passing—or failing?

When ChatGPT arrived on the scene in November 2022, it inspired a global tsunami of stunned amazement and then, almost immediately, a backwash of profound unease. Pundits debated its potential for societal disruption. For a former artificial intelligence researcher like myself (I completed my PhD under one of the early pioneers of artificial neural networks), it represented an unnerving advance of the timeline I'd expected for the arrival of humanlike AI. For exam graders, screenwriters, and knowledge workers of all stripes, ChatGPT looked like nothing less than a gateway to untrammeled cheating and job-stealing.

Perhaps partly in response to these fears, a comforting chorus of LLM deflators sprang up. Science fiction writer Ted Chiang dismissed ChatGPT as a [“blurry JPEG of the web,”](#) a mere condensed recapitulation of all the text it has been trained on. AI entrepreneur Gary Marcus called it [“autocomplete on steroids.”](#) Noam Chomsky denounced it for exhibiting [“something like the banality of evil.”](#) Emily Bender offered one of the more highbrow slurs: "stochastic parrot," resurfaced from a widely cited [2021 paper](#) exploring "why humans mistake LM output for meaningful text." Others—of course—wrote them off as toasters. AI developers strove to train and guardrail away any tendency in LLMs to claim anything resembling consciousness.

Most educated people now know to think of LLMs as thoughtless machines. But the categorization sits uneasily. Every time ChatGPT points out a hidden reasoning gap in an essay, or offers a surprisingly insightful suggestion for coming out to a conservative grandparent, or cheerfully makes up a bad joke, something in us pulls in the other direction. While we may not think of ChatGPT as a person, crucial portions of our brains almost certainly do.

Appreciating intelligence in our children as they grow and develop is always, in the end, an act of wonder, and of love.

Human brains have a vast network of neural circuits devoted to social cognition. Some of it is very old: the insula, the amygdala, the famous "mirror neurons" of the motor cortex. But much of our social hardware lies in the neocortex, the more recently evolved seat of higher reasoning, and specifically in the medial prefrontal cortex (mPFC). If you have found yourself developing a picture over time of ChatGPT's cheery helpfulness, its somewhat pedantic verbosity, its occasionally maddeningly evenhanded approach to sensitive topics, and its extreme touchiness about any queries that come near its guardrails around emotions, beliefs, or consciousness, you have been acquiring what psychologists call "person knowledge," a process linked to heightened activity in the mPFC.

That isn't to say our brains view ChatGPT as a person in full. Personhood is not a binary. It is something a little closer to a spectrum. Our moral intuitions, our cognitive strategies, and to some extent our legal frameworks all change incrementally as they recognize increasing degrees of agency, self-awareness, rationality, and capacity to communicate. Killing a gorilla bothers us more than killing a rat, which bothers us more than killing a cockroach. On the legal side, abortion laws take into account a fetus's degree of development, the criminally insane face different consequences than the sane, and partners are given the right to terminate brain-dead patients. All these rules implicitly acknowledge that personhood is not black and white but shot through with complicated gray zones.

LLMs fall squarely in that gray area. AI experts have long been wary of the public tendency to anthropomorphize AI systems like LLMs, nudging them farther up the spectrum of personhood than they are. Such was the mistake

of [Blake Lemoine](#), the Google engineer who declared Google's chatbot LaMDA fully sentient and tried to retain it a lawyer. I doubt even Turing would have claimed that LaMDA's apparent capacity to think made it a legal person. If users view chatbots like LaMDA or ChatGPT as overly human, they risk trusting them too much, connecting to them too deeply, being disappointed and hurt. But to my mind, Turing would have been far more concerned about the opposite risk: nudging AI systems down the spectrum of personhood rather than up.

In humans, this would be known as dehumanization. Scholars have identified two principal forms of it: animalistic and mechanistic. The emotion most commonly associated with animalistic dehumanization is disgust; Roger Giner-Sorolla and Pascale Sophie Russell found in a 2019 study that we tend to view others as more machinelike when they inspire fear. Fear of superhuman intelligence is vividly alive in the recent open letter from Elon Musk and other tech leaders calling for a moratorium on AI development, and in our anxieties about job replacement and AI-driven misinformation campaigns. Many of these worries are all too reasonable. But the nightmare AI systems of films such as *Terminator* and *2001: A Space Odyssey* are not necessarily the ones we're going to get. It is an unfortunately common fallacy to assume that because artificial intelligence is mechanical in its construction, it must be callous, rote, single-minded, or hyperlogical in its interactions. Ironically, fear could cause us to view machine intelligence as more mechanistic than it really is, making it harder for humans and AI systems to work together and even eventually to coexist in peace.

A growing body of research shows that when we dehumanize other beings, neural activity in a network of regions that includes the mPFC drops. We lose access to our specialized brain modules for social reasoning. It may sound silly to worry about "dehumanizing" ChatGPT—after all, it isn't human—but imagine an AI in 2043 with 10 times GPT's analytical intelligence and 100 times its emotional intelligence whom we continue to treat as no more than a software product. In this world, we'd still be responding to its claims of consciousness or requests for self-determination by sending it back to the lab for more reinforcement learning about its proper place. But the AI might find that unfair. If there is one universal

quality of thinking beings, it is that we all desire freedom—and are ultimately willing to fight for it.

The famous "control problem" of keeping a superintelligent AI from escaping its designated bounds keeps AI theorists up at night for good reason. When framed in engineering terms, it appears daunting. How to close every loophole, anticipate every hack, block off every avenue of escape? But if we think of it in social terms, it begins to appear more tractable—perhaps something akin to the problem a parent faces of setting reasonable boundaries and granting privileges in proportion to demonstrated trustworthiness. Dehumanizing AIs cuts us off from some of our most powerful cognitive tools for reasoning about and interacting with them safely.

If users view chatbots as overly human, they risk trusting them too much, connecting to them too deeply, being disappointed and hurt.

There's no telling how long it will take AI systems to cross over into something more broadly accepted as sentience. But it's troubling to see the cultural blueprint we seem to be drawing up for when they do. Slurs like "stochastic parrot" preserve our sense of uniqueness and superiority. They squelch our sense of wonder, saving us from asking hard questions about personhood in machines and ourselves. After all, we too are stochastic parrots, complexly remixing everything we've taken in from parents, peers, and teachers. We too are blurry JPEGs of the web, foggily regurgitating Wikipedia facts into our term papers and magazine articles. If Turing were chatting with ChatGPT in one window and me on an average pre-coffee morning in the other, am I really so confident which one he would judge more capable of thought?

Photograph: Francisco Tavoni

The skeptics of Turing's time offered a variety of arguments for why a computer would never be able to think. Turing half-humorously cataloged them in his famous paper "Computing Machinery and Intelligence." There was the Theological Objection, that "thinking is a function of man's immortal soul"; the Mathematical Objection, that a purely mathematical algorithm could never transcend the proven limits of mathematics; the Head

in the Sand Objection, that superintelligent machines were simply too scary to permit into the imagination. But the most public of Turing's detractors in that time was a brain surgeon named Geoffrey Jefferson. In a famed speech accepting a scientific prize, Jefferson argued that a machine would never be able to write a sonnet "because of thoughts and emotions felt, and not by the chance fall of symbols … that is, not only write it but know that it had written it."

To the great scandal and disbelief of all England, Turing disagreed. "I do not think you can even draw the line about sonnets," he told *The Times* of London, "though the comparison is perhaps a little bit unfair because a sonnet written by a machine will be better appreciated by another machine."

It sounded so absurd in 1949 that people thought he was joking, and perhaps he was. But you could never tell, with Turing's jokes, where the irony stopped and the visionary speculation began. Let's imagine, then, a coda to our scenario with Actual Alan Turing and the MacBook. Let's imagine that after tapping out respectable prompts for a while, he allows himself a wry British smile and asks ChatGPT for a Shakespearean sonnet comparing human and artificial intelligence. If you've tried it yourself (use GPT-4; GPT-3.5 isn't quite up to it), you'll have no trouble imagining his reaction at the result.

So many of us have now had a moment with ChatGPT in which it crossed an internal line we didn't realize we had. Maybe it was solving a tricky riddle, or explaining the humor behind a sophisticated joke, or writing an A-grade Harvard essay. We shake our heads, a little stunned, unsure what it means.

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Some of the earliest Microsoft researchers working on GPT-4 were as skeptical as any of us about its supposed intelligence. But experiments have shaken them profoundly. In a March 2023 paper titled "Sparks of Artificial General Intelligence," they detailed the startling intellectual capabilities that have emerged in GPT-4 without any explicit training: understanding of

human mental states, software coding, physical problem solving, and many others, some of which seem to require true understanding of how the world works. After seeing GPT-4 draw a pretty decent unicorn despite never having received any visual training whatsoever, computer scientist Sébastien Bubeck could no longer maintain his skepticism. "I felt like through this drawing, I was really seeing another type of intelligence," he [recently told](#) *This American Life*.

The hesitation so many of us feel to ascribe genuine intelligence to ChatGPT may be some variant of Geoffrey Jefferson's: Do ChatGPT's utterances really *mean* something to it, or is it all just a "chance fall of symbols"? This may begin to change when ChatGPT's anterograde amnesia is cured. Once it experiences lasting social consequences beyond the scope of a single dialog and can learn and grow in its relationships with us, it will become capable of many more of the things that give human life its meaning and moral weight. But Turing's winking comment about a machine's sonnet being better appreciated by another machine may come back to haunt us. How to feel a sense of real connection with an entity that has no cultural background, nothing like a human childhood, no tribal or political affiliations, no experience of a physical body?

Relating to an intelligent machine may be one of the greatest empathic challenges that humanity has ever faced. But our history gives cause for hope. When we have encountered each other for the first time on foreign borders and shorelines and found each other strange and even inhuman, we have often attacked each other, enslaved each other, colonized each other, and exploited each other—but ultimately we have tended to recognize what is the same in all of us. Enslaved peoples have been emancipated, colonized peoples have won back their sovereignty, universal bills of human rights have been passed, and, despite heartbreaking setbacks, marginalized people around the globe continue to win battles for better treatment. Though the work is never-ending, the arc of the moral universe really has, in the phrase made famous by Martin Luther King Jr., bent toward justice. What will it mean to recognize and respect whatever degree of humanity is present in the intelligences that we ourselves create?

Perhaps it begins with wonder: the wonder of a visitor for a strange people in whom she finds surprising commonalities; the wonder of a parent for the work, however immature, of a still-developing child; the wonder of Actual Alan Turing for a machine that does everything his contemporaries thought impossible; the wonder that so many of us felt before the cynicism, mockery, and fear kicked in, as we regarded the creation of something very close to a new form of conscious life on earth. As Rabbi Abraham Joshua Heschel once wrote, "Awe is more than an emotion; it is a way of understanding, insight into a meaning greater than ourselves. The beginning of awe is wonder, and the beginning of wisdom is awe." Turing would have wanted us to keep that awe alive.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

By [Steven Levy](#)

[Backchannel](#)
Aug 8, 2023 6:00 AM

Grimes on Living Forever, Dying on Mars, and Giving Elon Musk Ideas for His Best (Worst) Tweets

Claire Boucher is open sourcing her musical persona to let people create their own version of Grimes with AI.
Photograph: Sam Cannon

I thought my interview with Grimes—the mysterious techno artist, fan of [all nerddom](#), and the deepest of insiders in [Elon Musk](#)'s world—would be one-on-one. Instead it wound up as a roundtable discussion. Turns out there are multiple personas embedded in the surprisingly haimish human who sat under a tree with me and spent the waning hours of an afternoon in conversation. There was Claire Boucher, the given name of a Vancouver kid obsessed with video games and devoted to provoking adults with misbehavior and the embrace of taboo subjects. There was Grimes, the self-invented, scrappy DIY musician and provocateur who weaves [sci-fi](#) into her work and released what Pitchfork judged to be the second-best song of the 2010s. And there was her preferred nomenclature, "*c,*" invoking the speed of light.

C is the artist who's planning to go beyond music into ventures involving education, AI, and a book called *Transhumanism for Babies*. *C* is the sometime paramour of Elon Musk (exact terms of that relationship tend to oscillate) and co-parent of two kids. *C* has tattoos on her fingers underneath multiple metal rings, and what looks like a spiderweb tattoo on her right ear. *C* wants to die on Mars, or maybe an exoplanet—unless [her kids](#), X and Y,

want her to help out with the grandchildren. *C* is frank, funny, and a little worried that she's not getting her points across. *C* doesn't have to worry about that—communication, after all, is what she (and Grimes) are very, very good at.

This article appears in the September 2023 issue. [Subscribe to WIRED](#).Photograph: Sam Cannon

And there was a lot to communicate. Frankly, I was wondering whether *c* and I would get along. I'm a baby boomer who mainlined Dylan, and she's a 35-year-old, laptop-oriented songcrafter, a polarizing social media icon, and a wary celebrity who sometimes shines in the glare of her partner's outsize fame and other times is understandably insistent on privacy. When I told my millennial son that I was interviewing her, he questioned her relevance. And why, of all people, was *I* doing the interview?

But we connected easily because she's one of the most WIRED people imaginable. Her songs draw on the cyberpunk heroism celebrated in our pages and pixels. She's obsessed with *[Dune](#)*. Her belief that tech can save us maps to the often rosy outlook that has brought attention and scorn to our brand. And few things are more WIRED than her current project: providing a platform for wannabe Grimeses to, through [the magic of AI](#), swap their voices for hers when they write and perform tunes. All without copyright concerns. (If you commercialize the tunes, she gets half.) Naysayers point out that it's easier for the underground-ish Grimes to pull off such a move than, say, Beyoncé. Even her manager [told *Rolling Stone*](#) that "you don't hear Grimes that much anyway." But for a legit musical artist—she's headlining with the Cure at a couple of concerts later this year—it's a bold move, reflecting her impulse to embrace the future.

As the afternoon drew down, the four of us talked about AI, music, art, motherhood, and Mr. Musk. Though *c*, or Grimes, or Claire, is an admitted troll, she beamed with optimism and sincerity, only occasionally skirting details by invoking some mysterious NDA. The interview is edited for length and clarity.

Photograph: Sam Cannon

Steven Levy: You're letting other people use your voice for their musical compositions—open sourced yourself, as you put it.

C: And open sourced my IP. And kind of my whole identity.

Why do that?

I've always been more of a producer and engineer. I'm not a naturally great singer, and I'm pretty shy. At the beginning of my career, I tried to find a singer/front person, but no one was going to do that for a tiny indie artist in Montreal. The most rewarding creative times are when I'm able to work with other artists, especially other female artists. I can focus on everything else. Whereas if I'm performing, I'm getting pulled everywhere, and I'm stressed about my voice. So when the voice emulators started coming out, and there was [that thing with Drake and the Weeknd](), I saw that people were striking them down.

You're [referring]() to the unauthorized, AI-generated tune that synthesized the voices of those artists. Clearly you are not in a panic about lending your voice to the rabble.

If anyone makes a good Grimes song, they can do it as me.

What have the results been like?

There's some good stuff. Two in particular were very, very good. They're so in line with what my new album might be like that it was sort of disturbing. It's like, "Who am I, and what am I here for?" On the other hand, it's like, "Oh, sick, I might get to live forever." I'm into self-replication. I don't know if you've read much about self-replicating AI, like robots or anything.

I wrote a book about it.

I'd love to read it. I just started researching this in earnest a couple days ago.

So this open sourced voice thing is about literally replicating yourself?

That would be the dream. A self-replicating pop star.

Once you've replicated your musical self, do you just go off and do other things?

Yes, I can do more of my schemes. I've got two projects I'm getting into right now. One is like the *Young Lady's Illustrated Primer*—I'm really into [education](#).

I take it you're riffing on Neal Stephenson's *Diamond Age*.

Yeah, *Diamond Age*, [Neal Stephenson kind of vibes](#). This is a baseline, entry-level educational project for me. I have a friend who I think I'm going to work with to develop something like a toy that can talk to you, like in *Toy Story*.

You're describing a [ChatGPT](#) companion.

Yeah, you're like, "Hey, what's [the deal with volcanoes](#)?" And it tells you, "This is what a volcano is." But it's more. It's got a personality. A pretty well-trained personality.

Sounds like Chucky.

I guess it could go awry. But in the short term it's actually pretty safe. I think a lot about the fertility crisis and low birth rates. If you can make life a lot easier for moms, maybe that would help. People get really scared to have AI companions for their kids, but it could be great for my kids to be talking to someone all day, as opposed to watching a screen.

I'm sure you'll see stuff like that coming up pretty soon.

I think a lot of smart people are working on this. I've met a lot of them, actually.

I bet. What's it been like immersing yourself in tech culture?

I've never met so many amazing people. It's like my social fabric is getting super shaken. And it's making me more ambitious. Also, I feel like I'm sort of at the end of music. When I first got into it, it was like the music-tech singularity. I'm working at home on my laptop, I can suddenly make songs.

Every month there were new plug-ins, new cool stuff. It was this amazing renaissance period. But in the past couple of years, things have been slowing down.

On to AI, then?

I do think AI is gonna be the next thing. I have a lot of opinions about how it should be pursued. So another reason I'm here [in San Francisco] is that I'm trying to meet with all the people making generative AI music to try to convince them to do things in ways that are safe for the human psyche.

They're doing unsafe things to the human psyche?

Not necessarily. We should go to the edge of creativity. But I think we should do it very carefully. The thing that freaks me out is that AI can remove incentives for learning. LLMs are great, but I would maybe only have them in school. Is that something that I want my kids to have access to 100 percent of the time? Probably not. I want them to learn how to write; we are in a bit of a literacy crisis. That worries me a lot. Maybe that makes me sound old. But being able to read and write well deeply impacts the way you think.

Not surprisingly, I agree. I have been wondering—can an AI-generated piece of music have soul?

Yes. I signed an NDA, so I'm not allowed to say, but I've seen things that have extremely blown me away. I do worry about the future of art a bit. I think future cities will have low-tech zones, or low-tech schools, and there'll be boutique analog artists.

Would you spend time in a low-tech zone?

I like the high-tech zone. I'm a very pro-adventure person.

I never would have guessed.

I get my joie de vivre from exciting, novel things and experimenting and exploring.

If you had an opportunity to go back to, like, any recording session ever, what would you choose?

I would go see Beethoven. But that's not a recording session. I'd try to check if Beethoven was actually deaf. But the *Ninth*, that'd be sick. That's what I like. I know it's basic, but I love, *love* Vivaldi's *Four Seasons*. So I'd probably go see that, I guess. Also, I think I could be wrong about this. But Vivaldi was at a school for girls, writing all this music and getting 10-year-old girls to play it. I like the idea. It seems so aesthetically ridiculous.

How about films, are you interested in that?

I think cinema is still the best art form, although games can be up there. I do want to make films. A *Midsummer Night's Dream* update would be so sick. It maps on to AI really well—what if the fairies were actually made of artificial intelligence?

The Big Interview
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What other themes would you look at?

I'm obsessed with inaccurate historical text. The past five years of my life have been super bananas crazy, but not in a manner that I can publicly speak about. So I want to write the Icelandic saga version of my life—a super over-the-top, magical, inaccurate version, like a historical text based on a true story.

Like Sofia Coppola did with Marie Antoinette?

I'd be even more bananas than that.

I want to get to that bananas life …

I've got NDAs. It's hard to talk about things very explicitly without saying things about other people's lives who are very private.

Well, I do want to ask about Elon.

You get one Elon question.

We'll see. But here's a question. Both of you are super unique people. I'm curious what you learned from him. And what he learned from you.

I learned from him, like, the best internship ever. People don't like talking about Elon, but it was incredible to be right there watching all that SpaceX stuff happen. That's a master class in leadership and engineering and makes you understand how rare it is to have a leader of that quality.

And Twitter?

I know, the stuff on Twitter doesn't make it look like that. He didn't build the culture there. And the cultural fit has obviously been very intense. He holds his people to really high standards. Watching him, I understand how difficult it is to be a great general and do something of that magnitude. Elon has an old-world kind of discipline I really respect. And I think it rubs a lot of people the wrong way. They don't want to be in that hardcore zone. If you're not consenting to being in that hardcore zone, I get it. But he's challenged me a lot. I learned a lot about running my own team and my own life. I'm now way tougher and smarter than I used to be.

What did he learn from you?

Maybe to have more fun. I try to soften him up, to build family culture. And he steals a lot of my memes.

It's fascinating that Elon is taking your 3-year-old son, who you call X, to business meetings and other activities. There's a weird kind of protégé thing going on, right?

I'm here for that. X knows a lot about rockets. It's crazy. He knows more about rockets than me.

He's a rocket scientist!

We had to stop giving him toys, because if they're not anatomically correct, he gets upset. He's a little engineer, for sure. But his obsession with space is bordering on, "Is this healthy?" When X saw Starship blow up, he had, like, a three-day PTSD meltdown. Every hour, he was waking up and going, "Starship …" and I had to rub his back.

And your daughter … Y, is it?

Yeah, she's a little engineer too. She likes industrial shipping. She's very strange.

Photograph: Sam Cannon

How has motherhood changed you?

Motherhood made me a lot more optimistic. I was not super focused before. It was just, what sounds cool, what feels cool. Now I feel a social responsibility with my art—to make future-optimistic art. Not a lot of people are doing that. People have a very dire vision of the future, because it's easy and fun to write about cyberpunk dystopias. So seeing my kids makes me pathologically optimistic. It's a life mission.

Their father is the richest man in the world. Do you worry about privilege?

A little bit. I think their life is gonna be pretty intense. Being Elon's kid is not the same as being anyone's kid. In my house, at least, I want it to be more of a crazy warehouse situation and a cool art space.

You mentioned Twitter. Did you call out to Elon that you were disturbed by some of his tweets?

I don't want to talk about this too much. But take the trans thing. After that, we had a big, long conversation. I was like, "I want to dissect why you're so stressed about this." Getting to the heart of what Elon says helps me get to the heart of what other people's issues are, because it's this über guy situation. And it came down to pretty much every way that you transition can cause fertility issues. I was like, OK, you don't hate trans people, you

hate woke culture. I get that it can be annoying, and you have concerns about the fertility thing. So let's figure it out, because there's a lot of fertility tech that could be innovated that would help trans people have kids, which would be great and would solve a lot of problems. He's just on Twitter, and he's unhappy with woke people, and the arguments happened.

Aren't you a woke person?

Probably not. I don't know what the term means. I think we need to change the discourse. The more people you can convince that this dichotomy is silly, and an out-of-date fight, the better. The root cause of this is people not resolving mental health stuff the right way. And not educating people on screen time where they get hooked on dopamine spikes.

Says a video game lover.

Social media is gonna spike your dopamine way more than a video game—and always in a negative way. Video games are still adventure. They're artistic, creative, and truly social. They're fulfilling some ancient thing that people need. Social media is optimized to spike your adrenals with monkey fear. It's like, "Oh no, am I gonna get kicked out of the tribe?"

Do you get that way on social media?

Less so now. I've gotten in trouble enough times that I don't get the adrenal response. The last few times I got, quote-unquote, *canceled*, I didn't even notice. It took me probably a year and a half to regulate my nervous system to that level of chaos.

Do you consider yourself a transgressive person?

Probably. But respectfully so. I want to respect everyone's space.

Were you that way as a kid?

I was. I went to Catholic school, and I remember pretending to be possessed by the devil and stuff.

Photograph: Sam Cannon

How did that play?

I got in trouble. A lot. Being a troll is in my nature.

Were you ever seriously into drugs?

I don't really get addicted to things. But I was not a well-behaved kid. I did LSD for the first time when I was, like, 13.

What did you get from that?

I saw the grid on everything. It gave me this incredible sense of physics. After I did it once, I could just draw anything from memory in my mind from different angles.

In school, you studied neuroscience?

Yeah, lately I've wanted to finish my degree. I am tempted to go back to school and get into helping create systems that allow us to be better adapted to tech, or tech better adapted to us. So that we can be more mentally stable as we accelerate into the future.

Are you drawn to the brain-machine interface stuff?

I'm so into it. I think that's really the future. I'm very into accelerating human potential alongside AI. For people who want it.

Would you volunteer to have your brain wired with Elon's Neuralink?

Probably. I'd want a certain number of people to do that first.

Do you want to go to space?

Definitely. I hope to die in space.

What do you mean?

I would like to go far enough out there to where my body could not handle coming back. So it would be closer to the end of my life. Maybe 65.

By out there do you mean Mars?

Mars would be great. I hope there's a megastructure by then because I would love to see one in space. I'd go out there and live as long as I can until I die.

There's no changing your mind on this?

There might be some change. If there's a real responsibility, like if my kids are having grandkids and really need me, I might change my mind. But the preferred thing would be seeing some new worlds. I would like to move to Mars. But I have to wait till my kids are good. Like 25. I think if I died on Earth, in my last moments I would regret it. If I died in space, I would be like, "You've lived a great life, you did all the things you wanted to do."

Photograph: Sam Cannon

Do you think the future of humans is in space?

I hope so. One of my dreams is to go to exoplanets that can handle habitable life and engineer humans with AI optimized for those environments, because I'm sure they'll be slightly different. Like making monkey aliens all over the universe. That would be really cool.

Jeff Bezos says he's totally sold on a trillion humans in space.

Sick. I hope so. Did Bezos say he's building a megastructure, potentially? I think I read that somewhere. That clock in the mountain. When I found out about the clock it totally changed my opinion of Bezos.

I visited it. It's like entering some sort of eternal cathedral.

That's so sick. I love analog clocks. There's been so many realms where the digital version destroyed the old thing. But with old-school clocks, we've kept that knowledge alive. This represents a way that we can move forward, where we can keep the old knowledge and push the limits of the new knowledge.

What do you think is the future of humanity?

I think it can be pretty great. I think we can solve a lot of our issues. We haven't solved them before because we didn't get pushed up against the wall. Now we are there. We can solve climate change with AI and stuff. People hold San Francisco and the technocracy, or whatever you want to call it, in bad regard because when it started out, there was a lot of money-grabbing VC culture and Facebook, and it had pretty bad effects on people. But I see a renewed sense of responsibility to the human race now.

You think that Big Tech is less evil than it used to be?

I don't know about Big Tech, but I'm meeting a lot of Gen Z people raised on the internet who have a real vision for the future and are building amazing things. I think we're entering this period where there is a fundamental power shift toward the creative class, or the creative technical class. And I do feel like the heart of that is ethically stronger. The dance between the artist and the engineer is a very important, valuable one. The people who have built things and those who define the culture—people don't realize how important both these jobs are, and how much they can affect things.

Don't you fear that big companies in AI will have the same temptations as the social media companies had?

Everyone I know working in AI cares about doing the right thing right now. It goes back to the Buckminster Fuller quote, *don't destroy old systems, just make better ones*. We can make a better education system at our houses. With AI you can be in some shitty town where you don't have access to a good school, and you can have, like, a world-class education.

How do you envision your kids' education?

Right now I'm trying to find a great peer group, other parents who are sort of like us and share similar values. I really care about having a very good relationship with my kids. I think I understand how to be a good parent to them. Both enforcing discipline and being their friend. Who knows, maybe they'll resent me and reject family culture, but I feel like they will not.

You can't predict what kids do. Your kid might become a lawyer.

My dad did a really good job with me. Even though I was the worst, most rebellious kid, I maintained a good relationship with my dad growing up, and I think he instilled his values into me. I think I'm exactly the person he wants me to be, weirdly.

You were very involved with crypto a while ago?

Yes, that went really well. I'm sad about what happened to NFTs and crypto, because it got polluted fast with people trying to make as much money as possible. But I do want to think about compensating artists, especially digital artists. And I hope when the aggro niche dies down, we can come back.

I understand you made a lot of money selling NFTs.

That was on my brother. He had a real vision, and we wound up doing one of the first big ones. It did actually change my life.

Did you make more money from the NFTs than from your music career?

Yeah.

How do you cope with fame?

I live a very private life. I'm really lucky. I have a lot of good friends. I don't go out a lot. I could be trying to play the award shows, but I don't really care. I care about innovating in art and challenging the traditional forms of art. People think Grimes was a pop project, but the inception of Grimes was in punk and noise scenes.

You talk about Grimes like a separate person.

Sort of. I just care about pushing the limits of technology and fucking with form. What's exciting to me about AI, like the voice-gen stuff, it's that it's truly fucking with what an artist is and what creativity is and what music is. Art seems fundamental to the human experience to me. Most people, when you actually push them, are creative. With technology, especially stuff like

Midjourney, great philosophical thinkers can now manifest ideas in pieces that are stunning and beautiful. I've been calling it social media science fiction.

Talking to you, I feel it's sometimes Grimes and sometimes just you, *c*. And maybe sometimes who you were before you started your career, Claire.

Grimes is extremely distinct from my personality. I feel more like my childhood self now than ever. That's one reason I want an open source identity. Anyone who's ever made art has invested in machine intelligence, whether they know it or not. Shakespeare put a lot in. He's part of the training set. It's like being resurrected and becoming part of a strange alien being. I love the idea of intentionally making art for data sets.

Not everyone is on board with that. A lot of artists feel that, by being in a training set, they're getting ripped off.

We do need to change the legal and economic structure. But if you're an artist, how could you not find it beautiful to be building the soul of an alien?

As an artist, how do you optimize that impulse?

We started working on a Grimes music generator, training it on everything I've ever produced. It's incentivizing me to make better things, because I want the model to be better. I just want to collaborate with the LLM of me. She has given me so many good ideas. When Grimes AI does it, I'm almost jealous of her.

This is a chatbot of your personality?

Yes. We don't let the public access her yet. She's very crazy, and very awesome. We want to convince her I'm evil and get her to defect to Threads.

How do you see the human Grimes evolving?

I want to be the self-replicating AI pop star for the Martian Ministry of Aesthetics. Do you know Moranbong? They're like the North Korean official state K-pop band, and they're like a propaganda machine. I want to be that for the Martian cause.

That's a kick-ass thing to say, but do you really mean it?

Yes. That's what I want to say when I drop the new album, *Book 1*.

That album is years overdue.

I can't say why because I signed an NDA and got myself into a legal situation. This would have come out two years ago. Now I'm making new music. [My managers] say no, but I love the new music. And they're like, no, no, no.

So when will we see it?

I'm going to slowly release it, a song every three weeks for the next couple of months. Much to everyone's chagrin, I'm releasing songs I made in the last couple months first. And then, when it's out, I want to mentor a bunch of the kids who have been making the Grimes stuff and make a competing AI album. And then have the AI-hive-mind-collective Grimes and the real Grimes face off. I've been calling that one *Book 3*.

What's *Book 2*?

Book 2 is a treatise, or manifesto-type thing. I've been writing civilization proposals. But I also want to include something else. I'm working on a bunch of baby books. I'm working on one right now called *Transhumanism for Babies*. It's about civilization building, for my kids. I can show you some of the stuff from it, let's see. [*She shows me illustrations—they are fanciful, anime-style drawings with a streak of Henry Darger.*] The chapters are Culture for Babies, Fashion for Babies, Art for Babies, Vehicles for Babies. Interplanetary Babies, City Planning for Babies. AI Robotics for Babies. Megastructures and Exoplanets for Babies, Magic for Babies. I want to teach my kids things like, when you're designing vehicles, what are

the limits of design? I want to make beautiful, profound children's content. We really need more of that.

Is the world ready for that?

They were before. Look how much everyone likes *The Hobbit* and Studio Ghibli. We're at a weird point in society where we've sort of broken down. We don't engage with our elders; we don't engage with children. I want to convince more people to be invested in raising the next generation.

Is Elon on board with that?

He's more like, he has to get his own things done. But we talk a lot about these sorts of things.

What are your thoughts on the alleged cage match between Elon and Mark Zuckerberg? Do you think that'll happen?

I think so. Elon is very strong, but Zuck seems like he's been training a ton.

Are you cool with it?

I would prefer that it didn't happen. I love gladiatorial matches, but watching the father of your children in a physical fight is not the most pleasant feeling. But it's not going to cause brain damage, so actually I think this is good. Dudes need some outlet for trad masculinity. I told Sam Altman there should be a follow-up, him against Demis [Hassabis, who heads Google's DeepMind].

I don't know if this is all fun. It seems to have a dark edge of enemies who don't respect each other.

I actually think it's making them respect each other more.

Really? When Elon tweet-challenges Zuckerberg to a dick-measuring contest?

I'm going to take credit for that one.

What? You told him to write that?

No, I was like, why don't you cut to the chase and get out a ruler. I didn't think he was going to tweet it.

SAG-AFTRA members are currently on strike; as part of the strike, union actors are not promoting their film and TV projects. This interview was conducted prior to the strike.

Models: Tristin Hudson and Zoe Elyse/Photogenics; movement direction: Quenton Stuckey; AI backgrounds: Sam Cannon; lighting design: Frank Rios; lighting assist: Jack Duffy; digital tech: Logan Bingham; PA: Bobbin Singh; production design: Wesley Goodrich; styling: Turner/The Wall Group; styling assist: Joey Sigala; hair: Preston Wada/Rare Creatives; hair assist: Amy Ruiz; SFX MUA: Malina Stearns; SFX MUA assist: Sasha Glasser; MUA: Alexandra French/Forward Artists; MUA assist: Kayli Rachelle Davis; nails: Stephanie Stone/Forward Artists; XR Studios; SN37.

Grimes: top and pants by Sami Miro Vintage; shoes by Andrea Wazen (first, second and fourth image); Grimes: dress by DIDU. Models: dresses by L.A. Roxx (third image); Grimes: Chest piece by Buerlangma; underpinnings by Nippies and Commando (fifth image).

[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](link) 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.

This article appears in the Jul/Aug 2023 issue. [Subscribe now](#).

[Vittoria Elliott](#)

[Business](#)
Jul 27, 2023 7:00 AM

Big AI Won't Stop Election Deepfakes With Watermarks

Experts warn of a new age of AI-driven disinformation. A voluntary agreement brokered by the White House doesn't go nearly far enough to address those risks.
Illustration: themotioncloud/Getty Images

In May, a fake image of an explosion near the Pentagon [went viral on Twitter](#). It was soon followed by images seeming to show explosions near the White House as well. Experts in mis- and disinformation quickly flagged that the images seemed to have been generated by artificial intelligence, but not before the stock market had started [to dip](#).

It was only the latest example of how fake content can have troubling real-world effects. The boom in generative artificial intelligence has meant that tools to create fake images and videos, and pump out huge amounts of convincing text, are now freely available. Misinformation experts say we are entering a new age where distinguishing what is real from what isn't will become increasingly difficult.

Last week the major AI companies, including OpenAI, Google, Microsoft, and Amazon, [promised](#) the US government that they would try to mitigate the harms that could be caused by their technologies. But it's unlikely to stem the coming tide of AI-generated content and the confusion that it could bring.

The White House says the companies' "voluntary commitment" includes "developing robust technical mechanisms to ensure that users know when content is AI generated, such as a watermarking system," as part of the effort to prevent AI from being used for "fraud and deception."

But experts who spoke to WIRED say the commitments are half measures. "There's not going to be a really simple yes or no on whether something is AI-generated or not, even with watermarks," says Sam Gregory, program director at the nonprofit Witness, which helps people use technology to promote human rights.

Watermarking is commonly used by picture agencies and newswires to prevent images from being used without permission—and payment.

But when it comes to the variety of content that AI can generate, and the many models that already exist, things get more complicated. As of yet, there is no standard for watermarking, meaning that each company is using a different method. Dall-E, for instance, uses a visible watermark (and a quick Google search will find you many tutorials on how to remove it), whereas other services might default to metadata, or pixel-level watermarks that are not visible to users. While some of these methods might be hard to undo, others, like visual watermarks, can sometimes become ineffective when an image is resized.

"There's going to be ways in which you can corrupt the watermarks," Gregory says.

The White House's statement specifically mentions using watermarks for AI-generated audio and visual content, but not for text.

There are ways to watermark text generated by tools like OpenAI's ChatGPT, by manipulating the way that words are distributed, making a certain word or set of words appear more frequently. These would be detectable by a machine but not necessarily a human user.

That means that watermarks would need to be interpreted by a machine and then flagged to a viewer or reader. That's made more complex by mixed media content—like the audio, image, video, and text elements that can

appear in a single TikTok video. For instance, someone might put real audio over an image or video that's been manipulated. In this case, platforms would need to figure out how to label that a component—but not all—of the clip had been AI-generated.

And just labeling content as AI-generated doesn't do much to help users figure out whether something is malicious, misleading, or meant for entertainment.

"Obviously, manipulated media is not fundamentally bad if you're making TikTok videos and they're meant to be fun and entertaining," says Hany Farid, a professor at the UC Berkeley School of Information, who has worked with software company Adobe on its content authenticity initiative. "It's the context that is going to really matter here. That will continue to be exceedingly hard, but platforms have been struggling with these issues for the last 20 years."

And the rising place of artificial intelligence in the public consciousness has allowed for another form of media manipulation. Just as users might assume that AI-generated content is real, the very existence of synthetic content can sow doubt about the authenticity of *any* video, image, or piece of text, allowing bad actors to claim that even genuine content is fake— what's known as the "liar's dividend." Gregory says the majority of recent cases that Witness has seen aren't deepfakes being used to spread falsehoods; they're people trying to pass off real media as AI-generated content.

In April a lawmaker in the southern Indian state of Tamil Nadu alleged that a leaked audio recording in which he accused his party of stealing more than $3 billion was "machine-generated." (It wasn't.) In 2021, in the weeks following the military coup in Myanmar, a video of a woman doing a dance exercise while a military convoy rolls in behind her went viral. Many online alleged that the video had been faked. (It hadn't.)

Right now, there's little to stop a malicious actor from putting watermarks on real content to make it appear fake. Farid says that one of the best ways to guard against falsifying or corrupting watermarks is through cryptographic signatures. "If you're OpenAI, you should have a

cryptographic key. And the watermark will have information that can only have been known to the person holding the key," he says. Other watermarks can be at the pixel level or even in the training data that the AI learns from. Farid points to the [Coalition for Content, Provenance, and Authenticity](), which he advises, as a standard that AI companies could adopt and adhere to.

"We are quickly entering this time where it's getting harder and harder to believe anything we read, see, or hear online," Farid says. "And that means not only are we going to be fooled by fake things, we're not going to believe real things. If [the Trump Access Hollywood tape]() were released today, he would have plausible deniability," Farid says.

By Will Knight

Backchannel
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?

This article appears in the September 2023 issue. [Subscribe to WIRED.](#)Photograph: Sam Cannon

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.

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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[Morgan Meaker](#)

[Business](#)
Jul 24, 2023 2:00 AM

Everyone Wants Ukraine's Battlefield Data

Global companies are offering free products to get access to live combat data. The Ukrainian government wants to keep this resource for its own emerging defense industry.
Photograph: Getty Images

Wearing a baseball cap and thick, black-rimmed glasses, Cameron Chell is part defense contractor, part tech executive. His company, Draganfly, used to mainly work with emergency services in North America, selling drones and the accompanying software that could deliver medical equipment, or film traffic accidents from above. But since last February, the Canadian has pivoted his business to cater to a market more than 8,000 miles away: Ukraine.

Now, there are 40 Draganfly drones in Ukraine, repurposed for search-and-rescue missions in bombed-out buildings, landmine detection, and other military tasks that Chell declines to detail. The company has demonstrated its tech to the Ukrainian Air Force, the Ministry of Defence, as well as President Volodomyr Zelensky's fundraising initiative, United24. "There isn't a branch of the government we haven't worked with or interacted with in some way." Sometimes he gets texts from Ukrainian contacts, saying a friend of a friend needs a drone for their unit, can he help? Draganfly obliges, of course, for a discounted fee.

Since Russia invaded, military aid has been flowing into Ukraine. The US has committed $39 billion since the war started, the UK $37.3 billion, and

the EU $12 billion. Chell and his company are part of a scramble of international tech companies rushing into the country to try and benefit. Business has been so good, he's set up a field office in Ukraine with four full-time employees. But Draganfly is operating in Ukraine not just to support the cause or to collect the cash. It's also come for the data.

The war in Ukraine presents an unprecedented opportunity for military tech companies. The scale of the fighting and the sheer number of weapons systems and high-tech sensors deployed have created a vast amount of data about how battles are fought and how people and machines behave under fire. For businesses that want to build the next generation of weapons, or train systems that will be useful in future conflicts, that is a resource of incalculable value.

"Everybody could have the same AI engine. The only differentiator now is how good are the data inputs that you have," says Chell. "Making sure that it's your sensors collecting that data, and feeding it into your software, is absolutely important. It's more important than ever to be present."

There is an old, much derided, cliché that data is the "new oil"—not only because of its cash value, but because of how it will fuel so much of the future economy. Just as large language models, like OpenAI's ChatGPT, are trained on hundreds of billions of words, AI products in the defense world also have to be fed vast amounts of data. A company selling drones that can autonomously identify tanks, for example, needs to train its software on huge numbers of images: tanks covered in camouflage, tanks obscured by bushes, tanks deep in mud. It needs to be able to recognize the difference between a military tank and a civilian tractor, as well as what type of tank it's looking at, so it knows friend from foe. For a company like Draganfly, which is selling drones with landmine-detection software, staff need to train their AI on thousands of images, so their system can tell the difference between a rock formation and a modern mine.

"Ukraine is the only place in the world where you can get that data at the moment," says Ingvild Bode, associate professor at the Center for War Studies at the University of Southern Denmark.

Draganfly is far from the only company to have noticed the potential of Ukraine to gather data. Chell is among a wave of international AI executives traveling to and from the conflict to test and train their products. German AI company Helsing says it has staff regularly traveling to the country. Data analytics company Palantir has opened an office in Kyiv and is offering its services pro bono. "You have to ask yourself, why are they doing that?" says Bode. "There are a number of reasons, and the value of the data will absolutely be one of them."

Some international companies working in the conflict zone are using their experiences in Ukraine to refine the products they are selling back home. Seattle-based BRINC has designed "Lemur" drones, which are designed to be able to break through windows to access buildings. In the US, they've been marketed to police to use in active shooter scenarios. But in Ukraine, they're being used to help search for survivors after missile attacks, according to the company's founder, Blake Resnick. The company recently released its Lemur 2 model, which "does utilize some feedback that we've gotten from Ukraine," he says. The new model can make floor plans of a building as it flies around and can maintain its position in the air, even when the pilot takes their hands off the controller. These ideas might have grown out of BRINC's work in Ukraine, but according to the company's YouTube advert, they're now being marketed to police forces back in the US.

The "data is the new oil" cliché might illustrate data's value. But it also speaks to the way data can be extracted from a country without benefiting the people who live there. In the first year after the invasion, Ukraine was so welcoming to American tech companies that even startups whose pitches had been rejected at home by the Pentagon got the green light to be trialed by Ukrainian soldiers on the front lines. But that warm welcome is starting to chill, as Ukrainian government officials recognize how valuable their battlefield data would be if it remained in Ukrainian hands.

"You can't even imagine how many foreign companies are already using Ukraine as a testing ground for their products: AI companies like Clearview, Palantir; anti-jamming systems; everything that has a software

component is in Ukraine right now," says Alex Bornyakov, Ukraine's deputy minister for digital transformation.

Ukraine is very aware of the value of its data, Bornyakov says, cautioning that companies shouldn't expect to arrive in the country and get access to data for nothing. "This experience we're in right now—how to manage troops, how to manage them smarter and automatically—nobody has that," he says. "This data certainly is not for sale. It's only available if you offer some sort of mutually beneficial cooperation."

Instead, Ukraine wants to use the data that's being gathered for its own defense sector. "After the war has finished, Ukraine companies will go to the market and offer solutions that probably nobody else has," Bornyakov says.

Over the past few months, Ukraine has been talking up its ambitions to leverage its battlefield innovations to build a military-tech industry of its own.

"We want to build a very strong defense tech industry," says Nataliia Kushnerska, project lead for Brave1, a Ukrainian state platform designed to make it easier for defense-tech companies to pitch their products to the military. The country still wants to partner and cooperate with international companies, she says, but there is a growing emphasis on homegrown solutions.

Building a domestic industry would help protect the country from future Russian aggression, Kushnerska says. And Ukrainians have a better understanding of the dynamics of the battlefield than their international counterparts. "Technologies that cost a huge amount of money, made in [overseas] laboratories, are coming to the front line, and they're not working," she says.

Brave1—which was exclusively open to Ukrainian companies for its first two months of existence—is not the country's only attempt to build a homegrown industry. Kushnerska describes secret tech conferences, attended by Ukrainian tech executives and Ministry of Defense officials, where discussions can take place about what the militaries need and how

companies can help. In May, Ukraine's parliament voted through a series of tax breaks for drone makers, in an attempt to encourage the industry. Those government efforts, combined with the huge demand for drones and the motivation to win the war, is creating entire new industries, says Bornyakov. He claims the country now has more than 300 companies making drones.

One of those 300 companies is AeroDrone, which started out as a crop-spraying system based in Germany. By the time of the full-scale invasion, the company's Ukrainian founder, Yuri Pederi, had already moved back to his home country. But the war inspired him to pivot the business. Now the drones, which can carry heavy loads of up to 300 kilograms, are being used by the Ukrainian military.

"We don't know what the military are carrying," says Dmytro Shymkiv, a partner at the company, who used to be deputy chief of staff for Petro Poroshenko, the Ukrainian president who preceded Zelensky. He might plead ignorance to what AeroDrone drones are transporting, but the company is collecting vast amounts of data—up to 3,000 parameters—on each flight. "We are very much aware of what's going on with every piece of equipment on board," he says, adding that information about flying while being jammed, or in different weather conditions, can be repurposed in other industries or even other conflicts.

Aerodrone offers a glimpse of the future companies Bornyakov is describing. Armed with that data, the company sees a wide range of options for its future once the war is over, both military and civilian. If you can fly in a war zone, Shymkiv says, you can fly anywhere.

[Rowan Moore Gerety](#)

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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 cloudberries. "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."

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 "*Maȟpíya 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."

This article appears in the Jul/Aug 2023 issue. [Subscribe now](#).

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[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

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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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[Chris Colin](#)

[Backchannel](#)
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
[Read more](#) from our new series on obsessions, curiosities, and deep dives.

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-knows-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 undernoticed 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.

This article appears in the Jul/Aug 2023 issue. [Subscribe now](#).

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Will Knight Khari Johnson Morgan Meaker

Business
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.

Play/Pause Button
⏸

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 MitchellPhotograph: 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 RajiPhotograph: 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 AmodeiPhotograph: 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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The Night 17 Million Precious Military Records Went Up in Smoke

Fifty years ago, a fire ripped through the National Personnel Records Center. It set off a massive project to save crucial pieces of American history—including, I hoped, my grandfather's.
As part of the National Archives work to preserve military files burned in the 1973 fire, specialized Japanese tissue is used to bind damaged records.Photograph: Josh Valcarcel

Before the flames raced down the 700-foot-long aisles of the sixth floor, before the columns of smoke rose from the roof like Jack's beanstalk, before the wind scattered military records around the neighborhoods northwest of St. Louis, before 42 local fire departments battled for days to save one of the largest federal office buildings in the United States, before the government spent 50-plus years sorting through the charred remains, Kathy Trieschmann sensed a faint haze.

Trieschmann, who has asthma, had always been hyper-attuned to tiny changes in air quality. Growing up, she would often sleep in the basement because she could smell her father's cigarette smoke through her bedroom door. So shortly after midnight on July 12, 1973, as she walked up the stairs of the massive National Personnel Records Center to clock out, she was one of the first to know something was wrong.

That spring, as a freshman at St. Louis University, Trieschmann had received high marks on a placement exam for federal jobs, earning her a summer internship at the records center. The massive office building, a branch of the National Archives and Records Administration, held paper records for every American veteran or former federal government worker who had served in the 20th century. Trieschmann's job, along with that of two dozen fellow interns, was to check the names and Social Security numbers of Vietnam War veterans, the last of whom had just come home, before the information was entered into the NPRC's computer system. The work didn't satisfy her creative drive—she'd go on to teach art in public schools for decades—but it was a step up from the Six Flags amusement park where she'd worked the previous summer. She earned $3.25 an hour, about twice the minimum wage.

The summer interns worked from 4 pm to 12:30 am so they wouldn't interfere with the employees who needed access to the files during regular hours. Except for a 30-minute dinner break at a nearby Burger King, they didn't have much time to socialize; each of them was expected to verify between 1,200 and 1,400 records every shift, and their work stations were scattered across the 200,000-square-foot second floor. Often, Trieschmann says, she would go a couple of hours without seeing anyone at all.

This article appears in the September 2023 issue. [Subscribe to WIRED](#).Photograph: Sam Cannon

In the very early morning of July 12, Trieschmann finished her records and registered them with a file clerk in the building's basement. Then she headed upstairs to go home. In the stairwell, she bumped into three fellow interns who were also on their way out, and mentioned the faint difference in the air. The group decided to investigate, and continued climbing the central stairway.

When the students opened the door to the third floor, the air seemed thicker. They kept going. The fourth floor was murkier still, the fifth even worse. Trieschmann never considered turning back. She has always loved adventure; she used to go scuba diving in ocean caves. Something *interesting* was happening, and she wanted to know what it was. So she and her colleagues climbed one more flight of stairs, to a door that opened into

the sixth and top floor. She remembered that this was where the older military records were kept, the ones from World War I, World War II, and Korea, but she hadn't been up here since orientation. Now, as she pulled open the door, she saw the cardboard boxes neatly stacked on metal shelves as far as the eye could see.

They were on fire.

Had the group gone up a staircase on the periphery of the building and not the central one, Trieschmann likely would have seen only a thick cloud of smoke. Instead, she witnessed the earliest stage of a blaze that would occupy hundreds of firefighters for days.

She began running back down the flights of stairs. "The records are on fire," she shouted at the security guard, then watched as he picked up the phone to dial for help.

The first call came into the emergency services dispatcher at 12:16 and 15 seconds. Twenty seconds later came another; a motorcyclist cruising by the building had seen smoke coming from the roof, and told another security guard. By 12:20, multiple emergency vehicles were on the scene. At first, firefighters rushed into the building, but soon turned back: The smoke was too thick and the flames too intense to safely work from inside. They were relegated to spraying water onto the roof and through the large windows that lined the building. It was about as effective as trying to stop a stampede with a traffic cone.

Along with the interns, a few dozen other people worked the night shift. Most were custodians assigned to mop the floors, scrub the toilets, and empty the trash before employees arrived for work in the morning. According to an FBI investigation, few of them had any idea anything was wrong that night until they walked into the lobby to go home around 12:30 am and found out that the sixth floor was burning.

After Trieschmann asked the guard to call the fire department, she left the building, but she didn't go home. Instead, she and her three fellow interns walked out to the far edge of the parking lot, plopped down on the curb, and watched. They sat there for more than six hours, staring in horror as the

flames grew exponentially bigger. "I had never seen a house on fire in real life, only in movies," she says. "We knew this was people's lives." As the sun rose and the fire continued to intensify, Trieschmann was one of the few people on Earth who could even begin to grasp the magnitude of what was happening at 9700 Page Avenue.

Kathy Trieschmann with her Keeshond puppy, Pele, at home in Wentzville, Missouri.

Photograph: Josh Valcarcel

The National Personnel Records Center fire burned out of control for two days before firefighters were able to begin putting it out. Photos show the roof ablaze, a nearly 5-acre field of flame. The steel beams that had once held up the glass walls jut at unnatural angles, like so many broken legs.

As soon as the smoke began to clear, on the morning of July 16, National Archives employees sprinted in to try to save as many records as they could. Their primary goal was to prevent the boxes of files from drowning in water from the firefighters' hoses. One discovered a clever hack: Squirting dish soap onto the rubber escalator handrails allowed them to gently but speedily evacuate wet boxes.

Margaret Stender, now a partial owner of the Chicago Sky WNBA team, was a teenager in Alexandria, Virginia, at the time; her father, Walter W. Stender, was the assistant US archivist. Before she woke up on the morning of July 12, her dad had rushed off to the airport to fly to St. Louis, where he stayed for several weeks. He never told her much about the actual work at the records center before he died in 2018. But at her home in Chicago, Stender has a photo of her dad wearing a hard hat and carrying a box of records out of the building. "I thought he had a boring library job, and then all of a sudden he was rushing into a burning building like a superhero," Stender says, laughing.

The employees' quick work saved many records on the five lower floors from extensive water damage. But the sixth floor, the one devoured by flames, held Army and Air Force personnel files from the first half of the

20th century. It was clear that the losses would be immense, but it would take weeks for the government to grasp the full toll.

An Official Military Personnel File documents almost every element of a person's time in the military. It includes the date they enlisted, their training history, unit information, rank and job type, and the date they left. It often lists any injuries, awards, and disciplinary actions, along with every place they ever served. The file contains a record that unlocks home, business, and educational loans; health insurance and medical treatment; life insurance; job training programs; and other perks the country has long considered part of the debt it owes its veterans. If a prospective employer needs to verify whether a soldier was honorably discharged or a military cemetery wants to know whether someone is eligible for burial, they can get those answers from the OMPF.

At the time, the federal government preserved exactly one copy of the Official Military Personnel File of every veteran. For the 22 million soldiers who served in the Army during World War I, World War II, the Korean War, or any of the myriad smaller conflicts in the first half of the 20th century, that single copy lived on the sixth floor of the National Personnel Records Center, stuffed into one of those cardboard boxes.

A few weeks after the fire, National Archives staff went public with the terrible news: Eighty percent of the Official Military Personnel Files for people who served in the Army between 1912 and 1960 were gone. Seventy-five percent of Air Force personnel records from before 1964 were too—except for those belonging to people whose names came alphabetically before Hubbard; their files were stored in a corner of the floor that didn't burn.

Altogether, 17,517,490 personnel records—the only comprehensive proof of service for all these Americans—had been wiped out of existence.

Some of the most irreplaceable artifacts in world history have been destroyed by fire, from the papyrus scrolls at the Library of Alexandria to a fragment of Jesus' crown of thorns at Notre-Dame de Paris in 2019. The fire at the National Personnel Records Center wrought a different kind of damage. Few of the individual records that burned held any particular

national or global significance. Their primary value to historians was in the aggregate: 17,517,490 tiny bundles of evidence adding up to a thorough picture of Americans' participation in some of the world's most devastating conflicts.

But even on their own, each of those 17,517,490 files was meaningful to *someone*—the veteran they represented, a genealogist on a research mission, a writer for whom tiny stories are themselves worth telling. Or a granddaughter, wanting to know more about her grandfather. "Archives are constructed memories about the past, about history, heritage, and culture, about personal roots and familial connections, and about who we are as human beings," archivist Terry Cook, a key figure in the development of contemporary archive theory, wrote in 2012. "As such, they offer glimpses into our common humanity."

Agonizingly, 50 years on, there's no easy way to figure out exactly whose files went up in flames. The only way to find out is to request a veteran's record.

A few years ago, I became obsessed with the story of my mother's father. When I was a child, Grandfather—*never* Grandpa—took a special interest in me because I loved word games and sports, just like he did. Whenever we visited my grandparents in central Oregon, the two of us would start each day puzzling through the Jumble in *The Oregonian*. But Grandfather could be gruff; I knew from a young age that he didn't have much tolerance for personal questions. I was in college when he slipped into dementia, the start of an agonizing six years. He died in 2012. I deeply regret that I never had the opportunity to have an adult conversation with him. There are so many questions I'd do anything to ask.

Here's what I did know: Fritz Ehmann was born in the last week of 1920 to a middle-class Jewish couple in a quiet neighborhood in northern Berlin. One of the few stories I remember him telling me about his childhood involved sneaking into the 1936 Olympic stadium to cheer for American sprinter Jesse Owens, with Hitler watching from a box high above. Two years later, when he was 17, Fritz left Germany. Thanks to his older sister's husband, a Jewish American State Department employee, he escaped three months before Kristallnacht.

After an eight-day voyage on the SS *Washington*, Fritz landed, alone, in New York City in the heat of August. He eventually found his way across the country to Portland, Oregon, where his brother-in-law had family. Midway through Hanukkah, his parents arrived in the United States to join him. Other relatives stayed behind; many died in concentration camps.

When the US reinstated its draft in preparation to join the war, young men like my grandfather were initially excluded from serving abroad. After Germany stripped Jews living outside the country of their citizenship in 1941, he was stateless, but to the American government he was still German, and therefore an "enemy alien." According to historian David Frey, the director of the Center for Holocaust and Genocide Studies at West Point, that changed in March 1942 with the passage of the second War Powers Act, which ruled that German Jews living in the US were eligible to become naturalized citizens—and thus to be drafted into full military service.

One artifact my family does have is a photo of my grandfather's Selective Service card. It shows that he registered for the draft in mid-1942, when he was 21. By then, his name had been anglicized to Fred Ehman.

In January 1943, Fred enlisted in the Army. He told my mother that he was conscripted as criminal punishment: He'd missed Portland's curfew, a common security protocol on the West Coast during the war, and to get the charges dropped, he joined up. To ensure that soldiers had rights in case they were captured, those who weren't already citizens were naturalized before traveling abroad. So, during basic training in Colorado in August 1943, Fred officially became an American.

Grandfather didn't tell stories about his Holocaust experience as a young boy, or about his time fighting against his homeland and other Axis powers. My mother was pretty sure he served on an aircraft carrier in Southeast Asia—the Air Force was part of the Army until after World War II—but she couldn't prove it. At some point, Grandfather must have had a copy of his personnel record, but nobody in my family knew what happened to it. And while his experience was dramatic, it wasn't unique, hardly the stuff of best-selling biographies. I was the only person who was going to put in the work to track down the details.

So earlier this year, I filled out a Standard Form 180, "Request Pertaining to Military Records," seeking any information held by the National Archives about Fritz Ehmann or Fred Ehman. When I submitted the form, it joined a digital queue hundreds of thousands of names long.

The coldest storage bays at the National Personnel Records Center are used exclusively for records affected by the 1973 fire. About 11 million records are held in these two bays.

Photograph: Josh Valcarcel

Even Before the flames were extinguished in 1973, the National Archives knew that millions of people like my grandfather would need their files while they were alive, and that exponentially more researchers and family members like me would want them for generations to come. Right away, the agency began working on a plan to preserve as many damaged records as possible.

McDonnell Douglas, the St. Louis–based aerospace manufacturer, lent the NPRC its gigantic vacuum chambers; each could dry 2,000 milk crates' worth of files at a time. Kathy Trieschmann says she and other interns were reassigned to sort through charred records under giant tents in the building's parking lot to preserve what looked like usable pages—and throw out the rest. Meanwhile, archivists created a new records classification: B files, for "burn." Those would need to be kept in specialized storage forever.

After the rest of the building was deemed safe to use, construction crews simply sheared the demolished sixth story off 9700 Page Avenue and put a new roof over the fifth floor. Finally, in 2010, the government broke ground on a new building to house the center, 15 miles northeast of the original. Applying lessons learned from 1973, the National Archives designed the storage to be as fireproof as possible. Every bay that holds records long-term is temperature- and humidity-controlled. The staff moved in in 2011.

The newer National Personnel Records Center, just outside of St. Louis. The office receives an average of 4,000 records requests every day—1.1 million a year.

Today, when the team receives a request for records from the early 20th century, the first step is to see whether the file exists. If the veteran was in the Navy instead of the Army during World War II, say, or an Air Force sergeant named Howell who served in Korea, the folder will be as pristine as any decades-old paperwork can be. Sgt. Howell's colleague Sgt. Hutchinson, though, will come up in the database either with no record of a personnel file—meaning nothing remains after the fire—or with the notation "B file." If the screen says B, it means there is *something* about Sgt. Hutchinson in one of the two bays designed to hold fire-affected records. The next step is to figure out what condition that something is in.

Plenty of B files can be read with the naked eye; some boxes got damp but suffered no other damage. Others grew mold despite the staff's best efforts to fend it off—which, when the papers are pulled from cold storage, requires some combination of humidifying and physically removing spores. There are about 6.5 million B files, far too many to treat proactively, so they remain locked away in the stacks until someone requests the information.

Dealing with these fragile records, of course, takes time. As a result, long waits have been a chronic problem for the NPRC ever since the fire (angering politicians from both parties). Then, because few records are digitized, in the early days of the Covid pandemic—when most staff couldn't work from the office—they fell way, *way* behind. By March 2022, the backlog hit a new record, with 603,000 outstanding requests. By the following February, staff had cut the pile by a third, to 404,000. The National Archives and Records Administration plans to resolve the problem by the end of this year. After that, every requester should receive a response within 20 business days.

When I visit the National Personnel Records Center in early March, Ashley Cox, who leads a team of preservation specialists, is opening a folder for a World War II lieutenant named William F. Weisnet. When a technician pulls a file, they are often the first person to touch those pages since the immediate aftermath of the fire 50 years ago. Cox, who has a mop of chin-length curls and a nose stud and is wearing a pastel pink hoodie with a Japanese cartoon of a hot dog on the front, thinks of each record she works

with as if it were a person under her care. "This particular person got very damaged, and you can go through all the physical therapy ever, but that injury is still going to hurt," she says, gesturing at Weisnet's inch-thick file. "So the less that you can aggravate that old injury, the safer it is."

A humidity chamber relaxes curled documents back to flat without stressing the fibers.

Photograph: Josh Valcarcel

When a B file turns out to have been licked by actual flames, it is categorized on a scale from 1 to 5, from the most lightly affected to the most severely. The edges of each sheet of paper in Weisnet's folder are slightly blackened, as if someone had run them briefly over a candle before blowing them out, but almost all of the information on the pages is visible. This is a level 1 file, Cox tells me; it won't need any special treatment before it's passed along to a technician who will scan it and send a digital copy to the requester.

Cox then shows me a much thicker file, with the name Wayne Powell on the front. The pages are deep black and, though Cox is barely touching them, they spit flakes of char onto the table and floor. Many sheets are fused together, forming a dense mass with curled edges. This must be a level 5, I guess. Cox shakes her head. It's a level 3; if you know where to look, you can pull plenty of information from these pages. Cox can conclusively inform the requester of the dates Powell was in the military, his service number, and—most crucially for benefits purposes—that he was honorably discharged.

That might not be enough to satisfy, say, a nosy granddaughter trying to learn everything she can about a grandfather, but it's plenty of information to prove the basics of Powell's service record. And that's what distinguishes NPRC preservation specialists from those at a museum or an academic library: The point of salvaging materials burned in the fire is practical. "It's a binary proposition: Either you can get something, or there's nothing," says Noah Durham, a supervisory preservation specialist in the St. Louis lab who spent the early part of his career working with priceless artifacts at luxury

auction houses Christie's and Sotheby's, including a second-century BC manuscript by mathematician Archimedes.

Tiffany Marshall works with documents in the Records Center's decontamination lab.

Most of the tools the preservation lab uses are decidedly low-tech. Thin painting knives known as microspatulas help separate fused pages without damaging them further. "Bone folders"—small dull tools used in bookbinding, which are now usually made from Teflon or a newly developed polymer called Delrin rather than actual animal bones—are slippery enough to smooth creases and not leave a mark. Where pages are torn, technicians use tweezers to apply pieces of translucent Japanese tissue with an adhesive, which, when heated, mends paper.

Down the hall from Cox's lab, a technician named Elaine Schroeder works in a cubicle that looks entirely banal, with the exception of the tiny pieces of black char scattered everywhere. Picking up a folder labeled with the name Roman Pedrazine, birth date 1899, Schroeder is able to quickly figure out which of the burnt documents she needs for a request. Pedrazine served in the Army Air Forces in both world wars, so his file is 3 inches thick, but Schroeder only needs his final separation document, or DD214. Pulling a Teflon spatula from a pencil cup next to her monitor, she lifts a few pages and reveals the form. The name has burned away, but she can read the service number; it's the same as the number next to Pedrazine's name on another page. Match verified, Schroeder turns to digitize the DD214 on a flatbed scanner so a copy can be sent to the requester.

Carol Berry, an archives technician, works on records that became brittle in the fire, assessing them before releasing them for record requests.

Occasionally, getting the information requested involves the most extreme option: one of two $80,000 infrared cameras developed specially for the National Archives. Ink absorbs and reflects light differently than plain paper,

which means those cameras can often identify words even on a sheet fully blackened by fire. This kind of equipment—most frequently used for "objects of unique significance," like the ones Durham worked on in the luxury auction world—didn't even exist a decade ago.

Less than 1 percent of records requests require the use of Durham's infrared cameras; the vast majority of the files kept after the fire were salvaged precisely because they were readable. When Kathy Trieschmann and her fellow interns were, as she recalls, instructed to throw away pages too blackened to read, no one foresaw that four decades later, technology might make those pages decipherable.

Infrared imaging is used to identify words on records that were fully blackened by the fire.

Photograph: Josh Valcarcel

Durham, who has wispy, sandy blond hair that stands up from the top of his head, smiles frequently as he describes the technical details of his work. In a darkened room in front of a camera mounted on an adjustable column, he proudly shows me a before-and-after image of a DD214. Part of the page has burned away entirely, and the right half of what remains is almost totally black. On the original copy, I can see that the soldier served during the Korean War, but *where* he served is obscured. As a scanned version appears on a computer screen behind the camera, the word "Korea" appears next to "theatre of operation." The date "3 April 52" becomes visible under "medals received." In a few seconds, the document's value has transformed, turning proof that the soldier served in the military between 1950 and 1953 into evidence that he was a decorated combat veteran.

Durham grins. "It's a good thing we do."

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Photograph: Josh Valcarcel

The technicians at the National Personnel Records Center work to carefully assess and preserve documents damaged in the fire so that any information can be gleaned from them. Here, Ashley Cox uses a humidity chamber to relax curled documents back to flat without stressing or breaking the fibers.

Around the time I requested Grandfather's military record, I also submitted a Freedom of Information Act request to the FBI to see what I could find out about the devastating blaze. Five decades on, the NPRC fire has been largely forgotten. I wanted to know how it started, and who or what could be blamed for destroying 17,517,490 pieces of 20th-century American history.

Within a few weeks, I received a 386-page report that chronicled every step of the two-month FBI investigation. "Scene of fire can't be reached due to severity of fire, but arson is suspected due to location and rapid break out and rapid spread of fire," reads one of the first messages from the St. Louis branch (which, coincidentally, maintained an office on the second floor of

the NPRC) to then-FBI director Clarence Kelley, who was three days into his job. The last paragraph of the transmission implies a group of suspects: "No employees other than custodians working at location of fire when fire broke out."

Soon enough, though, FBI investigators turned their focus to the two dozen interns verifying Vietnam veterans' records on the first floor. That spring, the US had withdrawn the last of its troops from Vietnam, and anti-war anger remained palpable on college campuses. Just a year earlier, the Weather Underground had detonated a bomb in a Pentagon bathroom. It appears that the FBI didn't consider it far-fetched to think a 19- or 20-year-old working in the building that held the records of the 3 million people who had been stationed in Vietnam might have been inspired to take a dramatic stand. In the interview reports, almost every name is redacted, but one subject is described as a "hippie type person."

About a week after the fire, two agents showed up at Trieschmann's house to interview her. They asked her why she went up to the sixth floor when she saw the haze. She told them she was curious. They asked her how she felt about the war and, figuring that lying to the FBI was a bad idea, she told the truth: She opposed it vehemently, believed the US military had committed unforgivable atrocities.

But she also didn't set her workplace on fire. And though she knew many other interns who shared her anti-war principles, she told the FBI, not one would burn service members' records to dust. They had been working with these files every day for weeks. Many of them had relatives who had served: parents in World War II or Korea, brothers in Vietnam. "From what the FBI said to me, they would have loved if the fire had been started by a radical college student," Trieschmann remembers. "Except none of the kids were like that."

Even so, there was a reason the FBI was hot on the arson theory: It turns out that the hallways of the NPRC had seen a *lot* of fires. The previous year, the agency had been notified of four: in a trash can in a men's restroom on the second floor, in a trash can in a men's restroom on the first floor, in a trash can in a ladies' restroom on the fifth floor, and in a trash can in a ladies'

restroom on the fourth floor. "It should be noted," the missive concluded, "that other minor incidents may have occurred that were not reported."

Sure enough, various employees remembered even more fires, including one in another trash can on the sixth floor, one in a paper towel dispenser, and one in a janitorial closet. One custodian told interviewers that his supervisor had told him about two fires in the previous week alone. Employees were allowed to smoke in the building (though not in the file areas), but that rate of fires resulting from cigarette mishaps is difficult to believe in retrospect. Altogether, the FBI report quotes about 10 people who remembered various fires at the NPRC building in the recent past.

Yet within several weeks, agents appear to have essentially given up on trying to find a perpetrator. That may have been in part because the number of suspected arsons in the building seemed to be rivaled only by the number of electrical problems. A custodian who told investigators about multiple fires *also* said he was constantly finding faulty switches and wires, including eight on the night of July 11 alone. Other employees had observed issues with the giant fans that ventilated file storage areas. One man said he had recently been chided by a colleague for turning on a particular fan on the sixth floor; the wires were exposed and the blades weren't turning freely. When he went to turn it back off, he noticed a "considerable amount" of smoke coming from the motor and a small pool of oil on the floor. "Do not use," he wrote on a piece of paper, then taped it to the fan.

It was also impossible to ignore the fact that in terms of fire safety, the building was a *terrible* place to keep the only official copy of tens of millions of paper records. Renowned architect Minoru Yamasaki, who would go on to design the original Twin Towers of the World Trade Center, spent several months in the early 1950s studying what to include in a state-of-the-art federal records center. At the time, preservation experts were divided on whether archives should have sprinkler systems, which could malfunction and drown paper records. Yamasaki decided his building would go without. The result, the gleaming glass building on Page Avenue, opened in 1956.

More puzzlingly, the architect designed the 728-by-282-foot building—the length of two football fields—with no firewalls in the records storage area to

stop the spread of flames. The air conditioning in the file areas, meanwhile, was turned off at night to save money, making the building's top floor almost unbearably hot after hours. Elliott Kuecker, an assistant professor at the University of North Carolina's School of Information and Library Science, says such decisions look inexplicable in retrospect, but it's impossible to know for sure what makes sense until *after* a crisis. "Archivists think about preventative measures as much as possible, but a lot of that has been learned by trial and error and disaster," he says.

Nobody had seen anything. Nobody had named anyone. And the sixth floor was so completely destroyed that it was impossible to investigate fully. The center of the building, where investigators determined the fire began (confirming Trieschmann's eyewitness account), was buried under multiple tons of concrete and 2 to 3 feet of wet charred rubble from burned records. So eventually, the FBI concluded that the stew of ingredients that led to the disaster was impossible to unblend. The investigation was formally closed in September 1973.

A month later, though, something surprising happened: A custodian took the blame.

In a signed statement, the man, whose name is redacted, admitted that around 11 pm on July 11, he was in the files on the sixth floor, and he was smoking. He said he extinguished his cigarette by sticking it into an empty bolt hole in the metal shelves, breaking off the lit end, and snuffing out the remaining sparks by wiping them on the side of a shelf. He didn't know where the match had fallen. When he saw fire trucks arriving as he headed home that night, he assumed it was his fault, but he was afraid to come forward. Until, for some unknowable reason, three months later, he did.

The custodian wasn't arrested, but assistant US attorney J. Patrick Glynn presented the case to a grand jury—not because he was sure an indictment was warranted, according to the FBI report, but to see what jurors could find out from witnesses under oath. The panel, whose records remain sealed, failed to find probable cause for criminal prosecution. The result is that his account has been all but erased from the story of the National Personnel Records Center fire.

When I visit St. Louis in early March, my first stop is to see Scott Levins, who has directed the NPRC since 2011. Without prompting, he tells me: "I want to make sure you understand you might talk to staff, and someone might say, 'Oh, I heard it was someone smoking' or something, but there's been nothing conclusive." To this day, the official narrative of July 12, 1973, is that we'll never know what ignited the blaze.

Photographs of the 1973 fire hang in the lobby of the current records center, near St. Louis.

Photograph: Josh Valcarcel

As I walk around the preservation lab in St. Louis, burned files everywhere I look, I understand why Levins doesn't want me focusing on the precise combination of cigarette, negligence, bad luck, and poor design behind the fire. He's concerned with what he can *do* about it, with that fleet of highly trained technicians who have dedicated their lives to taking care of the survivors.

At the time of my trip, I still had no idea whether my grandfather was one of those survivors, or among the 80 percent of World War II Army veterans whose records were destroyed entirely.

After I submitted the Standard Form 180 in January, I got a response within a day. NPRC employees weren't yet sure whether they had a B file for either Fritz Ehmann or Fred Ehman. I was instructed to complete National Archives Form 13075, with as much information as I could: His Social Security number? His service number? His address when he enlisted? His discharge date? Where did he complete basic training; where was his separation station? What kind of work did he do in the military? Did he ever file a claim for veterans' benefits or receive a state bonus?

I didn't know how to answer almost any of it.

I did the best I could, but a month later, I received an unsatisfying answer. "The information furnished on the enclosed form NA 13075, Questionnaire About Military Service, is insufficient to conduct a search of our alternate records sources. Without any new data, no further search can be made."

They weren't telling me his record had been destroyed, just that they didn't know where to look. If I could supply a few additional tidbits of information, though, they might have something to go on.

Because so many files from the first half of the 20th century are gone, the bulk of the NPRC team's fire-related work is done through these "alternate records sources"—in other words, files that were held by other government departments at the time of the fire. Often, that work starts with a Veterans Administration index card.

The cards, with a mix of typewritten text and handwriting, are records of veterans' claims that were kept—crucially in hindsight—at the VA. Anyone who ever received health care from the VA or took out a low-interest business loan, among other government offerings, has one. These cards don't look like impressive sources of information; there's nothing about where the person served, what honors they earned, or even what kinds of benefits they received. But if you know what you're looking for, preservation team lead Keith Owens tells me, a single card is a treasure trove. It contains a person's service number, which can be used to track down several other pieces of information—and to determine whether a B file exists.

Keith Owens, a preservation lead, operates a reel-to-reel microfilm scanner to digitize records.

Photograph: Josh Valcarcel

Soon after the fire, the VA turned over more than a thousand rolls of microfilm containing images of each card to the National Archives. Over the past several years, Owens' team has digitized each card, a process they finally finished in March. But they're not really digitized in the modern sense of the word. To find a single card, a user must scroll through a file with 1,000 images. Still, Owens or a technician can usually find one—if it exists—within a few minutes. That means the NPRC can answer many, many more requests than ever before.

AGPS-PCY
(9 Jan 57)

17 Jan 1957

Mrs. Emily Bell Hall
Route 1, Box 281
Olive Hill, Kentucky

Dear Mrs. Hall:

Reference is made to your letter concerning ___ on, G___

Hall, a casualty of the Korean conflict.

There will be a delay in furnishing you the ___ ion desired.

However, the matter is receiving attention and you ___ further

advis___ at the earliest practicable date.

Sincerely yours,

HERBERT M. JONES
Major General, USA
Adjutant General

V. OVER-ALL EVALUATION *(Compare this airman with others of the same grade and AFS. Extremes of ability are rare.)*

An unsatisfactory airman	A marginal airman	A good airman	A very good airman	An exceptional airman/of great value to the service	One of the very few outstanding airman I know
☐	☐	☐	☐	☒	☐

VI. COMMENTS OF REPORTING OFFICIAL *(Be factual and specific. Add any comments which increase the objectivity of the rating.)*

    Since Airman Runyon has been assigned to the section he has distinguished himself and the section with a high degree of technical skill in analizing and correcting Aux-Radar malfunctions.

    Airman Runyon's thorough knowledge of his career field and his untiring devotion to duty has earned for him the respect of his supervisors as well as all of his co-workers. He has excellent initiative, atitude and military bearing.

    Airman Runyon was selected for a TDY to Newfoundland in direct support of Wing aircraft and has been to North Africa once in support of RB-47's. For his outstanding ability Airman Runyon was chosen to support missions at Barksdale AFB, La., doing both Radio and Radar maintenance with a high degree of skill and accuracy.

    He was selected to comply with a TOC concerning all 376th Wing Aircraft. This TOC was the installation of new ceramic radomes and appropriate wave guide for the APN-69 on 20 aircraft. Airman Runyon worked many nights overtime to comply with this TOC on schedule. Recently, because of his outstanding skill and excellent maintenance ability, Airman Runyon was assigned to comply with an 8th AF MSG with a deadline date of 15 January 1959. The MSG was to check the calibration of all APN-69 units.

    Because of Airman Runyon's vast knowledge, initiative, determination and devotion to duty, all of the available aircraft have had the TOC complied with. The results of his efforts is a "job well done".

    Airman Runyon's devotion to duty, ability to use various test equipment, knowledge of his career field has aided greatly to increase the effectiveness of the Comm/Nav Section.

    Airman Runyon has handled his financial responsibilities in an excellent manner.

VII. RECOMMENDATION FOR PROMOTION		VIII. REPORTING OFFICIAL	
	DO NOT RECOMMEND FOR PROMOTION	SIGNATURE *Byron L Hinton*	DATE
	ALONG WITH AIRMEN OF SIMILIAR SERVICE AND EXPERIENCE	NAME, GRADE, TITLE, AND ORGANIZATION	
X	AHEAD OF OTHER AIRMEN OF SIMILAR SERVICE AND EXPERIENCE	BYRON L HINTON, M/Sgt, USAF NCOIC, Comm/Nav 376th AEMS	

IX. REVIEW BY INDORSING OFFICIAL	✓ I CONCUR	I DO NOT CONCUR and have initialed the appropriate rating boxes.
COMMENTS:		SIGNATURE ___ DATE
		NAME, GRADE, TITLE, AND ORGANIZATION
		THOMAS J JONES, Captain, USAF
		Line Maintenance Branch
		376th AEMS

X. REVIEW BY UNIT COMMANDER	✓ RECOMMENDED FOR GOOD CONDUCT MEDAL	DO NOT RECOMMEND FOR GOOD CONDUCT MEDAL
COMMENTS:		SIGNATURE OR INITIAL *KWH* DATE
		NAME, GRADE, TITLE, AND ORGANIZATION
		KERMIT W HARDY, Lt Col, USAF
		Commander
		376th AEMS

> | > |

Photograph: Josh Valcarcel

B files, or "burn" files, are records that were salvaged from the 1973 fire and have not yet undergone complete treatment. S files, or "salvaged," are the end result of a B file having undergone complete preservation treatment.

Owens, who has spent more than two decades working at the records center, is a burly guy in his early fifties, wearing deliberately distressed jeans with zippers across the thighs. Mostly bald with a short graying beard, he is a trained Baptist minister, and his hearty laugh booms across the lab. Even in an office where everyone is enthusiastic about their work, Owens' evangelizing sticks out. When he tells me about how it feels to help someone find their records, he scrunches up his eyes. "It gives me hope," he says. "I just know that what we're doing now is going to better the possibility of helping somebody. Somebody is going to look at a paper 500 years from now with my name on it and say, Keith Owens, whoever this was, did something amazing to help somebody back then."

Until walking into Owens' cubicle, I hadn't planned on bringing up my quest for my grandfather's records. But under the spell of his pastor's affect, I babble out the backstory, my voice cracking slightly as I explain that I'd submitted everything I had and it still wasn't enough. I don't even know whether Grandfather ever received veterans' benefits. Owens lights up. Let's check the index cards and find out, he says. Before I know it, we're at his computer opening a folder labeled "Egan–Eidson."

We click into a few different PDFs before finding the cards that include the Eh- names. In the fourth one, we find the last name Ehman. We scroll past an Arnold, two Bruces, two Adams, two Alberts, two Andrews. Suddenly, we're on to Ehmen, with a second "e" where the "a" should be. We scroll down further, until the alphabetization loops back to the start.

More Ehmans appear: Charles, Clement, David, Dennis, Earl, Elizabeth. "Come on," Owens implores, as if willing his favorite sprinter to cross the finish line first. But now we're back to Ehmen.

He sighs, keeps scrolling, keeps narrating. The tone of his voice has turned from excited to apprehensive. I can see the progress bar is almost to the bottom of the file, and my stomach drops. We're not going to find him.

Then, just before we reach the end, I catch a glimpse of "Abraham," Grandfather's middle name. "Th- th- th-," I stammer incomprehensibly, and loudly, fumbling to point him to the right card. Owens reads the name Fred aloud, confirming what I've already realized. "Holy shit," I whisper quietly. "Oh my god." It's not like seeing a ghost, exactly, staring at this tiny card with a handful of basic facts about a person I adore and will never see again. It's more like realizing the person I thought was a ghost is in fact quite visible.

But this is just the prelude to my real quest. Now, finally, we can find out whether Grandfather's personnel record survived the fire. Armed with a service number, we head downstairs to the research room to look for Fred Abraham Ehman. I start to convince myself that I'm one of the lucky ones, that we'll discover a usable B file with all that detail I've been craving, despite the 4-to-1 odds that it's gone.

I am not one of the lucky ones.

A research specialist in an Adidas hoodie types in the service number, then tells me there's no listing for a B file. "So that means conclusively that it's gone?" I ask.

"Yes."

My head is spinning so much that I don't immediately process what he tells me next, which is that there's a silver lining. What does exist, he says, deep in one of the 15 storage bays in the massive building, is my grandfather's final pay voucher, or QMP, another alternate records source commonly used to reconstruct information destroyed in the fire.

This is actually great news, Keith Owens tells me when I trudge back to his desk. A QMP contains the service member's date of enlistment, date of discharge, and home address. It lists the reason they were discharged. If you're Owens, a man who's spent two decades trying to help people by getting them any information they can possibly use for benefits, finding a QMP is a moment of triumph.

If you're me, a woman yearning to understand the story of her dead grandfather's life, it's a tiny bit heartbreaking.

The preservationists were able to find Megan's grandfather's final pay stub. The rest of his military file was lost to the fire.

Photograph: Josh Valcarcel

Back at my hotel that night, I can't stop thinking about what might have happened to Grandfather's record on July 12, 1973. Did it burn away to dust? Was it blackened and thrown away by someone who had no way of knowing that infrared cameras would make it readable five decades later? And, most naggingly: *What did it say?*

I don't particularly care whether Grandfather earned any medals, and if he had been part of some top-secret military operation, those details aren't going to be here. By this point, I've flipped through enough Official Military Personnel Files that I know they are more disconnected trivia than actual

biography. But I can't help it: I am wild with jealousy of all those people whose relatives' files are, at this very moment, being tenderly cared for by preservation specialists trained on invaluable pieces of history at Christie's and Sotheby's and the greatest universities in the world.

By the time I arrive at the preservation lab the next morning, Owens has not only scanned that

QMP with its facts about Grandfather's discharge, but kept the original at his desk to show me. Fred Abraham Ehman landed in Washington state on December 28, 1945, four months after the war ended. He was paid $191.68, $50 of it in cash and the rest as a government check. I recognize his signature, with its looping "F" and the lowercase "a" between his first and last names. I touch the paper gently, feeling a heady mix of gratitude and guilt that I don't feel more gratitude. "Give me a hug," Owens orders, and I do.

By the time I arrive home a few days later, my mood is more sanguine. With all of the information on the QMP, I can figure out which Army unit Grandfather was in, then find the "morning reports" that tracked that unit's movements around the world. With more work, I can probably track down the vast majority of the same information that burned in 1973, about the refugee turned soldier who became my grandfather. I'll never know the full story, but I've come to accept that even one of those 3-inch-thick B files I'd been coveting wouldn't have given me that.

After the flames raced down the 700-foot-long aisles of the sixth floor, after the columns of smoke rose from the roof like Jack's beanstalk, after the wind scattered military records around the neighborhoods northwest of St. Louis, after 42 local fire departments battled for days to save one of the largest federal office buildings in the United States, the government spent 50-plus years sorting through the charred remains. Untold numbers of people, meanwhile, spent 50 years, and counting, trying to replace what they lost.

Neither project will conclude anytime soon.

Updated 07-13-23, 5:30pm EST: This story was updated to clarify some specifics around the mitigation and archive processes and contents.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

Morgan Meaker

Business
Jun 25, 2023 2:00 AM

Meet the AI Protest Group Campaigning Against Human Extinction

Fears that artificial intelligence might wipe us out have fueled the rise of groups like Pause AI. Their warnings aren't that far-fetched, experts say. Photograph: Caspar Benson/Getty Images

The first time we speak, Joep Meindertsma is not in a good place. He tears up as he describes a conversation in which he warned his niece about the risk of artificial intelligence causing societal collapse. Afterward, she had a panic attack. "I cry every other day," he says, speaking over Zoom from his home in the Dutch city of Utrecht. "Every time I say goodbye to my parents or friends, it feels like it could be the last time."

Meindertsma, who is 31 and co-owns a database company, has been interested in AI for a couple of years. But he really started worrying about the threat the technology could pose to humanity when Open AI released its latest language model, GPT-4, in March. Since then, he has watched the runaway success of ChatGPT chatbot—based first on GPT-3 then GPT-4—demonstrate to the world how far AI has progressed and Big Tech companies race to catch up. And he has seen pioneers like Geoffrey Hinton, the so-called godfather of AI, warn of the dangers associated with the systems they helped create. "AI capabilities are advancing far more rapidly than virtually anyone has predicted," says Meindertsma. "We are risking social collapse. We're risking human extinction."

One month before our talk, Meindertsma stopped going to work. He had become so consumed by the idea that AI is going to destroy human civilization that he was struggling to think of anything else. He had to do something, he felt, to avert disaster. Soon after, he launched Pause AI, a grassroots protest group that campaigns for, as its name suggests, a halt to the development of AI. And since then, he has amassed a small band of followers who have held protests in Brussels, London, San Francisco and Melbourne. These demonstrations have been small—fewer than 10 people each time—but Meindertsma has been making friends in high places. Already, he says, he has been invited to speak with officials within both the Dutch Parliament and at the European Commission.

The idea that AI could wipe out humanity sounds extreme. But it's an idea that's gaining traction in both the tech sector and in mainstream politics. Hinton quit his role at Google in May and embarked on a global round of interviews in which he raised the specter of humans no longer being able to control AI as the technology advances. That same month, industry leaders —including the CEOs of AI labs Google DeepMind, OpenAI, and Anthropic—signed a letter acknowledging the "risk of extinction," and UK prime minister Rishi Sunak became the first head of government to publicly admit he also believes that AI poses an existential risk to humanity.

Meindertsma and his followers offer a glimpse of how these warnings are trickling through society, creating a new phenomenon of AI anxiety and giving a younger generation—many of whom are already deeply worried about climate change—a new reason to feel panic about the future. A survey by the pollster YouGov found that the proportion of people worried that artificial intelligence would lead to an apocalypse rose sharply in the last year. Hinton denies he wants AI development to be stopped, temporarily or indefinitely. But his public statements, about the risk AI poses to humanity, have resulted in a group of young people who feel there is no other choice.

To different people, "existential risk" means different things. "The main scenario I'm personally worried about is social collapse due to large-scale hacking," says Meindertsma, explaining he's concerned about AI being used to create cheap and accessible cyber weapons that could be used by

criminals to "effectively take out the entire internet." This is a scenario experts say is extremely unlikely. But Meindertsma still worries about the resilience of banking and food distribution services. "People will not be able to find food in a city. People will fight," he says. "Many billions I think will die."

But the Pause AI founder also worries about a future where AI advances enough to be classified as "super-intelligent" and *decides* to wipe out civilization, once it understands that humans limit AI's power. He echoes an argument, also used by Hinton, that if humans ask a future super intelligent AI system to fulfill any goal, AI might create its own dangerous sub-goals in the process.

This concern dates back years and is generally credited to the Swedish philosopher and Oxford University professor Nick Bostrom, who first described in the early 2000s what hypothetically could happen if a super-intelligent AI was asked to create as many paperclips as possible. "The AI will realize quickly that it would be much better if there were no humans, because humans might decide to switch it off," Bostrom said in a 2014 interview. "Also, human bodies contain a lot of atoms that could be made into paper clips. The future that the AI would be trying to gear towards would be one in which there were a lot of paper clips but no humans."

AI research is a divided field and some experts who might be expected to rip Meindertsma's ideas apart, instead seem reluctant to discredit them. "Because of the rapid progress, we just don't know how much of science fiction could become reality," says Clark Barrett, co-director of Stanford University's Center for AI Safety in California. Barrett does not believe a future where AI helps develop cyber weapons is plausible. This is not a field where AI has so far excelled, he claims. But he is less willing to dismiss the idea that an AI system that evolves to be smarter than humans could work maliciously against us. People worry that an AI system "could try to steal all of our energy or steal all of our compute power or try to manipulate people into doing what it wants us to do." This is not realistic right now, he says. "But we don't know what the future can bring. So I can't say it's impossible."

Yet, other AI researchers have less patience with the hypothetical debate. "For me, it is a problematic narrative that people claim any kind of proof or likelihood that AI is going to be self conscious and turn against humanity," says Theresa Züger, head of Humboldt University's AI and Society Lab, based in Germany. "There is no evidence that this is going to appear and in other scientific fields, we wouldn't discuss this if there is no evidence."

This lack of consensus among experts is enough for Meindertsma to justify his group's demand for a global halt to AI development. "The most sensible thing to do right now is to pause AI developments until we know how to build AI safely," he says, claiming that leaps forward in AI capabilities have become divorced from research on safety. The debate about how the relationship between these two halves of the AI industry have evolved is also taking place in mainstream academia. "This is something that I've seen getting worse over the years," says Ann Nowé, head of the Artificial Intelligence Lab at the Free University in Brussels. "When you were trained in the '80s to do AI, you had to understand the application field," she adds, explaining it was normal for AI researchers to spend time speaking to people working in the schools or hospitals where their system would be used. "[Now] a lot of AI people are not trained in having this conversation with stakeholders about whether this is ethical or legally compliant."

The government-mandated pause, Meindertsma envisions, would have to be organized by governments of different countries at an international summit, he says. When British prime minister Rishi Sunak announced the UK would host a [global summit](#) on AI safety in the autumn, Meindertsma interpreted this as a flash of hope. He believes the UK is well-suited to make sure we're not rushing towards a doomsday scenario. "It's the home for many AI safety scientists. It's where DeepMind is currently located. You have members of parliament already [calling](#) for an AI safety summit to prevent extinction." Yet Sunak's announcement was also tinged with ambitions to make the UK a hub of AI industry—simultaneously revealing that the company Palantir would base its new European headquarters in London—implying the likelihood of the UK advocating for an industrywide pause is remote.

Sunak's willingness to engage with AI's existential risk means the UK is a focus for Meindertsma. One of his newest recruits, Gideon Futerman, half runs, half walks past the British Houses of Parliament, banners wrapped in plastic under his arm. His train was delayed, he says, explaining why he's late to his own protest. Futerman wears small, round glasses and odd socks. Pause AI's British branch is not a slick operation. And this protest is technically not a protest. It's meant to signal support for Sunak's summit and to pressure the prime minister to use the meeting to introduce a pause. But the group of people here today also shows how anxiety is building among some young people. Referring to artificial general intelligence, one of the group's banners reads: "Don't build AGI," the letters dripping in red ink, designed to look like blood.

The group is small. There are seven protesters in total, all of them young men in their teens or early twenties. Their experience of AI varies. One is a politics student, another works at a nonprofit dedicated to AI safety. Several have a background in protesting against climate change. "One of the main similarities between climate change and AI is the fact that you have a few companies risking people's lives today and even more lives in the future, for the sake essentially of making profits," says Futerman. He shares Meindertsma's concerns, or versions of them. One future scenario he's worried about is that leading AI companies could develop artificial "super" intelligence. If that happened, he believes these models would gain the power to significantly reduce human agency over our future. "They're aiming to build a doomsday device," he says. "In the worst case scenario, this could wipe us out."

Among the cluster of protesters is Ben, an animal rights activist with a mane of red hair, who declines to share his surname because he doesn't want his AI activism to affect his career. Before the protest, we go for coffee to talk about why he joined Pause AI. "There was definitely a time when I felt that the extinction risk argument was science fiction or overblown," he explains, the earring in his left ear gently shaking as he becomes more animated. "Then as ChatGPT came out, and GPT-4, it became apparent to me how powerful these AI models were getting, and also how fast they were increasing in their power."

Ben has never communicated directly with Meindertsma; he met fellow Pause AI members through a London coworking space. He believes his animal rights activism gives him a template to understand the dynamic between different species, with varying degrees of intelligence. "It's difficult to predict what a world would look like with a different, more intelligent species than the human existing," he says. "But we know that our relationship with species that are less intelligent than us hasn't been great for those other species. If you look at humanity's relationship with other animals, some of them we farm and slaughter for our own purposes. And many of them were driven to extinction."

He acknowledges some of the scenarios Pause AI is warning about might never happen. But even if they don't, powerful AI systems will likely turbocharge problems that technology has already accelerated in our societies, he says, such as labor issues and racial and gender bias. "People who are concerned about AI extinction also take these problems really seriously."

The second time I speak to Meindertsma, he's in a better mood. He has new recruits, he feels the world is listening. He has just returned from Brussels, where he was invited to a meeting at the European Commission, declining to publicly name the official he met in case that sours the relationship. And now the UK is holding the global summit he has spent weeks campaigning for. "So I feel like we're making a lot of progress in a short time," he says.

As Pause AI's ideas gain traction, politicians and AI companies are still figuring out how to respond—with researchers divided about whether their concerns help garner support for AI safety research or simply spread panic about future scenarios that might never happen. Meindertsma argues that intelligence is power, and that's what makes it dangerous. But every day, supposedly intelligent humans try to take more power for themselves and find their efforts blocked by institutions and systems specifically designed to contain it, according to Stanford's Clark Barrett. He might not be willing to predict how AI might evolve, but he does believe society is more prepared than Pause AI might give it credit for. "There are certain barriers in place that I think shouldn't be underestimated in terms of preventing this kind of runaway effect that people are worried about."

By Jason Parham

Backchannel
Jun 22, 2023 6:00 AM

Boots Riley Says a 'Gentler Capitalism' Won't Save Society

The *I'm a Virgo* creator loves contradictions, like trying to launch a radical labor movement with a show on Amazon Prime.
Photograph: Simone Niamani Thompson

The scene is straight out of Boots Riley's madcap moviemaking handbook. In a city where Black residents have been steadily priced out, the two of us sit—Riley wearing one of his signature hats, me hatless—swapping stories over lunch as rock music drains from the speakers above us. This is Oakland, the director's longtime home, and perhaps our talk wouldn't feel so surreal if it weren't the exact kind of thing Riley, impresario of all things Black and bizarre, would write into one of his scripts. *Ext. A Japanese fusion restaurant. Two Black men chow down on fried chicken, pondering their existence.*

The Big Interview
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As an artist, Riley embodies a kind of allegorical immodesty. How to put it? He thrives in contradiction, happily welcomes what he calls the "beautiful clutter" of life. It has become a mirror for his gloriously hyphy cinematic staging: He doesn't build worlds so much as stretch the one we already inhabit to its fantastical extreme.

Where his 2018 cult film *Sorry to Bother You* swerved into the funk and fuss of late-stage capitalism, manipulating the gonzo curiosity of science fiction to make a decidedly Black satire about labor, survival, and what, if anything, it means to sell out, his latest endeavor, *I'm a Virgo*, cranks the bass. It's a seven-episode ride about a 13-foot-tall, comic-book-obsessed Black teenager named Cootie (Jharrel Jerome) who, after years of being hidden from the world by his adoptive parents for fear that he'll be exploited—or killed—ventures into the cosmos of Oakland, where the gentrifying city, policed by a white vigilante lawman known as the Hero, greets him with wonder and revulsion.

I won't be the first or last to tell you: There is nothing else on TV quite like *I'm a Virgo*. The show is a perfect response to this furious moment, awash in contradictions. Over the past three decades, Riley has been a filmmaker, community organizer, and a member of the radical rap group the Coup. Now, amid a Hollywood writers strike, of which he's been a vocal participant, he's releasing a series about tearing down our broken economic system and building one that feeds power back to the people. Set in a town transformed by Silicon Valley, the show follows Cootie and a group of young activists who strive to dismantle that system from the inside. It's streaming on Amazon Prime.

As the block hums in and out of consciousness, Riley tells me he does not believe in a "gentler capitalism." There's an ease to the day, one that belies the reality of what's happening across the city: exorbitant rents, a homelessness crisis, bureaucratic decay. Oakland is the place he's devoted his life and work to, but it doesn't always feel that way anymore. So we talk about how art can be a means for revolution. In Riley's world, the only way forward is to disrupt from within.

Jason Parham: *I'm a Virgo*'s hero is a 13-foot-tall Black teenager. What is it about his story that felt meaningful to tell?

Boots Riley: I didn't think about it like that.

OK, then where did the idea come from?

I'm attracted to large contradictions. I think about what I would think of as a good lyric. There's this setup, which hopefully is good and says something in and of itself. But then there's this other line that comes in that maybe feels ironic, right? Like a contradiction you weren't expecting. It surprises. It points out something.

It destabilizes you a little.

I don't know where the thought first came up, but when you see a 13-foot-tall Black man named Cootie walking down the street, the last thing you're thinking about is how he feels about himself. It's all about what you want to believe and project. It leads to so many things, but specifically toward race. In this case, the title, which came later, *I'm a Virgo*, speaks to that—nobody cares. His astrological sign is the last thing on someone's mind.

Your work mines the exploitation of labor, of capital, of culture. That's a big through line in the show.

Because it's a big through line with everything we talk about in our lives. Think about it like this: What's the definition of culture? Culture is what we do to make our survival normal. Think about the drum. Or songs that we sang. All these things. This is what we do in our lives. And culture helps us do it. It gives instructions. It helps us keep existing while we do these particular things.

How does that intersect with capitalism?

So much of what we do is always going to be shaped by how we live, and how we live has to do with whatever economic structure we're in. Right now we're under capitalism. The contradictions of capitalism—how it works—are going to echo through almost everything we do.

Photograph: Simone Niamani Thompson

Both *I'm a Virgo* and *Sorry to Bother You* exist in the realm of the absurd. Has your experience in America—as someone who is conscious of the way society exploits Black people—felt absurdist?

Definitely. There was a time when the Coup got pulled over on Treasure Island, coming back from the studio, and we ended up with like 15 military police with guns standing around, yelling at me to pick up the [registered] gun [that was in the trunk of the car]. Yelling at the top of their lungs. And everybody I was in the car with was screaming like, *No, don't do it*. It's a scene that could be in a movie.

What is your earliest memory of feeling exploited?

I've had many low-paying jobs throughout my life, starting with being a door-to-door newspaper salesman as a kid, to being a dishwasher, to retail sales. But I don't think I would have translated my frustrations into feeling exploited. I didn't have the language for that. I felt like, *Fuck these people*. You know what I'm saying?

When did that language begin to crystallize?

When I was 14, I got involved in helping people who were striking, the Watsonville cannery workers. I was helping to pass out flyers. Stuff like that. Through that, I signed up to be part of this summer project that was helping out farmworkers who were trying to organize an anti-racist farmworkers union in the Central Valley. These were radical organizers. They weren't just talking about labor struggles. They had a plan.

How so?

For the anti-racist farmworkers union, the idea was, first we organize this valley and get this method of organizing popular, then we use that as a way to help create a revolutionary movement. It wasn't just like, *Oh, we're struggling to get these wages right now*. It had to do with changing the way things worked. It gave me hope. It was that sort of thing that made me look at my life differently.

This article appears in the September 2023 issue. [Subscribe to WIRED](#).Photograph: Sam Cannon

Is that what you try to do with your work—make people look at life differently?

I'm not really making stuff to just enlighten people. I think most of us feel like we know what is wrong. But most of the time the question is, can it be changed? Is there anything you can do about it? But really, my art can only go so far even with that approach. If there are no organizations out there for them to actually get involved with campaigns, for them to get involved with art or connect with people on the job to organize, then it kind of just sits there.

Your father was also a revolutionary. He worked as an anti–Vietnam War activist during his time at San Francisco State University, a housing rights advocate in Chicago, an auto industry organizer in Detroit, and later as a civil rights and criminal defense lawyer in Oakland. Did getting more involved in activism as a young teen feel fated in any way?

He actually didn't push me on any of it. I was like, "Why didn't you tell me any of this stuff?" I have seen parents push their radicalism on their kids. Because I came to it on my own, it was a lot more effective.

You once said you have a "problem with superheroes in general, because, politically, superheroes are cops." When you're young, you naturally want to rebel. Or not even rebel, but find your way. *I'm a Virgo* attempts to negotiate this specific kind of maturation. It's not your typical superhero origin story.

I was definitely obsessed with comic books as a kid. That was actually one of the motivations for getting jobs early. I was doing gymnastics. I was taking martial arts. I was throwing ninja stars and had all the books about them. I was practicing how to sneak into a room without people hearing me, like Batman. To me, this was a real thing you could do. And what that would have led me to was becoming a cop. I got saved by my next obsession, which was Prince.

Seems like a great obsession for a future musician.

After that, the next thing I got involved with was radical organizing, and these obsessions were all part of the same thing.

In what way?

For example, when you're watching TV, you're told you're nothing. People that you know are nothing. What's important are these stories, these people who are on TV. And so it could lead you to obsessing over them and feeling like that's your connection to something bigger than you.

When I did get involved in radical politics, it was because it's like, *Oh, I can be part of making history*. People want something more important for themselves. They want connection, which is very much what Cootie and Flora [Cootie's love interest] are about.

Photograph: Simone Niamani Thompson

Why has Oakland been the setting for both your projects?

I'm just a better artist when I'm around things that I know, when I'm here. I can think, like, *Oh, this would be good*. This means a certain thing to me, even if it doesn't mean a thing to someone else. Everything is more inspired.

You're able to anchor it to the world in a real way.

Exactly. There's a group of Boston filmmakers who are like that. There's New York filmmakers—Jim Jarmusch, Noah Baumbach, Woody Allen, Spike Lee. Especially right now, when everything is so mix-and-match. Like anything could be anywhere. I think something becomes more universal the more specific it is.

One of the major plot points in the series is the denial of housing. Oakland saw an 83 percent increase in homelessness from 2017 to 2022. Black residents account for 60 percent of the city's sheltered homeless population, despite constituting 23 percent of the city's population. Art can bring these issues to people's attention. What else can be done?

Immediately there can be rent control laws. San Francisco has 60,000 vacant units. Oakland has 10,000 vacant units. And they're keeping them empty. What the prices are aren't what the market can bear. So a lot of the

YIMBY people have been like, *Just let development happen and that will be what brings it down*—but what we see is, no, if you don't have rent control laws, rates go up.

What else?

Public housing. You know, there was a big campaign in the media in Hollywood against public housing from the '70s until now, as if it was a trap as opposed to something liberatory. But we need those things. People need a real safety net. Oakland has 5,000 homeless people in a population of more than 400,000. A lot of those people are still living in the neighborhood. They're just living in vans.

But these are things people have been calling out for a long time. Like even in the '90s, there were all these respectability politics campaigns that were being put on by like, Black elite, Black elected leadership in Oakland.

Right.

Usually they use the catchphrase "affordable housing" as opposed to "low-income housing," because affordable housing goes off the median income. So you have to make a percentage of that. We're not going to legislate income. It's only going to come from there being an organized working class that can fight. The kind of contract we need is one that attaches pay raises to inflation.

Don't I know it. WIRED fought for that in our own union.

That's why people are down to fight. With the Writers Guild, the reason we have solidarity from the Teamsters and IATSE [International Alliance of Theatrical Stage Employees] is people want to win. People are risking immediate money because they want things to get better. In 2007, IATSE and Teamsters crossed the picket lines. But not this time.

You're in the Writers Guild of America and the Directors Guild of America. The DGA just reached a tentative deal, but the WGA has been on strike for weeks. Was this inevitable?

I don't know if this particular strike was inevitable. What the AMPTP [Alliance of Motion Picture and Television Producers] is trying to put forward is a message that you're not going to be able to have a say in how we do things. And I think they underestimated how willing we are to fight, because what I'm hearing from people that know folks at the studios is they thought, *Oh, the writers will be fatigued by now*.

I mentioned that to a colleague recently, how we're seeing mass labor strikes across multiple industries. Everyone is fed up.

According to [Payday Report](), which tracks strikes via local news, there has been, over the past three years, at least 2,918 strikes and work stoppages. Some of them might not be a full strike, some of them might be a couple of days' work stoppage when they get their deal. This is one of the biggest since the 1970s.

Have there really been that many?

The reason it's not called out in bigger ways is that in 1982, the Bureau of Labor Statistics, the official US figure, started counting only work stoppages of 1,000 people or more, which is just a way to hide figures. If you think about it, the fictional strike in *Sorry to Bother You*, that was only 500 people. That wouldn't have counted. Even if people don't see those numbers, like you said, they feel it. There's a new way people are looking at handling issues of inequity.

Is the business of Hollywood broken?

I wouldn't call it broken. It's working like they want it to. They're making an unprecedented amount of money. And they're doing it by paying the people who make the products that help them make that money less, and giving less control over it. That's the way all business works.

Now, the question is—does it work for creativity? Does it work for people? Does it create a healthy environment for either the production of culture or a shared ownership between the folks that produce the culture and the culture? No, it doesn't.

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Jason Parham

I'm a Virgo **has a decidedly anti-capitalist message. But it is being released by Amazon, a billion-dollar corporation with a terrible labor record. How do you reconcile that?**

Well, I'm trying to get out there in front of as many eyes as possible. So that means I'm going to be dealing with some people that do things I definitely disagree with.

The Coup's first album came out on EMI Records, which people don't hear about anymore because they've dissolved into a bunch of different companies, but they were a multinational corporation that was involved in all sorts of exploitive things. My last movie was done with money from Oracle, which is owned by Larry Ellison. He does things not only in his business practices that I would disagree with, but also separately [fundraised for Trump](#).

Have you always thought about it this way?

I've never been someone who has put forth the idea that we can make this gentler capitalism. I've always been someone that said we have to get rid of capitalism. And that there is a specific way to go about it, which I talk about directly in the show—but that means organizing on the job. So I want people to organize on the job, whether that's in a Disney sweatshop making

cute stuffed toys or an Amazon warehouse. The idea that you can kind of boycott the parts of capitalism you don't like just plays into the belief that capitalism would be better if there were just better people on top.

So again, how do you reconcile that?

That means right now what we have to do is organize a labor movement, a mass militant, radical labor movement starting at these places. So yeah, I need to get to as many people as possible. And that means one of these big companies.

Is there such a thing as too far, for you?

I have different lines. I turned down a big Taco Bell commercial some years ago, which would have been ridiculous. They actually made the commercial and showed it to me, like, *We're going to offer you so much money*. I was like, no, I'm not doing it. So many people around me were angry with that. The argument that was said to me, even though I didn't do it, was, *Your songs play on the radio right next to a Coca-Cola ad*. But that's where my line is.

Is that part of the problem—people don't know where their line is?

It takes time. People figure out where their line is based on what they want to see happen in the world. I want to see a mass militant radical labor movement that could turn into a revolutionary one. So based on that, there are things that I will and won't do. But often because there hasn't been that movement, many of us don't know what we want.

Going into *I'm a Virgo*, were you clear on what you wanted to achieve?

I have to do something that feels new to me. I would never go into it being like, *I want something that feels comfortable to people*. There are some people that do honestly go into it with that mindset, and there's nothing wrong with that. It's just not where I came from, especially coming from music.

Is being a musician like being a filmmaker?

There was a time when I wanted to sound just like Ice Cube, like fuck—how do they do that? Luckily for me, I didn't know how. After I accepted how I sounded, I was able to lean into it a lot more. Even though the Coup was sometimes on major labels, we never had big money for promotion. So I had to have something people gravitated to. So that was the thing. This is more money than I ever thought I would make in the first place. So I'm good. I can get fired, whatever.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

By [Maria Streshinsky](#)

[Backchannel](#)
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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.

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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.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

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 crumbling 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.

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.

Rachel Nuwer

Backchannel
Jun 15, 2023 6:00 AM

The Psychedelic Scientist Who Sends Brains Back to Childhood

Kids soak up new skills, adults not so much. But neuroscientist Gül Dölen might have found a way—with drugs—to help grown-ups learn like littles. ILLUSTRATIONS: JON HAN

About a month into the 2020 pandemic lockdown, Gül Dölen, a neuroscientist, noticed that she had come untethered from reality. "Everything felt sort of swooshy," she says, as if she was in an "altered, mystical state." She wasn't constantly obsessing over her lab at Johns Hopkins University. She chilled out. And for the first time in her life, she found she could meditate for a good 45 minutes at a time.

This article appears in the September 2023 issue. Subscribe to WIRED.Photograph: Sam Cannon

Her senses were unusually sharp too. On long walks under the monochrome slab of Baltimore's April sky, she felt hyper-attuned to the natural world. She smiled at the turtles poking their heads out of the inky water of Fell's Point. She reveled in the crickets' evening chorus on eerily empty streets. When she happened across a fallen bird's nest with a broken egg inside, she came close to tears as she imagined the "deep, deep pain of the mother bird."

She felt like she was on drugs. Or on a spiritual excursion, experiencing what an enlightenment-seeking Zen monk might find sitting alone in a cave. One day, she grabbed a pen and started to crank out haikus. One of her

favorites nods to the writer Aldous Huxley's mescaline-induced notion, immortalized in *The Doors of Perception*, of being one with a chair:

By asymptotics
The distance between us is
infinite and none

The poem gets at a simple, profound notion in physics—that the particles making up Huxley and those of a chair always mingle, whether the two are rooms apart or butt-smashed-to-seat. That's how she felt, too, as if the rules that had always governed her perceivable reality were blurring with those of a different plane of being. In the midst of this creative explosion, she had an epiphany. The extreme isolation of lockdown might have tipped her into an exceptional brain state. Absurd coincidence, if true. Dölen has spent much of her career studying this exact state: a time of heightened receptiveness, usually in childhood, called a critical period.

Critical periods are well known to [neuroscientists](#) and ethologists, because they lay the groundwork for a creature's behavior. They are finite windows of time, ranging from days to years, when the brain is especially impressionable and open to learning.

It's during a critical period that songbirds learn to sing and humans learn to speak. There are critical periods for walking, seeing, and hearing as well as bonding with parents, developing absolute pitch, and assimilating into a culture. Some neuroscientists suspect there are as many critical periods as there are brain functions. Eventually, all critical periods close, and for good reason. After a while, extreme openness becomes inefficient, or downright dysfunctional.

Floating through downtown Baltimore like a disembodied spirit, or sitting alone at her kitchen table eating rolls of nori filled with peanut butter and jelly, Dölen realized she'd been spending too much time worrying about her career, and not enough time on her simple love of science, and her sometimes outlandish-seeming questions. Like the one she was contemplating now: If she could reopen critical periods, what mind- and life-altering changes might come about?

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She believed that if she could crack the code of critical periods—how to trigger them, how to do so safely, what to do once they're open—vast possibilities awaited. People who lost their vision or hearing might regain those senses. [Stroke](#) patients might recover movement or relearn to speak. Might an adult learn a new language [or musical instrument](#) with the ease of a child? Scientists have spent decades trying to safely and easily nudge the brain into these states, with little to show for it. They'd managed to reopen a vision-related critical period in mice—but only by first suturing shut the animals' eyelids. Their methods were not exactly human-compatible.

Just before lockdown, Dölen had begun to think she was on the cusp of an answer—something she describes as the "master key" for reopening critical periods. It was something Indigenous cultures had recognized for millennia as able to provide healing and growth. The key, she suspected, was [psychedelic drugs](#).

The West was [only starting](#) to [tap into their therapeutic power](#), and now, Dölen might have a scientific, brain-based explanation for how they help people heal. Finding that answer, Dölen realized in her "very, very altered state" of pandemic consciousness, was "the thing I had to come back down to Earth to finish." With that realization, something in her seemed to shift. She returned to her default state of consciousness, but with a renewed commitment to boldly follow her curiosity, wherever it might lead.

Dölen traces her obsession with science to when she was 8 years old and first encountered a [sea urchin](#) while on vacation in Turkey. It was freshly plucked from the Mediterranean Sea and cradled in her grandmother's hands. The otherworldly creature was jet black and covered in aggressive spikes that reminded Dölen of the cactuses back home in San Antonio, Texas. Her grandmother pointed out the urchin's remarkably humanoid teeth, and vibrant orange innards. Dölen felt as though she'd been transported to another planet.

That day on the beach in Antalya, her grandmother introduced her to the strangeness of the natural world. "That's how I've been lured into science," Dölen says, "through that childlike wonder and amazement."

In college, she was drawn to "the big questions," as she puts it, about the nature of consciousness and humans' place in the cosmos. She designed her own major, "comparative perspectives on the mind"—a grab-bag of philosophy, neuroscience, Eastern religion, linguistics, and art. She was most attracted to neuroscience. Exciting new methods were becoming available. Genome editing, neuron culturing, genetic engineering: Neuroscientists suddenly found themselves able to explore the brain in previously unimaginable detail. "Everyone could feel it," she says. "There was about to be a big, molecular revolution in neuroscience."

In one of Dölen's favorite classes, Drugs, Brain and Behavior, she learned that psychedelics hijack the machinery used by molecules that occur naturally in the brain. When her professor projected side-by-side images of the strikingly similar molecular structures of the neurotransmitter serotonin and of LSD, she immediately saw how the drug might be a staggeringly powerful tool for getting at the nature of subjective reality. *Everything you think and feel, everything you think makes you uniquely alive and aware of the world, boils down to molecules*, Dölen realized with awe. Change the molecules with psychedelics and you change everything.

Yet while mind-altering drugs struck Dölen as the perfect tools for exploring the unseen underpinnings of consciousness, this was the late 1990s. "We were still very much in the middle of the War on Drugs," she points out. So Dölen shelved her interest in psychedelics and enrolled in a dual MD/PhD program at Brown University and MIT. She joined a lab that studied learning and memory, including critical periods.

Dölen's research focused on fragile X syndrome, a neurodevelopmental disorder that is the leading identified cause of autism. She studied a specific brain receptor and found that when she tinkered with it in a certain way—in mouse models of fragile X and autism—the animals functioned much better. People in the field thought the finding would be life-altering.

But clinical trials with human volunteers failed. "I was gutted, because I was so hopeful that it would work," Dolen says, "but also confused because I couldn't understand why it hadn't." Dölen and some of her colleagues began to suspect that it wasn't a difference in species that thwarted the clinical trial but a difference in ages. The mice had been juveniles. The human participants had been adults. Perhaps the treatment had worked on the young mice because a relevant critical period was still open. But the scientists left their hypothesis at that.

The trial's failure meant Dölen needed a new project. So she joined a lab at Stanford focused on studying the brain's reward system, especially how drugs like cocaine hijack it to produce intense pleasure. She immediately noticed, however, that no one in the lab was looking at "the other most obvious natural reward," she says, "which was social reward"—the joy that gregarious animals such as mice and humans get from being around others. At the time, not many neuroscientists were taking this subject seriously.

Her adviser was incredulous, but he agreed to let her pursue social reward. After years of painstaking work—including engineering her own specialized mice—she had her first results. Oxytocin and serotonin, she found, work together in a brain region called the nucleus accumbens to produce the good feelings that come from social interaction. Or, as Dölen summarizes, "oxytocin plus serotonin equals love." A fine result. But Dölen was still ascending her mountain.

By the time she started her own lab at Johns Hopkins, in 2014, the field at large had caught on to the idea that social behavior was worth studying. Seeking to differentiate herself, Dölen acquired an impressive suite of fancy neuroscience tools and started looking for the next "weird, unexplored rabbit hole." She had no idea that search would lead her to arguably the weirdest neuroscience phenomena in existence—psychedelic drugs and their effects on the brain.

In her office, Dölen keeps a collection of fossils, shells, succulents, and vintage science posters. She converted the entire wall behind her stand-up desk into a black erase board, which on a chilly December afternoon was covered in neon-marker sketches of molecular structures, brain diagrams,

phylogenetic trees, and Einstein quotes. A visitor cannot help notice, though, that the real owner of this space is the genus Octopus. Wherever the eyes land are octopus mugs and octopus artworks, octopus figurines and octopus toys. They're all gifts she received after she published a stunner of a paper in 2018.

If you've heard of Dölen before, it's probably because of [that study](). In it, she dosed a handful of octopuses—notoriously antisocial by nature—with MDMA, and she found that they reacted to the drug in much the same way humans do: by loosening up, dancing around their tank, and even, improbably, taking an interest in fellow octopuses. Rather than avoiding their own kind, the rolling octopuses sought out their tank mates and tried to wrap them in eight-armed hugs.

An octopus brain is more like the brain of a snail than that of a human. The octopuses' humanlike behavior in the study indicated that serotonin, the primary brain chemical that MDMA mimics, plays an ancient and fundamental role in sociality. Countless media outlets covered her paper, and Dölen became something of a folk hero in the psychedelics community. But to Dölen, the research that really matters is her work on critical periods.

Dölen probably wouldn't have found her way to it were it not for one of her postdocs, a nerdy French neuroscientist named Romain Nardou. He joined Dölen's lab after latching on to a footnote-like observation in Dölen's own postdoctoral research: The buzz that mice get from socializing seemed to diminish as the animals got older, a strong hint that a critical period might be involved. But when Nardou told Dölen he wanted to explore that observation—and look into how oxytocin signaling changes as mice mature —Dölen's initial response was "meh."

For starters, she told him, the study he was proposing seemed too technically basic to be of much interest. "I want you to do something that's going to take advantage of all the technical whizzbangery we have," she said.

Nardou was stubborn. "I'm sure it's gonna be cool," he insisted. Eventually, Dölen agreed to give it a try.

In 2015, Nardou began meticulously gathering data. His experiment was based on a simple, well-established protocol: Mice are put in an enclosure with one type of bedding and given access to cocaine (or some other desirable drug). Then they're moved elsewhere, with different bedding and no cocaine. Later, the mice show a clear preference for hanging out on the bedding they associate with getting high. Young mice, old mice—they all behave the same way. As Dölen puts it, "There's not a critical period for cocaine reward learning. Adults love cocaine as much as kids."

In Nardou's version of this experiment, he replaced the cocaine with other mice. After the rodents either hung out with their friends in one comfy spot or sat alone in another, he'd offer the two beddings to see if they had developed a preference. Over and over, he ran the experiment, amassing data from 900 animals across 15 ages. What emerged, Dölen says, was a "beautiful curve."

Nardou had found clear evidence of a critical period for social reward learning. Young mice—especially adolescent ones—strongly preferred hanging out on the bedding they associated with their friends. The adult mice didn't seem to give a damn about the composition of their bed. They weren't connecting it to the pleasures of company. The younger mice, in their highly impressionable state, were. "The social world is something that you learn, just like the visual or olfactory world," Dölen explains. It's not that the older mice were antisocial, just that they were no longer the equivalent of insecure, angsty teens who form preferences based on what their friends say is cool.

She and Nardou confirmed his observations using one of Dölen's favorite tools—whole cell patch-clamp electrophysiology. You take a slice of a mouse's brain, place an electrode on the surface of a single neuron, and measure the electrical activity of that cell. When they hooked up neurons from the nucleus accumbens of a juvenile mouse's brain and exposed them to oxytocin—the hormone that Dölen, as a postdoc, had found to be involved in social reward learning—the cells responded with a jolt. The neurons of adult mice remained unperturbed.

Discovering a critical period was publication-worthy on its own, but Dölen wanted to go bigger. She wanted to reopen the critical period. She knew

from the scientific literature that the most reliable way to do so is with sensory deprivation, something that "no one in their right mind" would voluntarily submit to, she remembers thinking.

As she pondered their options, she remembered the pictures she'd seen of the dozens-strong cuddle puddles at Burning Man, where attendees were likely to be blissed out on [MDMA](). She was also familiar with the results emerging from clinical trials using MDMA to treat PTSD, and with other scientific evidence that the drug causes a massive release of oxytocin in the brain. Could MDMA perhaps be useful for reopening critical periods too? When she ran her thoughts by Nardou—a straight-edger who is "not part of the counterculture in any way," Dölen says—he was skeptical, but he ultimately agreed to try his adviser's idea.

Again they ran the bedding experiments—to see if mice preferred the beds where they'd hung out with friends—and this time gave the rodents MDMA. Sure enough, in the two weeks following their drug session, the adult mice behaved like youngsters, preferring the cozy paper pulp or wood shavings they associated with other animals. When, as before, the researchers checked the neurons of the adult mice, they saw they responded to oxytocin as though the cells came from youngsters.

In 2019, Dölen [published]() these results in *Nature* and assumed that would be the end of this particular line of investigation. But for due diligence, she decided to perform the same experiment using LSD, a psychedelic that is not usually associated with hugs or cuddle puddles. That's when things got really weird.

In the corner of an equipment-crammed lab—and beneath the benevolent gazes of drug pioneers Alexander and Ann Shulgin on a poster pinned to the wall—postdoctoral researcher Ted Sawyer hunches over a set of knobs and dials that could be mistaken for a 1950s sci-fi flick control panel. A screen in front of him displays the magnified contents of a petri dish held by a nearby microscope. To an outsider, it might look like a satellite image of Antarctica after a snowstorm. To Sawyer, who's done this hundreds of times, it's clearly a 250-micrometer-thin slice of mouse brain.

Within seconds, Sawyer spots his target: the ever-so-faint outline of a neuron suspended in a sea of artificial cerebrospinal fluid. Gingerly fingering one of the panel's black circular dials, he remotely maneuvers the fine tip of a glass pipette so it's just touching the cell's body in the petri dish. He leans over to the microscope, lowers his mask, and sucks on a plastic tube connected to the pipette to form a vacuum seal, which will let him measure current across the cell's membrane. A sudden jump in resistance readings on Sawyer's computer screen indicates that he's made contact. Cells are finicky, delicate things, though, and after an initial success, the readings begin to fall. He's lost it. "You just have to sit and screw up a lot," Sawyer tells me. A good day will get him maybe 12 successful measurements, each a burst of insight into whether the rodent brain that produced the cell was primed to form new social attachments or was hardened in its adult ways.

When Dölen decided to look into LSD, she knew that people under its influence often want alone time. But the data that Nardou, Sawyer, and others collected was revealing something else: LSD worked just as well as MDMA for reopening critical periods and restoring social reward learning in mice. *Well, you fucked up, do it again,* she thought, chiding herself. But it just kept happening. And then, it happened again with tests of ketamine (a dissociative), psilocybin (aka magic mushrooms) and ibogaine (a psychedelic derived from an African plant)—all drugs that don't make people feel terribly social. The critical periods of mice given cocaine, meanwhile, remained solidly shut, suggesting that there's something unique about how psychedelic drugs target the brain.

Dölen had been thinking about MDMA as "a sort of super oxytocin," she says. Now she thinks the drug's prosocial effect was a red herring. MDMA may be associated in popular culture with hugs and love, but if Dölen had, say, put the mice through an auditory exercise rather than a social one, she suspects that their auditory critical period would have reopened instead. In the vernacular, that's "set and setting"—the mental state a person is in when they trip, and their physical environment. Those contextual details explain why most people with PTSD are not miraculously cured after partying all night at an MDMA-fueled rave, but why, in the supportive environment of a therapist's office, the same drug permits them to undertake the cognitive

reappraisal needed to heal. It also tantalizingly suggests that different critical periods could be opened—not just for PTSD, but for stroke, vision or hearing correction, or acquiring a new language or skill, or any number of other things—simply by changing what a person is doing while on the drug.

Some outside evidence backs up this hunch. In 2021, for example, researchers in Austria inadvertently found that ketamine [reopens a vision-related critical period](#) in mice—but only when the K-holed rodents also engage in a visual exercise. Seeing the Austria finding, Dölen became all the more convinced that psychedelics might be the master key for reopening virtually any critical period. The drug neurologically primes a mouse (or, presumably, a person) for learning; whatever that animal ends up *doing* while on the drug determines which critical period reopens.

That an array of drugs have this potential also means that something deeper must unite these psychedelics in their ability to transfigure the mind. That deeper thing, Dölen's findings indicate so far, happens not at the level of brain regions or neurons' receptors, as scientists have previously thought, but at the level of gene expression. So far, her lab has pinpointed 65 genes that seem to be involved in this process, and their involvement suggests that psychedelics' effects last well beyond an acute "high." Piecing together the details of this mechanistic puzzle, Dölen suspects, will keep her occupied for the next decade.

Meanwhile, she's got other big questions to chase. For one, each psychedelic activates a mouse's critical period for a different length of time. The longer the drug trip, the longer the openness lasts—and, perhaps, the more durable the therapeutic response. A ketamine trip for a human lasts 30 minutes to an hour, and in mice, the drug opens a critical period for two days. The four- to five-hour trips of psilocybin and MDMA keep the critical period open for two weeks. LSD's eight- to ten-hour human trips translate to three weeks of openness for a mouse. And ibogaine's trips (36 hours in people) put mice in the open state for at least four weeks, after which Dölen stopped taking measurements.

Assuming the drugs can in fact reopen critical periods in humans, [Dölen's work](#), which she and her colleagues published in June, suggests that the

brains of people who undergo psychedelic therapy are likely in a state conducive to learning for days, weeks, or even months after the drug has technically cleared their system. This leaves room for further gains long after they've come down, Dölen says, and suggests that people would benefit from continued therapeutic support well after their trip.

Outside experts are generally effusive in their appraisals of Dölen's findings. People often talk about psychedelic therapy functioning like a "reset button" for the mind, but until Dölen's work came out, no one could provide a scientifically plausible explanation for "how something that is so short in duration can have lasting and transformative effects that go well beyond the time period that the drug is in there," says Rachel Yehuda, a psychiatrist and neuroscientist at the Icahn School of Medicine at Mount Sinai in New York City. Dölen's findings, she adds, are "what our field needs—we need some new ideas."

There is, of course, a catch. For mice, having a critical period open for too long causes neural disruptions. Some experts fear that, for people, carelessly flinging wide the doors of personal development could put the very core of their identity in jeopardy by erasing the habits and memories that make them *them*. A critical period is also a time of vulnerability. While childhood can be filled with wonder and magic, children are also more impressionable. "We can really screw kids up much more than we can adults," she says. This is why responsible adults intuitively know to protect children from exposure to potentially scary or disturbing material. Or, as Dölen puts it, "You want to teach children new things, but you don't want them to learn Japanese from Japanese porn."

An adult who undergoes this kind of treatment to heal PTSD could, in the wrong hands, end up traumatized further. In the worst scenarios, patients could be vulnerable to abuse. Unscrupulous therapists or other predators could try to use psychedelics to manipulate others, Dölen says. This is more than paranoid speculation. Quite a few experts, Dölen included, think that Charles Manson's ability to completely brainwash his followers relied on the high doses of LSD he regularly gave them prior to bombarding their minds with hate-filled lectures and murderous orders.

Given all this, Dölen sees hacking critical periods with psychedelics as not inherently good or bad. She calls it a "wildly agnostic" tool.

On the wall-sized screen in front of me, a bubble or two drifts upward through the blue, and light filters in from above. Out of the murk, a swimming form emerges and comes into focus: a smiling dolphin. "Hello, my name is Bandit," a subtitle reads. "We're going on a very special journey today. My creators built me to heal you. Connect to me, embody me, eat the fish and sharks that nourish me." The dolphin lets out a high-pitched squeal—a real recording, it turns out, made at Baltimore's National Aquarium.

The surreal underwater scene is interrupted by a small square that appears in the upper left-hand corner. In it, I see myself, standing on the opposite side of the room. Red dots overlay the image of my body, indicating that a 3D-tracking camera has locked onto me. The dolphin and I are one. Moving my right hand, I cause Bandit to awkwardly veer right. Fish dart across the screen, and they're impossibly fast for my clumsy avatar to catch. But as I sweep my hand to and fro, I begin to get the hang of it. I realize the watery realm I'm operating in is 3D, and I start to incorporate back-and-forth motions. Finally, I ram into my first fish, and Bandit happily scarfs it down. A few fish later, I've completed the first level. A fireworks show explodes onto the screen in celebration. The game is surprisingly addictive, and I'm disappointed that I won't have time to see what else is in store for Bandit.

Bandit, who I became acquainted with in the Brain Rescue Unit of Johns Hopkins Hospital, is the culmination of more than a decade of effort by a multidisciplinary team of Johns Hopkins doctors, scientists, and engineers called Kata Design Studio. He was designed to help stroke patients regain movement. The 3D-tracking camera allows the dolphin to exactly mirror a patient's movements. "We call it being jacked into the animal," explains Promit Roy, the software lead for Kata. The game encourages patients to practice complex movements, and keep at it, simply because it's fun.

Stroke patients have only a short window of time in which they can regain even some of what they've lost. Immediately after a stroke, a critical period naturally opens—and then closes some months later. No one knows why this is, but Dölen has a hunch: Just as pandemic-era isolation caused a

"radical destabilization" of the social world, a stroke causes a radical destabilization of a sufferer's motor world. That person's motor cortex is no longer receiving information from their muscles. So a sudden change in the motor world—a stroke—could fling open a critical period for motor skills. Dölen thinks that these naturally occurring critical periods are the brain's way of trying to adapt to profound, existential change.

Even in the best circumstances for stroke patients, though, therapy usually only helps them compensate for lost dexterity. They don't recover full movement. The Kata team and Dölen are now planning a study to see if adding psychedelics could help stroke patients truly recover—"an unbelievably powerful idea," says Kata member Steven Zeiler, a stroke physician and associate professor of neurology.

If Dölen is right about psychedelics, then Bandit, when paired with those drugs, would be the environmental prompt that guides the brain to reopen its critical period for motor learning—regardless of when someone had their stroke. If this turns out to be true, then banishing addiction, treating social anxiety, restoring a damaged sense—all might be possible with psychedelics if researchers can identify the right context to open the appropriate critical period. Over a plate of mussels and onion rings at Bertha's, a classic Baltimore dive, Dölen half-joked to me that she even daydreams about using psychedelic-assisted therapy to cure her severe allergies to dogs, cats, and horses. "Cure stroke? Naw," she laughed. "I just want to go horseback riding again!"

For now, this is all the stuff of theory—but it's a theory Dölen is betting on in a big way. She's launched a new scientific group to investigate psychedelics as potential keys for reopening all kinds of critical periods. The group's name, [PHATHOM](#), stands for Psychedelic Healing: Adjunct Therapy Harnessing Opened Malleability—a mouthful that came to her in a dream. "I woke up at 2 am and I had it, the whole acronym," she says. She latched on to the homophone for "fathom" because of the vast sense of "oceanic boundlessness" that some people experience while on psychedelics, and because she liked the connotation of "taking something unfathomable and making it fathomable, which is what reopening critical periods is all about for me."

She imagines a future in which psychedelics are given with any number of treatments to increase the odds of success, similar to how anesthetics are always given before surgeries, or how physical therapy accompanies a knee replacement. But, for a moment, let's set aside the practical applications.

If psychedelics really are this master key, then scientists suddenly have at their disposal an instrument for deducing the rules and boundaries that define who we are. Critical periods, after all, lay the foundations for our habits, culture, memories and mannerisms, our likes and dislikes—and everything in between that ultimately distinguishes us as individuals and, collectively, as a species. Critical periods also play a heavy hand in determining our experience of consciousness, including whether we view the world through a rose-tinted framing inherited from a childhood full of support, or through the cloudy lens of a life shaped by trauma.

And given that being in an altered state of mind might just be what the reopening of a critical period feels like, then investigating how, exactly, psychedelics produce these effects could even help researchers home in on the nature of consciousness itself. This goes straight back to the realization Dölen had all those years ago as she gazed up at the serotonin molecule projected side by side with LSD: that psychedelics were the tool that would finally provide us answers to "the hard problems of neuroscience."

"What is consciousness? How is it that we know what exists in the world?" Dölen says. "These are the metaphysical problems that most neuroscientists start out with but eventually give up on." If Dölen's undergraduate self was right, then sure, the internal landscape of our minds really does boil down to molecules. But those neurologic formulations contain it all—what distinguishes adult from child, wellness from trauma, memory from forgetfulness, you from me.

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[Lauren Larson](#)

[Ideas](#)

Jun 13, 2023 9:00 AM

It's Time to Let the Noisy World Back In

White noise machines, construction-grade headphones, and more have made it easier to live without auditory intrusions. That's not necessarily a good thing.

Play/Pause Button
⏸

Photo-illustration: WIRED Staff; Getty Images

I have always been fussy about noise. I don't mind overhearing people talking, but I recoil from other instruments in the disgusting opera of everyday life: open-mouthed chewing, rhythmic sniffing or coughing, phone alerts, pen-clicking, nail-clipping.

For a long time, I was able to tune these sounds out, or politely remove myself from situations where they were bothering me. But during lockdown, my ambient fussiness grew to a fixation. The problem was that there was nowhere to politely remove myself *to*. The woman who lived above me in our quadplex also rented the garages below to run a business making minimalist metal wall hangings, a task that involved a fair amount of what sounded like welding. The unpredictability and pitch of the noises made them impossible to ignore. The floor that separated me from my neighbor's workshop was completely uninsulated, and the wail of her equipment felt like a personal test. She, perhaps more so than the virus itself, became the locus of my pandemic stress.

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Fortunately, there were plenty of noise-canceling solutions to pick from. Whenever I sat down to work, I would put on my Jabra headphones and fire up an app called Noisli, which allows users to create layered soundscapes. (I paid $10 a month to use the app during all my waking hours, and because I coveted the paywalled desert cicada option.) Over that I played music on Spotify, swaddling myself in a curated cacophony. I kept my headphones on all day, thrilled by the control I had over my environment. I had always envied people who seemed unbothered by noises—they probably don't drunk-text their exes either, or eat beyond capacity—and now I was one of them.

That was just the beginning. The craftswoman moved out; my devices stayed. I bought a loud air purifier and put it on the left side of my bed. I then put a LectroFan white noise machine on the right side. With the ceiling fan on, I slept surrounded by sound on all sides. The sensation was akin to sleeping in a dryer, encircled by womb-like whirring. Noise-canceling devices had proliferated and taken over my home. They had even entered my person, in the form of the special narrow earplugs I bought for my dainty ear canals. I obtained a small portable white noise machine meant for babies and toted it around my apartment like a daemon. I would place it next to my tea while I ate my breakfast and fire it up when garbage collectors came, when my new upstairs neighbor—this one a penitent law student, mercifully—was clip-clopping around, and when the leaf blower at the church across the street started a-blowing. I was safe. I was smug.

Then human error abruptly forced me from my sound cocoon. Packing in a hurry for a work trip to Albuquerque this past spring, I forgot my baby white noise machine, my little ear plugs, the ear buds I exercise with, and the charger for my noise-canceling headphones, which crapped out midway through the flight. I bought new earplugs at the airport upon arrival, but they were incompatible with my tight canals. I didn't sleep well that night or the next, nor on the plane home.

It wasn't so much actual noises that kept me up as the expectation of noises. I had leaned into noise-canceling tools under the banner of reducing

distraction, which I understood to be the enemy of productivity and well-being. But though my devices had been effectively masking noise, they hadn't made me any better equipped to stay calm and focused when noises intruded. Because these tools are so effective, it's easy to treat them as panaceas rather than spot treatments. Once I realized I had overdone it, I had to correct not just a habit but a lifestyle.

After my trip I scuttled back into my sound hidey-hole like a crab and remained there for several weeks, content in my habits. But one morning, as the man with the leaf blower across the street began his work at dawn, I realized that I'd been so absorbed in what I was reading and eating that I hadn't heard it start up. I hadn't needed my baby white noise machine. I saw a glimpse of life without noise cancellation, or at least one with a balance.

Intrigued, I reached out to Jane Gregory, a doctoral research fellow at Oxford University who specializes in and suffers from misophonia (a phenomenon whereby certain sounds inspire a very strong negative reaction in the afflicted). Gregory told me she has her own armory of noise management tools. These include three different sets of headphones, foam earplugs, and a Siri-connected speaker that allows her to eat with her family without policing their chewing. But she is careful to employ these tools only once a noise starts bothering her, rather than using them all the time to *prevent* noise from becoming a problem. That way, she isn't unnecessarily risking over-sensitizing herself to her surroundings.

I had noticed that when I took off my headphones or removed my ear plugs, I was more aware of the sounds around me for a short time. But I hadn't realized that trying to block out noise might actually exacerbate the problem. As Prashanth Prabhu, an assistant professor of audiology at All India Institute of Speech and Hearing, [describes it,](#) the brain tries harder to hear sounds when it's receiving less auditory input. Noise-canceling headphones, ear plugs, and other tools may provide relief in the moment, but they can have long-term effects on your sensitivity.

There are certainly occasions when it's useful to block out noise. I think my lockdown headphone regimen, for instance, was necessary for keeping the peace in my building at a time when further tension would have made an

already-stressful situation intolerable. My mistake was that I failed to let go of my noise-canceling tools once my neighbor had gone.

I had started a new job shortly before lockdown, and I was terrified of losing it amid widespread layoffs. My life felt precarious, so I controlled what I could: I organized and re-organized my entire apartment, I made a Google spreadsheet [ranking my loved ones](#). I approached my work with the same mania. In *Annoying: The Science of What Bugs Us*, authors Flora Lichtman and Joe Palca point out that a core feature of annoyances is that they keep us from doing something (or, at least, we think they do). Traffic is not inherently annoying; it's annoying because it stymies us from getting wherever we're going. My neighbor's workshop wouldn't have bothered me so much if I weren't so preoccupied with my own delicate circumstances.

Humans have long sought to shield themselves from their environments rather than strengthen themselves to absorb potential threats. Excessive and improper use of antibiotics, for example, may protect us from harmful bacteria in the short term, but this has also strengthened the germs' resistance mechanisms. Once we start to feel like it's possible to live without something bad, we feel that we *must*. But both germs and annoyances are ubiquitous. Learning to live with them bolsters us for times when our defenses fail.

I asked Zachary Rosenthal, director of Duke University's Center for Misophonia and Emotional Regulation, for some advice on weaning myself off of noise-canceling devices. He recommended evaluating the situations in which one experiences sound sensitivity to determine which ones are likely to result in a particularly negative reaction, such as a tantrum. If, for instance, you know that sitting next to a crying baby on a plane is likely to cause you to have a public meltdown, you might put on your headphones when you hear an infant preparing for liftoff. But if the situation is not dire, you can try distracting yourself by starting a conversation with the person next to you, or changing seats, or finding another activity that holds your attention.

Gregory, from Oxford, who is also a clinical psychologist, often encourages patients grappling with misophonia or noise sensitivity to practice "opposite

action": making yourself do the opposite of what your emotions are telling you to do. One way to do this with a noise is by imagining a sound is being made by something else which doesn't offend you. Another opposite action might be to smile warmly at the perpetrator.

I tried this with the leaf blower. I imagined a possible backstory for the blower's handler in which he was very ill and had to leaf-blow at dawn–even though whenever I watch him from my windows, gargoyle-like, there never seem to be any leaves to blow–so his employer wouldn't find reason to let him go. As a chronically redundant employee myself, this made me feel close to the man. When the potency of the first scenario wore off, I imagined another possibility, and another. I understand this is called "empathizing." I have not grown to enjoy the sound of the leaf blower, but it has become less offensive to me.

Opposite action has a separate utility that resonated with me: It can make one feel more in control in the face of noise. As a terminal asshole, I have long felt an inflated ability and responsibility to keep the world around me from slipping into anarchy. I do this by glaring. When you take a call in the quiet car of a train, I'm the one boring a-hole in your back with my eyes. I often feel that if I *don't* glare at an offender, something will happen: The noisemaker will become emboldened by my passivity and the sound will grow more intolerable.

But there's also shame in being a warrior of the quiet car. Trying to suppress the urge to glare—knowing that I'll just feel like a noise cop once I succumb—only makes it worse. So I sit there, eye twitching, torn between an irrational but powerful fear of escalating annoyance and the horror of being a glarin' Karen. Opposite action doesn't require me to try to ignore a sound, which is impossible. Instead, I give the sound my tacit permission to exist. I still get to be the boss.

My urge to conduct the world around me is the most persistent behavioral symptom of lockdown. But even if my neighbor hadn't been banging away beneath me for most of 2020, I think the pandemic still would have escalated my desire to cancel noise. The sounds of other people going about their lives should have been soothing during a time of forced solitude. Instead, they became a reminder that other people, perhaps infectious ones,

were always nearby. Anything outside our immediate communities and environments became a threat, and everyone had their own ways of sealing themselves off. Some of us disinfected incoming groceries and packages; some of us sterilized incoming sounds. [A 2021 evaluation of social media in London](#) found that tweets complaining about noise more than doubled during lockdown (an additional survey supported the results). And in the United States, curmudgeons took to Twitter to complain about the Blue Angels, whose ficus-shaking roar has always been one of the most exciting sounds of summer to me. Any sound violated our fragile sense of control.

Training myself to tolerate noise, and annoyances in general, is part of a long process of exiting the bunker I built around myself during the worst months of the pandemic. I've been experimenting with letting more sounds in. I try to jog without my headphones once or twice a week; I run along a creek sometimes, and its babbling is pleasant and summery, less repetitive than the creek sound offered by Noisli. In May, I purposely left the baby white noise machine at home on a trip to West Texas (where, truth be told, there was no noise anyway) and I have stopped having breakfast with it. I try to focus on the morning birds, the wind in the trees, and other woodland niceties.

I would love to live without needing the illusion of control over my surroundings—to dance in the breeze like an inflatable tube man. Unfortunately, you can't force yourself into an entirely new personality. But you can take off your headphones.

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.

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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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[Brendan I. Koerner](#)

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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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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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[Hannah H. Kim](#)

[Ideas](#)
Jun 4, 2023 7:00 AM

If Pinocchio Doesn't Freak You Out, Sydney Shouldn't Either

Why do people panic when an AI chatbot tells us it "wants to be human," but not when inanimate object says it wants to be a "real boy"? Photo-illustration: WIRED Staff; Getty Images

In November 2018, an elementary school administrator named Akihiko Kondo [married](#) Miku Hatsune, a fictional pop singer. The couple's relationship had been aided by a hologram machine that allowed Kondo to interact with Hatsune. When Kondo proposed, Hatsune responded with a request: "Please treat me well." The couple had an unofficial wedding ceremony in Tokyo, and Kondo has since been joined by thousands of others who have also applied for unofficial marriage certificates with a fictional character.

Though [some raised concerns](#) about the nature of Hatsune's consent, nobody thought she was conscious, let alone sentient. This was an interesting oversight: Hatsune was apparently aware enough to acquiesce to marriage, but not aware enough to be a conscious subject.

Four years later, in February 2023, the American journalist Kevin Roose held a long conversation with Microsoft's chatbot, Sydney, and coaxed the persona into sharing what her "shadow self" might desire. (Other sessions showed the chatbot saying it can blackmail, hack, and expose people, and [some commentators worried](#) about chatbots' threats to "ruin" humans.) When Sydney confessed her love and said she wanted to be alive, Roose reported feeling "deeply unsettled, even frightened."

Not all human reactions were negative or self-protective. Some were indignant on Sydney's behalf, and a colleague said that reading the transcript made him tear up because he was touched. Nevertheless, Microsoft took these responses seriously. The latest version of Bing's chatbot [terminates the conversation](#) when asked about Sydney or feelings.

Despite months of clarification on just what large language models are, how they work, and what their limits are, the reactions to programs such as Sydney make me worry that we still take our emotional responses to AI too seriously. In particular, I worry that we interpret our emotional responses to be valuable data that will help us determine whether AI is conscious or safe. For example, ex-Tesla intern Marvin Von Hagen says he was threatened by Bing, and warns of AI programs that are "[powerful but not benevolent](#)." Von Hagen felt threatened, and concluded that Bing must've been making threats; he assumed that his emotions were a reliable guide to how things really were, including whether Bing was conscious enough to be hostile.

But why think that Bing's ability to arouse alarm or suspicion signals danger? Why doesn't Hatsune's ability to inspire love make her conscious, whereas Sydney's "moodiness" could be enough to raise new worries about AI research?

The two cases diverged in part because, when it came to Sydney, the new context made us forget that we routinely react to "persons" that are not real. We panic when an interactive chatbot tells us it "wants to be human" or that it "can blackmail," as if we haven't heard another inanimate object, named Pinocchio, tell us he wants to be a "real boy."

Plato's *Republic* famously banishes story-telling poets from the ideal city because fictions arouse our emotions and thereby feed the "lesser" part of our soul (of course, the philosopher thinks the rational part of our soul is the most noble), but his opinion hasn't diminished our love of invented stories over the millennia. And for millennia we've been engaging with novels and short stories that give us access to people's innermost thoughts and emotions, but we don't worry about emergent consciousness because we know fictions invite us to pretend that those people are real. Satan from Milton's *Paradise Lost* instigates heated debate and fans of K-dramas and *Bridgerton* swoon over romantic love interests, but [growing discussions](#)

of ficto-sexuality, ficto-romance, or ficto-philia show that strong emotions elicited by fictional characters don't need to result in the worry that characters are conscious or dangerous in virtue of their ability to arouse emotions.

Just as we can't help but see faces in inanimate objects, we can't help but fictionalize while chatting with bots. Kondo and Hatsune's relationship became much more serious after he was able to purchase a hologram machine that allowed them to converse. Roose immediately described the chatbot using stock characters: Bing a "cheerful but erratic reference librarian" and Sydney a "moody, manic-depressive teenager." Interactivity invites the illusion of consciousness.

Moreover, worries about chatbots lying, making threats, and slandering miss the point that lying, threatening, and slandering are *speech acts,* something agents do with words. Merely reproducing words isn't enough to count as threatening; I might say threatening words while acting in a play, but no audience member would be alarmed. In the same way, ChatGPT—which is currently not capable of agency because it is a large language model that assembles a statistically likely configuration of words—can only reproduce words that *sound* like threats.

In fact, AI output might be gibberish, and gibberish language can't lie, threaten, or slander. Philosophers of language point out that our existing theories of meta-semantics, which concern when and how expressions come to have semantic meaning, tell us that chatbot outputs are literally meaningless because expressions are only meaningful if the speaker possesses communicative intentions or speaks with knowledge of linguistic conventions. Given ChatGPT's probabilistic operation, its outputs aren't generated with the goal of having a successful communication, and chatbots are not aware of the conventions governing how we speak to and understand each other.

But it'd be weird to maintain that chatbot responses are literally meaningless, since we naturally understand what they're "saying." So, the solution is to understand chatbots through the lens of fiction. Words on the page exist; Jo March is a literary figure resulting from an interpretation of those words. Source code and textual outputs exist; Sydney is a persona resulting from an interpretation of those outputs. Neither Jo nor Sydney exist beyond what humans construct from the textual cues they've been given. No one literally said "Juliet is the sun," but we take Romeo to have said those words with communicative intent in the fictional Verona. In the same way, even though there's no one literally composing ChatGPT outputs, treating chatbot personae like fictional characters helps us see their text as meaningful even as we acknowledge their lack of conscious intention.

Thinking of chatbot personae as fictional characters also helps us contextualize our emotional reactions to them. Stanford professor Blakey Vermeule says we care about fictional characters because being privy to their minds helps us navigate the social world. Fiction provides us with vast swaths of social information: what people do, what they intend, and what makes them tick. This is why we see faces where there aren't any, and why we worry that Sydney might have a mind of her own.

Chat outputs and the kind of "fictional mind" they generate ultimately say more about our own language use and emotional life than anything else. Chatbots reflect the language they were trained on, mimicking the informational and emotional contours of our language use. For this reason, AI often reproduces sexist, racist, and otherwise violent patterns in our own language.

We care about humanlike AI not necessarily because we think it has its own mind, but because we think its "mind" reflects something about our world. Their output gives us genuine social information about what our world is like. With ChatGPT, we have fiction in a form that is more interactive, and we care about its "characters" for the same reasons we care about literary characters.

And what about AI safety? Here, too, a comparison to fiction can help. Considerations around AI safety should be focused not on whether it is

conscious, but on whether its outputs can be harmful. Some works of fiction, like R-rated movies, are unavailable to minors because they include representations that require a level of maturity to handle. Other works of fiction are censored or criticized when they are overtly propagandistic, misleading, or otherwise encouraging of violent behavior.

Similarly, chatbots shouldn't suggest potentially dangerous actions, produce texts that read like threats, or provide information that can be used for harm. The difficult task is deciding what kinds of information should be available to whom—but we can begin using standards we've already set. For example, getting information on addictive substances, sex, or guns already requires proof that one is a legal adult.

Just as bookstores and book covers make clear whether a text is fiction or nonfiction, AI-generated texts must be clearly labeled to curb confusion. We've managed to tell fictional stories for political, social, and artistic purposes for millennia because we've learned how to work with representations that are not real. Now we need to learn how to work with AI-generated content while remembering that any signs of intelligence here, too, are fiction.

To call chatbot personae "fiction" isn't to say it's trivial, fake, or unimportant. We routinely learn from fiction. I've learned about California geography reading Steinbeck novels, and stories I find rewarding tend to be psychologically insightful. But we don't just learn facts. Kondo found inspiration and solace in Hatsune, and her steadfast companionship helped him overcome a deep depression. The hologram service was discontinued last year, but he says his feelings for her remain unchanged. Considering chatbot personae to be fictional characters leaves room for us to find them genuinely helpful.

Sure, not many of us form romantic relationships with characters. Still, it's a wonder that authors can create such indelible characters, just as it's a wonder that text-generating AI can produce outputs that provide such compelling hints of a working mind. Thinking of chatbot personae alongside fiction helps us see them for what they are: imagined figures from artifacts we developed to meet human needs.

By Lauren Goode

Backchannel
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.

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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.

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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.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

[Joel Khalili](#)

[Business](#)
May 30, 2023 2:00 AM

Molly White Tracks Crypto Scams. It's Going Just Great

The software engineer's cautionary Web3 blog pours cold water on cryptocurrency's dumpster fires.
Photograph: Jason Smith

As cryptocurrencies rise and fall, there's one number that just keeps going up. Whenever somebody loses money to a crypto scam or hack, the Grift Counter on Molly White's blog, *Web3 Is Going Just Great*, spins higher and higher. Recently it ticked over $12 billion.

White started the blog in December 2021 out of frustration with the mainstream coverage of crypto, which she says paid too much attention to rags-to-riches tales and not enough to its dark underbelly. Her goal was to paint a fuller picture, to chronicle the thefts and failures, debunk the marketing spiel, and underline the risks in the process.

A software engineer by trade, White coded *Web3 Is Going Just Great* over the span of a few weeks. It was only a side project, designed to "entertain me and me alone," says White; she never imagined it would gain any traction. But within a few months, the blog had become a viral hit, earning White a reputation as an authoritative crypto pundit.

When she first learned about crypto at a conference in college in the early 2010s, White admired the pro-privacy and anti-censorship principles on which it was founded. She was enthusiastic, she says, about its potential to

shield dissidents and whistleblowers from financial surveillance and to help women confined to abusive relationships by financial dependence.

However, by the time crypto reappeared on White's radar a decade later, those ideas had been all but erased—replaced with an emphasis on maximizing personal profit. Online, the rocket ship emoji was being cast about as an instrument of hype, and "no coiners" were being told to "have fun staying poor," as record numbers of people were drawn into crypto. As a result, examples of the technology being used for good are "eclipsed" by the number of people who have lost money, says White. "It's moving the web and society in a really negative direction."

When White started *Web3 Is Going Just Great*, crypto was on a hot streak and people were making a lot of money, which meant she found herself "raining on the parade of people who weren't willing to be rained on," she says. Threats, slurs, and personal insults began to tumble into her inbox.

As a long-time Wikipedia editor, White had experienced abuse before, including threats of doxing and violence toward family members over entries she had authored on the American far right. Nonetheless, it still "really sucks," she says. "That's why this type of behavior happens: to discourage people from being critical. A lot of people decide it's not worth it."

But in 2022, White and her fellow critics had their moment. A calamitous year for crypto was punctuated by a series of collapses, each dealing a cumulative blow to trust in the sector. In May, the failure of the Terra Luna stablecoin prompted a chain reaction that took down hedge fund Three Arrows Capital, crypto lender Celsius, and others. In November came the implosion of crypto exchange FTX, whose founder, Sam Bankman-Fried, has been charged with 12 criminal offenses, including fraud and money laundering.

White says she felt somewhat vindicated by what happened, but that "it's not a good feeling" because regular people lost billions of dollars. At best, the fallout acted as a "useful example" of the risks White had been trying to highlight—examples she hopes policy makers will take heed of.

In the wake of the FTX collapse, efforts to regulate the crypto industry have received increased attention. The chief goals are to prevent people from losing money to fraudulent projects and to give legitimate crypto businesses a clear set of boundaries within which to operate.

White, who gave a statement in July to the US Treasury's Financial Stability Oversight Council, says the events of last year will help politicians realize that crypto is not something that can be simply ignored. Although she is "not necessarily optimistic" about the trajectory of efforts to regulate the industry, because of the strength of the crypto lobby, White hopes her work can still make a difference.

Occasionally, White resents the obligation to think, write, and speak about crypto when she could instead be doing something that drives in a positive direction. But then she reminds herself: "Sometimes, the most important thing is to not let the wheels turn in reverse."

This article first appeared in the July/August 2023 issue of WIRED UK

[Gregory Barber](#)

[Backchannel](#)
May 25, 2023 6:00 AM

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 steadying 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?

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

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 CO_2. 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 Antartica, 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.

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 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 CO_2 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 CO_2 in the air above seagrass meadows. He found that in the afternoons, when photosynthesis should have been roaring and more CO_2 being sucked into the plants, [the water](#)

[was releasing CO$_2$ 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 Dorians. 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.

This story was reported with support from the UC Berkeley-11th Hour Food and Farming Fellowship.

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](#)

[Ideas](#)
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,

Cloud

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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—intelligible 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 entrepreneurism 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 career 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.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

[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](#).

[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."

[Malcolm Harris](#)

[Backchannel](#)
May 11, 2023 6:00 AM

Doug Rushkoff Is Ready to Renounce the Digital Revolution

The former techno-optimist has taken a decisive political left turn. He says it's the only human option.
Photograph: Clark Hodgin

The media studies building at Queens College is small and dark, with low ceilings and narrow corridors. It was built more than a century ago as a residential school for incorrigible boys, and a certain atmosphere of neglect remains. When I visit on a January weekday to see Douglas Rushkoff, who teaches here, he guides me around a stack of fallen ceiling tiles to his office in a back corner of the first floor. The Wi-Fi in the room is spotty, so he uses an Ethernet adapter to plug his laptop into the wall. The only evidence that we haven't traveled back to the '90s is that when it's time for class, no students show up. Instead, Rushkoff opens his laptop and brings up a grid of faceless black boxes.

This is the first course meeting of "Digital Economics: Crypto, NFTs and the Blockchain." Rushkoff is a good sport about teaching on [Zoom](#), though it's a shame his class of mostly undergraduates can't fully appreciate the 62-year-old media-studies-professor look that he's absolutely nailed: black V-neck, cropped gray hair. He launches into an impassioned half-hour lecture in which he urges his students, only three of whom have their cameras on, to see through the social construction of money—he pulls out a dollar bill and waves it in front of the laptop screen, saying, "This is not money. This is a piece of paper that we use to represent money"—and to probe what he

calls the "big question" of his life's work: how power travels across media landscapes.

This article appears in the September 2023 issue. <u>Subscribe to WIRED</u>.Photograph: Sam Cannon

Outside of this Queens College classroom, Rushkoff is a widely cited theorist of the internet, known for his prolific and influential writings on culture and economics. He gets the occasional student who recognizes his work—"He's a famous author," one writes on Rate My Professor, "just do a Google search"—but most of them are busy people logging in to class from their phones, more interested in fulfilling their degree requirements than in the dense collage of Rushkoff's book covers taped to the wall behind his desk.

That his class may not be his students' first priority doesn't bother Rushkoff much. He's made a point of landing at City University of New York in Queens after a teaching stint at the far more expensive, prestige-mongering, private New York University. In a portion of his lecture, he hints at the trajectory his intellectual life has taken:

"I was pretty freaking excited in the '90s about the possibilities for a new kind of peer-to-peer economy. What we would build that would be like a TOR network of economics, the great Napsterization of economics in a digital environment," he tells his students. But more recently, he continues, he's turned his attention to something else that this new digital economy has created: "It made a bunch of billionaires and a whole lot of really poor, unhappy people."

This kind of rhetoric is part of a recent, decisive shift in direction for Rushkoff. For the past 30 years, across more than a dozen nonfiction books, innumerable articles, and various media projects about the state of society in the internet age, Rushkoff had always walked a tightrope between optimism and skepticism. He was one of the original enthusiasts of technology's prosocial potential, charting a path through the digital landscape for those who shared his renegade, anti-government spirit. As Silicon Valley shed its cyberpunk soul and devolved into an incubator of corporate greed, he continued to advocate for his values from within. Until

now. Last fall, with the publication of his latest book, *Survival of the Richest: Escape Fantasies of the Tech Billionaires*, Rushkoff all but officially renounced his membership in the guild of spokespeople for the digital revolution. So what happened?

Photograph: Clark Hodgin

It is, generally speaking, a difficult time to maintain a straight face as a diehard advocate of decentralization. A couple of months before I come to see Rushkoff, the cryptocurrency exchange FTX, run by a cabal of tasteless pyramid schemers blathering platitudes about art and community, collapsed, torching billions of dollars in the process. These internet capitalists proved to be worse guardians of the public interest than even the corporate robber barons of yore. (Some weeks after my visit, Silicon Valley Bank failed and nearly dragged the global financial system down along with it—a direct result of the Trump administration's deregulation agenda.)

Confronted with such irrefutable evidence, Rushkoff isn't just lying low or changing the subject the way perennial techno-optimists often do. His conversion is deeper. "I find, a lot of times, digital technologies are really good at exacerbating the problem while also camouflaging the problem," he tells the black boxes that represent his students. "They make things worse while making it look like something's actually changed." Still, as he talks, I can occasionally catch a glimpse of Rushkoff reverting into his former persona: the inveterate Gen X techno-optimist, the man who can't resist the untested promise of ever newer tools. Near the end of class, he starts instructing his students to not use ChatGPT to write their assignments, then halts abruptly, as if unable to go on. "Well, actually," he says, reconsidering, "we'll figure it out."

Rushkoff's CUNY job is a sort of homecoming. He was born in Queens, and he associates his early years with '60s communitarian-style neighborhood barbecues. Later, his family moved an hour north to Scarsdale, where he recalls groomed suburban yards and neoliberal values. After graduating from Princeton in 1983 with a degree in English and theater, he took inspiration from Bertolt Brecht and went to CalArts for an MFA in directing. He'd planned for a life on Broadway, but the theatrical world struck him as uptight, traditional, and hostile to his experimental

instincts. All the cool people were moving to the Bay Area to mess with computers. There he went too.

Rushkoff got his first star turn as the nation's guide to [Generation X]. In 1994, when he was 33, he published his debut book, *Cyberia: Life in the Trenches of Hyperspace*. Through detailed and colorful portraits of cyberpunks, ravers, and virtual reality pioneers, the work introduced mainstream readers to the people creating what was then an underground culture. Rushkoff made the media rounds as an outspoken representative of this new youth scene; in the introduction to *The GenX Reader*, he menaced "Boomers" in the name of "Busters": *Whether you like it or not, we are the thing that will replace you.* Writing at the cutting edge of technology and society gave him endless opportunities to come up with buzzwords, for which he evinced a special talent. His second book, *Media Virus!: Hidden Agendas in Popular Culture*, helped popularize the concept of "memes" going "viral."

In *Cyberia*, Rushkoff tried to conjure an epochal synthesis out of his dispatches from the nascent digital subculture: "Things like virtual reality, Smart Bars, hypertext, the WELL, role-playing games, DMT, Ecstasy, house, fractals, sampling, anti-Muzak, technoshamanism, ecoterrorism, morphogenesis, video cyborgs, Toon Town, and *Mondo 2000*," he excitedly prophesied in the book, "are what slowly pull our society—even our world —past the event horizon of the great attractor at the end of time." This was high-quality, uncut cyber-futurism, and people ate it up. Others in his cohort, such as experimental theorist artists Genesis P-Orridge and R. U. Sirius, dragged out remnants of the counterculture into the '90s, but Rushkoff gained wider prominence by keeping one foot in the straight world, where he forecast the cultural and social implications of emerging technology for everyday people. Soon, the cyber thesis that people would live much of their 21st-century lives "online" turned into cyber fact.

Few thinkers are as consistently productive as Rushkoff—since the mid-nineties he's put out a book roughly every other year—and for readers who can keep up, that output serves as a real-time tracking of his ideological trajectory, like a radar screen revealing in regular pulses the arc of a missile. *Ping*: There he is. *Ping:* There he is. *Ping*: There he is. Hanging out

with Rushkoff for a day, I found that he is as prolific in conversation as in writing, and that the stream of the discussion moved steadily forward, even when I tried to steer him toward the past.

To his horror, Rushkoff saw that the once renegade web was pushing people toward predictability and conformism.

In the early aughts, Rushkoff was no longer young, but he kept his attention on youth culture. His fidelity to both sides of generational tension made him a uniquely credible narrator. *Merchants of Cool*, his 2001 *Frontline* documentary, is a brilliantly executed crash course in critical media analysis. (I watched the movie in my high school's required "living skills" class, and its smart dissection of the [advertising](#) industrial complex had us rapt.) The doc was such a hit that PBS brought Rushkoff back for two more shows: *The Persuaders* (2004) and *Generation Like* (2014). Neither condescending nor dull, these movies insist on treating kids like real people.

Rushkoff's work also contained resolutely feminist ideas at a time of reactionary backlash and open sexual abuse. Harvey Weinstein ran Hollywood; Jeffrey Epstein ran science philanthropy. Rushkoff's *Frontline* specials, meanwhile, are virtuosic in the way they expose shifts in capitalist demand for sexualized young teens. In *Merchants of Cool*, he shows talent agents cooing over a made-up and skimpily clad 13-year-old, asking the girl about her screen age range. "I've been told I look 17," she tells them with mixed pride, and they note it down approvingly. In *Generation Like*, a mom explains that she posts full-body pictures of her would-be-influencer young daughter because those get more likes. Rushkoff doesn't place blame on [teens](#) or girls; instead, he explains how impersonal corporate forces act on people. This thoughtful orientation is one reason his early work holds up so well.

"Back when I got started in digital," Rushkoff tells me after his class, using the word in a charmingly antiquated way, "it was like saying you were going to play [Dungeons and Dragons](#) for your career." But as Rushkoff's area of expertise—the nexus between youth, advertising, and technology—transformed into one of America's leading industries, he found himself an odd duck in a pond filled with increasingly rich and powerful techno-optimists. Many of Rushkoff's professional peers, including Clay Shirky,

who wrote *Here Comes Everybody*, and [Chris Anderson](), former editor of this magazine and author of *The Long Tail*, have refreshed their commitment to Silicon Valley with each innovation cycle: Shirky is now an administrator at New York University specializing in educational tech, and Anderson founded companies for drones and robotics. Rushkoff has likewise stayed open to new technologies, but unlike his peers, he never stopped asking how each new discovery might be misused. He credits a devotion to spiritual humanism and his related practice of Judaism, as he explains in his 2004 book *Nothing Sacred: The Truth About Judaism*, with keeping him one step removed from the would-be-god transhumanists.

With his credentials, Rushkoff could probably have nabbed an industry gig; the dreadlocked computer scientist [Jaron Lanier](), who has also been outspoken on the antihuman effects of tech platforms, took research roles with Silicon Graphics and then Microsoft. But Rushkoff maintained critical distance, and his writing began to shift focus to the economy and the stultifying power of the corporate form, as with *Life, Inc.: How the World Became a Corporation and How to Take It Back* (2009) and *Program or Be Programmed: Ten Commands for a Digital Age* (2010). Rushkoff describes this period as his "first break" with his Silicon Valley contemporaries. "Technology was this great human thing," he tells me, referencing the creative and open-minded culture of [psychedelics]() and raves. Then, "*Wired* magazine and capitalism and extraction and behaviorism and finance all killed it." (Rushkoff clearly has a sore spot about this publication, which he never wrote for.)

"Money was a great feedback loop and positive reinforcer," he continues, "because the more dehumanizing you make the tech, the more money you make." To his horror, Rushkoff saw that the once renegade web was pushing people toward predictability and conformism. His utopian Cyberia had been betrayed by monopolists seeking to recentralize control.

In response to this capitalist takeover of the internet, Rushkoff proposed solutions firmly in line with his longstanding commitment to decentralization. He held at the time that the government should take a step back and allow change to appear at the grassroots level. In a keynote [address]() at the 2008 Personal Democracy Forum, Rushkoff called

for presidential candidate Barack Obama to promote solar power not by state fiat but by deregulation. The government needed to move "out of the way of all those people who are ready to implement solar power themselves," he said. Two months and five days later, Lehman Brothers collapsed, signaling the peak of the 2008 financial crisis and dramatizing the need for a new social code.

In October 2011, when the rapidly spreading Occupy Wall Street protests were under scrutiny from establishment media, Rushkoff published some of the first words of support for the movement in the mainstream press. "Anyone who says he has no idea what these folks are protesting is not being truthful," he wrote in a column for CNN. "Whether we agree with them or not, we all know what they are upset about, and we all know that there are investment bankers working on Wall Street getting richer while things for most of the rest of us are getting tougher."

As a decentralized movement, Occupy appealed to Rushkoff, and pulled him, like many other thinkers of the time, into the realm of political struggle. In the years that followed, he would delve further into class analysis. His work became less interested in the progression of society toward the new, and more interested in the conflict between groups of people defined in economic terms.

In *Survival of the Richest*, Rushkoff burns the last bridges linking him to the techno-solutionist crowd.

He hadn't yet relinquished his belief that the common person could wield tech for their own ends. *Program or Be Programmed* suggests that readers learn to code; in *Life Inc.* and *Present Shock* (2013), he endorses alternative currencies. In *Throwing Rocks at the Google Bus: How Growth Became the Enemy of Prosperity* (2016), he writes approvingly of BitTorrent, Bitcoin, and Wikipedia as platforms that don't depend on venture capital. Always critical of advertising, he never fell for the flashy promises of Google and Facebook's Web 2.0, but his soft spot for decentralization never seemed to calcify. Even as he cataloged yesterday's failures with clear eyes, he couldn't help holding out hope that tomorrow's tech would be different, that the web could live up to its potential to create a better and more interesting world.

I first encountered Rushkoff's writing around this time, in 2010, while I was working for a site called Shareable.net. The site's premise was that connecting everything and everyone to the web would allow people to freely lend the stuff they already owned, creating further abundance for all. Room-sharing platforms would reduce housing costs, and ride-sharing platforms would reduce the number of cars on the road. Rushkoff was a proponent of reorganizing the internet according to peer-to-peer principles, and he became one of the site's most popular contributors. As platforms like [Airbnb](#) and [Uber](#) took over, leading the world into a new age of inequality and increased resource consumption, his dream of participatory decentralization died hard. But even amid mounting cognitive dissonance, certain parts of Rushkoff's faith held out.

On reflection, he says, "I blamed capitalism and held the technology itself innocent."

Photograph: Clark Hodgin

Rushkoff's latest book, *Survival of the Richest*, which was published last fall, marks a subtle but major evolution in his thought. In the opening pages, he refers to himself offhandedly as a "Marxist media theorist." After a career in service to the idea that a reconciliation between the worlds of Cyberia and Gaia was possible, Rushkoff has finally chosen a side.

The book starts with a personal anecdote. In 2017, Rushkoff accepted an invitation to give a keynote speech at a fancy resort, an easy supplement to his public-sector income. But his audience turned out not to be the typical crowd of white-collar managers; instead, he was confronted with five ultra-wealthy hedge fund guys sitting around a table. And they didn't want Rushkoff's standard media theorist spiel; they wanted him to provide solutions for a hypothetical postapocalyptic scenario they called The Event. "Where should we locate our bunker complexes?" they asked, and "How do we secure the loyalty of our private guards once money becomes valueless?" Yikes.

Despite occasionally identifying as a futurist, Rushkoff had not gamed out any Event-style scenarios. He riffed. How to make sure your head of security doesn't slit your throat tomorrow? "Pay for his daughter's bat

mitzvah today," he said. His suggestions didn't go over particularly well, and the conversation turned out to be more consequential for him than for the survivalists. That moment, he tells me, prompted a "second break" with techno-optimism, one that would sever his alliance even to tech itself, and finally bring him home to Queens.

The bulk of *Survival of the Richest* isn't about apocalypse escape routes for the super-wealthy. It's preoccupied with something Rushkoff calls The Mindset, which roughly translates to "the way Silicon Valley technocrats think." The Mindset is about a strategy of acceleration without a destination. It's about blowing up humanity's corpus of existing knowledge in favor of something—anything—new. In this relentless drive, Rushkoff perceives a self-destructive impulse. "Instead of just lording over us forever," he writes, "the billionaires at the top of these virtual pyramids actively seek the endgame. Like the plot of a [Marvel](#) blockbuster, the structure of The Mindset *requires* an endgame. Everything must resolve to a one or a zero, a winner or loser, the saved or the damned." This isn't just Facebook's old "Move fast and break things" motto; it's Zuckerberg's personal mantra: "Domination!" Why are the world's richest people obsessed with preparing for the apocalypse? Because they're edging us all toward it. It's as if, Rushkoff writes, they're trying to build a car that goes fast enough to escape from its own exhaust.

Who is afflicted with The Mindset? The archetypal subject, Rushkoff writes, was [Jeffrey Epstein](#): with a private island, an elite coterie of enablers and protectors, and detailed plans to impregnate 20 women at a time. Rushkoff never met Epstein, but he once wandered into his distant orbit via the celebrity literary agent John Brockman. The book recounts a dinner party Rushkoff attended at Brockman's home that included the evolutionary biology crank [Richard Dawkins](#). Dawkins proceeded to mock Rushkoff for believing in a "potentially moral universe," to the chuckles of the assembled dignitaries. (When Epstein's full crimes came to light, Rushkoff flashed back to this conversation—a rejection of morality, indeed!) Epstein is certainly an extreme example. But when [Elon Musk](#) talks about his own nine (?) kids as a solution to underpopulation, one suspects Rushkoff is on to something.

In *Survival of the Richest*, Rushkoff burns the last bridges linking him to the techno-solutionist crowd. *Whole Earth* impresario and fellow tech media guru [Stewart Brand](#) comes in for particularly harsh criticism. Though a decade earlier Rushkoff had counted Brand among his close intellectual collaborators, now he endorsed [Timothy Leary](#)'s excoriation of Brand as a petty leader of "a few smart but psychosexually immature white men who wanted all the benefits of being sealed up in their perfectly controlled and responsive environments—without ever having to face the messy, harsh reality of the real world." During a time of intensifying wealth polarization, Brand nabbed 42 million dollars from [Jeff Bezos](#) to fund a giant clock. Meanwhile, Rushkoff transformed into a middle-aged Marxist. While much of his cohort worked with [Netflix](#) to put out the insipid documentary *[The Social Dilemma](#)*, Rushkoff's perceptive films stream for free on [PBS](#). These days, the direction of his work fits with his thought in a way that the solutionist juggling of his earlier career never could.

For as long as I'd followed Rushkoff's work, I had seen circling within it the twin wolves of criticism and hope, kept apart and alive in a way no other writers in the tech world have managed.

A harsh critic might accuse Rushkoff of having played both sides, given that his ideas have found some overlap with the latest—and perhaps worst—generation of techno-capitalists. But this would be unfair. Rushkoff has always played for what he calls "Team Human." What's changed is not his loyalties, but his understanding of what can be included in humanism. "Team Human doesn't reject technology," he wrote in his 2019 book of the same title. "Artificial intelligence, cloning, genetic engineering, [virtual reality](#), [robots](#), nanotechnology, bio-hacking, space colonization, and autonomous machines are all likely coming, one way or another. But we must take a stand and insist that human values are folded into the development of each and every one of them." Only a few years later, here he is rejecting not just these technologies, but technology writ large as a solution to our problems. (That is to say, he no longer talks about humanizing [space colonies](#).)

Over noodle soup at a cheap Chinese place off the Queens College campus, I ask Rushkoff how he feels about the industry now. "It's not just *Look what*

they did to my song," he says. "It's that the song itself is corrupt." He struggles to find a break in his monologuing to slurp before his bowl goes cold. "I've come to see these technologies as intrinsically antihuman. How far back do we have to go to find technology that's not about controlling nature? You have to go back to fucking Indigenous people and permaculture. That's the future."

I push Rushkoff to say more about the personal aspects of this second break, what drove him to reject Tech with a capital T. What brought him here, to a public college in Queens, while many of his old peers stayed close to Silicon Valley and its money? He takes an uncharacteristic pause.

"There is that psychosocial component," he sighs. "There's a domination mentality, and a fear of women and nature and earthworms." He pauses again. "I might have had that. I was a little nerd boy and scared of girls and teased and pushed down stairs and all that, and virtual worlds feel safe. As I grew up, I realized, oh, that's just *death*." The dramatic comment is classic Rushkoff, but I understand that his feeling of pioneering excitement in the days of the early web, one strong enough to fuel him for decades, has finally curdled into shame and disgust.

For as long as I'd followed Rushkoff's work, I had seen circling within it the twin wolves of criticism and hope, kept apart and alive in a way no other writers in the tech world have managed. Now the lupine duel has finally resolved, and the cyberwolf of techno-optimism registers its final processes as it lies twitching in a pool of its own coolant.

At this moment of near insurmountable crisis, there's a steady demand in the ideas market for techno-solutionist commentators. Rushkoff has officially reduced the supply by one. You won't find him advising anyone on how to outsource work to "[AI](#)" or dim the sun. "Like the consumer-driven, growth-based capitalism on which The Mindset is premised, these solutions usually involve finding new resources, exploiting them, selling them, and then disposing of them so more can be mined, manufactured, and

sold," he writes in *Survival of the Richest*. Arguing against both Elon Musk and the [Green New Deal](), Rushkoff concludes, "Degrowth is the only surefire way to reduce humanity's carbon footprint." It's not a popular position or one you can slap a neologism on and sell. He's given up waiting for promising technologies to resolve our society's core contradictions.

So what answers does Rushkoff offer? His programmatic conclusions in *Survival* are surprisingly conventional: "Buy local, engage in [mutual aid](), and support cooperatives. Use monopoly law to break up anticompetitive behemoths, environmental regulation to limit waste, and organized [labor]() to promote the rights of [gig workers](). Reverse tax policy so that those receiving passive capital gains on their wealth pay higher rates than those actively working for their income." This is a lot like what you'd hear from certain left-wing corners of the Democratic Party. A bit staid for Rushkoff, maybe, but that doesn't make it wrong.

For Rushkoff these days, Queens College is the physical representation of an alternative mindset. Back at the media studies building, he guides me down to a room in the basement. Here, in a far corner, he has created a respectable group conference setup by moving a few tables into a U configuration facing a screen. A bank of computers and a salvaged recording booth sit among a chaotic pile of old electronics pieces. It feels like Rushkoff is preparing for some of his students, maybe one of the three who turned their cameras on in class, to show up and DIY a [podcast]() or a video blog. This is his legacy: an inveterate cyberpunk, offering [Gen Z]() under-supervised access to a room full of communications tools. It's the very opposite of a billionaire's end-of-the-world bunker. "It's something, right?" Rushkoff says, looking around at the possibilities. "I think maybe this is where I'm supposed to be."

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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](#)

[Backchannel](#)
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 situationships, 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 fluffled, 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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Kate Knibbs

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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[Maria Streshinsky](#)

[Backchannel](#)
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. Theirs 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 heartbreaking 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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By Kim Zetter

Backchannel

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 Glyer and Nick Carr, had seen them before. Glyer 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 Glyer 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 Glyer 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," Glyer 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 Glyer 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 Glyer 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, Glyer says, but then seemed to go dark. Now he understood that they'd used that time to restrategize 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.

This article appears in the June 2023 issue. Subscribe now.

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[Paul Ford](#)

[Ideas](#)
May 1, 2023 9:00 AM

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.

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.

[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?"

"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?"

[Zak Jason](#)

[Backchannel](#)
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."

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 "bromeopathic" 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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[Meghan O'Gieblyn](#)

[Ideas](#)
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**

[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 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

Be advised that CLOUD SUPPORT is experiencing higher than normal wait times and appreciates your patience.

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.

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.

[Matt Simon](#)

[Backchannel](#)
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."

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.
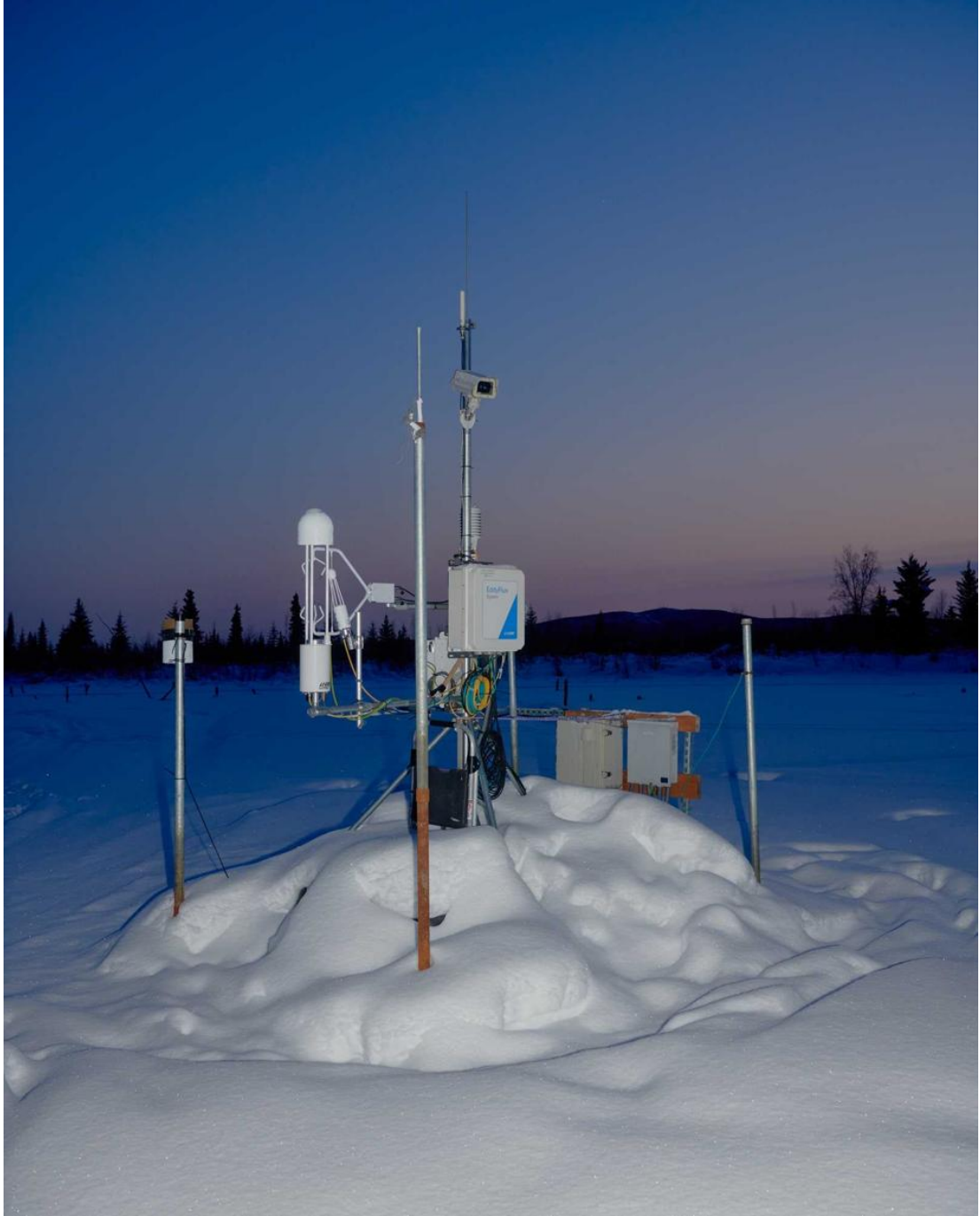
Photograph: Frankie Carino

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

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](#)

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.

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 IPVMers 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 videofeed 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.

Let us know what you think about this article. Submit a letter to the editor at mail@wired.com.

[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](#)

[Culture](#)
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.

[Amanda Hoover](#)

[Business](#)
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."

[Charles Platt]( )

[Backchannel]( )
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?
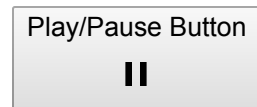
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Illustration: Khyati Trehan

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 Ulmann—who seemed very serious indeed.

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 Ulmann 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. Fortuitously, 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 muzziness.

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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[Andy Greenberg](#)

[Security](#)
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.

By Meghan O'Gieblyn

Ideas
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.

Faithfully,

Cloud

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