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BIG

On a barren Icelandic plateau, this factory sucks CO₂ out of the air before trapping it in stone. The plant is a decades-old idea that's finally becoming reality. The next challenge: build 10,000 more.

INHALE

by Vince Beiser

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[Wed, 02 Feb 2022]

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Feb 1, 2022 3:45 PM

Six-Word Sci-Fi: Stories Written by You

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

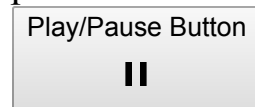


Illustration: Elena Lacey

THIS MONTH'S PROMPT

In six words, write a story about an extraordinary coincidence.

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

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FEBRUARY 2022

A Story About a New National Holiday

ILLUSTRATION: VIOLET REED

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Jan 24, 2022 8:00 AM

Is It OK to Listen to a Butt-Dial Message?

WIRED's spiritual advice columnist explores the forgotten comfort of accidental surveillance.

Illustration: Inga Ziemele

A couple times a month, my mom, or sometimes my dad, [butt-dials](#) me and accidentally leaves a voicemail that is several minutes long. I always listen to the entire thing, even though I've never overheard anything interesting. Why do I continue to do this? And is it OK to eavesdrop on people's lives without their knowledge?

—**Scuttle Butt**

Dear Scuttle Butt,

The butt-dial voicemail is the most aesthetically underrated artifact of our time. Years from now, when cell phones are relegated to the museum of technological obsolescence, we will finally recognize the strange beauty of these ghostly dispatches, recordings captured without human intent, wisps of life that occasionally rose to the level of art. The muffled, vaguely sonographic rustle of a pocket, or a purse. The familiar voices that seem to be speaking from the depths of the ocean. Everyone listens—how can you not? There is always the possibility of emergency. Someone has fallen and is lying, helpless, unable to speak. A thief has broken into the house and your loved one is crouched in the closet, afraid to whisper for help.

Voicemails, after all, are *messages*, and you wait in vain for the missive long after it's clear that there is none, that there is only the crunch of footsteps across gravel, the buzz of an electric razor, the unmistakable sound of your mother's laughter, reaching you for no reason as you sit at your desk on the other side of the country, eating lunch in the glow of your Twitter feed.

That's not to say there isn't some garden-variety voyeurism at play. Overhearing some revealing tidbit—perhaps even about yourself—is always a non-negligible possibility. Pocket-dial voicemails belong to a larger category of technological seepage that, as far as I know, doesn't have a name. Let's call it “accidental surveillance.” Long before cell phones, car radios occasionally picked up the voices of truckers talking over CB. Before that, there was the party line, its circuit running through several households, carrying gossip and intrigue through the neighborhood. In John Cheever's story “[The Enormous Radio](#),” a couple discovers, much to their amazement, that their new radio intercepts conversations taking place in other apartments in their building. Instead of Mozart and news briefs, they turn the dial to hear marital spats, bedtime stories, the feverish tail end of a cocktail party. The wife becomes obsessed with listening in on the neighbors, much to her husband's chagrin. “It's indecent,” he says. “It's like looking into windows.”

Perhaps these examples strike you as quaint. What appeal, after all, can voyeurism still hold in an age when people gladly throw open the curtains? The windows we peer into are seemingly endless, opening onto the bedrooms of celebrities, the cabins of private yachts, the breakfast spread of British royals—images that appear in the feed alongside the intimations of ordinary mortals: the post-chemo haircut modeled by your former boss, the positive pregnancy test proudly brandished by your high school nemesis. I suspect, Scuttle Butt, that there is some measure of guilt—or fear of ingratitude—contained in your question. It cannot but seem greedy to crave yet another peek into the lives of others when you can, with a few clicks, be privy to so many intimacies.

Maybe there's a paradox at play. It has become something of a cliché to point out that the technologies designed to connect us end up creating more

alienation and loneliness. Perhaps it's also true that the plasticine flavor of self-presentation has made us more hungry for the raw material of lived experience—not the curated aura of intimacy, but what might be called the “deep private,” glimpses into lives as unvarnished as the one you actually live. Given that this material depends upon the ignorance of those it depicts, it is rare and fleeting. The impeccably crafted [Zoom backdrop](#) is occasionally breached by a shirtless husband; the screen-share reveals a desktop folder labeled divorce; a politician's snarky aside to her aide is caught on a hot mic.

Back when public life was more robust—that pre-pandemic era when restaurants were crowded and offices fully operational—our lives were rife with moments of accidental surveillance: the phone calls that carried over from the neighboring cubicle, the domestic grievances aired on the subway. Such glimpses into the lives of others could be oddly comforting, a reminder, if nothing else, that you were not the only one whose private life often failed to live up to the gleaming model of social composure you projected online. It's a fact that is difficult to remember during periods of isolation. The writer Megan Stielstra [wrote an essay](#) several years ago about how her video baby monitor, which came with two frequencies, picked up the feed of her neighbor's child. In the lonely throes of new motherhood, she found herself switching between channels, watching this other sleeping infant and searching for signs of its mother, who would occasionally step into the frame. One night, she heard the woman sobbing. “I shouldn't have listened,” she writes, “but it was the first time since my son was born that I didn't feel alone.”

As for your question about the ethics of eavesdropping, it seems that the law is on your side. In 2013 an airport board chairman spoke freely, on the balcony of a hotel, with his vice chairman about firing the airport CEO for discriminatory reasons, only to realize later that he had pocket-dialed his assistant, who recorded the entire conversation. The chairman insisted that his assistant had broken the law by listening in on his private conversation, but the court disagreed: “A person who knowingly operates a device that is capable of inadvertently exposing his conversations to third-party listeners and fails to take simple precautions to prevent such exposure does not have a reasonable expectation of privacy.” (The court noted, additionally, that

phones are capable of being locked.) Given that such accidents are more common among people over a certain age, it's tempting to see this as generational comeuppance. The frequency with which [Rudy Giuliani butt-dialed journalists](#) seemed, for a time, to augur that an administration that remained undaunted by mass protest and the rule of law would self-destruct through senility and technological incompetence.

I would hope, Scuttle Butt, that you don't harbor such animosity toward your parents—or anyone else who warrants a place in your contacts. With that in mind, I might recommend the Golden Rule. Would you want someone listening in on your private life without your knowledge? Surely you are not so careless as to allow this to happen. But ancient wisdom suggests that life tends toward moral symmetry. The high will be brought low, we will reap what we sow. What lies in darkness will be brought into light, and even you might wake up one day to find yourself on the dispatch end of the generational divide. Few of us today believe such justice is encoded in the laws of the universe, but it is, oddly enough, reflected in modern communications technologies, which tend to run in two directions. Where there is a speaker, there is most likely a microphone. The device that receives a video feed also has a camera. It's a truth that dawns on the wife in the Cheever story only after it's too late. "Turn that thing off," she says to her husband, in a moment of panic. "Maybe they can hear *us*."

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Jan 11, 2022 9:00 AM

A Grand Unified Theory of Buying Stuff

So you've acquired a new thing. And now you want accessories. Ask yourself: Will the potential experience be worth the cost to the supply chain?

Illustration: ELENA LACEY

Years ago, I asked a friend what kind of case she planned to buy for her shiny new flip phone. She paused, a little offended. “I don't like to buy stuff for my stuff,” she said. Those words drilled directly into my hippocampus, never to depart. *She's right!* I thought. *Don't buy stuff stuff! So simple!* I have tried to keep to that principle ever since, and it has gone about as well as you would expect. Sure, I might spend \$1,000 on a tech-giant-controlled smartphone, but I only do it every three years (nods sagely) instead of every two. *This is how we win.*

The problem is that certain kinds of stuff simply attract more stuff. The home is an obvious one: It craves sofas, sweaters, buffet cabinets, chandeliers. Computers are another; they grow USB tendrils. Smartphones beget [earbuds](#), cloud backups, and [music service subscriptions](#). I am jealous of the people who make it work with an Eames chair, a fancy ottoman, some nice art books, and multigenerational inherited wealth. Their iPads are so empty, just a few apps, whereas I have 60 terabytes of storage spread across a variety of blinking devices because I download large data sets for fun.

I often trick myself into thinking that the road to less stuff might be paved with more stuff. Recently, under the influence of some long-suppressed percussive desire, I bought a drum machine. It's actually more of a portable production studio—a hardware-based update of the music-sequencing software from old Amiga computers. It has buttons, a jog wheel, and a screen that shows mostly numbers. It's called the Polyend Tracker, but I think of it as the Sonic Spreadsheet. Everything you can do with it can also be done on, you know, a laptop. Crucially, though, it doesn't connect to the internet.

I bought the Sonic Spreadsheet with the fantasy of going offline, escaping the centralized world in which I live, making sick beats in the backyard or at the kitchen table. I wanted to stare at a little screen instead of a big screen, which is how I do back-to-the-land. Instead I ended up hunched in front of my regular monitor, watching YouTube videos of various nerds demonstrating how *they* make beats. Most of their beats were not that sick. Their lighting was good, though. Maybe the people making the sickest beats are not making YouTube videos.

After a few weeks of use, the Tracker began to call out: *Feed me accoutrements*. Boxes of stuff started to arrive—bendy legs to prop it, rubber feet to stabilize it, a padded case to protect it, a battery pack to power it. While I had a microphone and many headphones, I decided that I wanted a special microphone and special headphones just for this thing. Then I downloaded 100 gigs of audio samples from the 1990s, which meant that I needed to upgrade the Sonic Spreadsheet's microSD card. (And of course the samples were inconsistently named, so I wrote code to organize them.) Each thing, each unit of stuff, came with its own, pet stuff—a stand, a foam cover, cords, a manual, a little drawstring case. The [supply chain](#) is fractal: Zoom in on your stuff and there's more stuff, ad infinitum.

The upshot of all this is that I have absolutely no musical talent. I spent hours cutting and pasting, turning tiny expressions into whole songs, spinning that jog wheel like a pro, and when I came back to those tracks the next night, I kept discovering that I did not have a single creative idea. My drum tracks sounded like a nervous rabbit kicking a bongo. If you need portentous, pompous digital clown music that might as well be Christmas

carols played in dog barks, I am your guy. I am not a musician. I am a systems administrator for my digital audio workstation. There will be no SoundCloud for me.

But that journey of self-discovery set off a side trip into systems analysis. I have been learning about supply chains, procurement, product life cycles, and the overall [greenhouse gas emissions](#) of the stuff we buy. When I opened a spreadsheet to calculate the emissions of my drum machine excursion, listing all the stuff I bought and the fractal stuff inside that, it quickly ballooned into hundreds of lines. And I closed the spreadsheet, because, well, here I am.

To stop this from happening again, I have come up with a personal Theory of Stuffness, a way to structure and understand my local stuff ecosystem, especially the digital stuff. I divide Stuffworld into the Object (drum machine), the Enhancements (all the extras), and the Experience (sick beats). Another example: The Object is the phone. The Enhancement is the Spotify app. The Experience is that of listening to music. In the past, you might buy a record player and spend 10 years curating a collection of really good jazz albums. You'd read the liner notes and learn new things over time, boring your friends in the process. Now you pay a fee, and some approximation of every bit of recorded jazz is just there on every device that plays sound. It used to take a lifetime of reading reviews and trips to the record store, or going to jazz clubs, and a ton of money. Now the cost approaches free. This is the Great Stuff Discontinuity. You just parachute in, like my kids playing *Fortnite*.

What I was doing with my drum machine was trying to skip learning, attempting to buy talent and accomplishment by configuring my workstation. That's the promise of buying stuff for your stuff: The Enhancements will make the Experience so much better and give you more of the power of the Object. (Am I serious about all this? Well, I *was* desperate for a grammar to understand what I was doing on Amazon and eBay.)

The Object did not give me the Experience I wanted, despite all the Enhancements. But let's not waste it, right? It does no good if it joins the rat king of USB cables and old laptops in the closet. So I've limited myself to

one sample and one track, trying to figure out how music works. And doing that—going into student mode, humbling myself before the task of making just one passable beat without using a ton of reverb—has almost instantly made me a better listener, a greater appreciator of the talents of others. I've started to pick songs apart as I commute, suddenly aware of filter sweeps across the drum loops or where they cut the bass before the chorus. If I can't buy talent, at least I can understand its supply chain.

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Jan 6, 2022 8:00 AM

Can Being Reminded of My Death Improve My Life?

WIRED's spiritual advice columnist on whether apps that send reminders of your mortality can help you live a better life.

Illustration: Christopher Gale

Lately I've been feeling like life is passing me by, so I downloaded an app that reminds me five times a day that I'm going to die. I thought it would help me accept my mortality and focus on what really matters, but it just makes me anxious. Is there something wrong with me? Is being anxious the point? Do you think these apps can be helpful?

—**Pinged to Death**

Dear Pinged to Death,

I don't think there is something wrong with you. Or rather, you seem to be suffering from a problem that is endemic to the whole of humankind, a species with an almost limitless ability to live in denial of the one inevitability. Even explicit reminders of our demise—be it the death of a loved one or a phone notification—fail to inspire a fear and trembling worthy of the abyss and instead suffuse our lives with a vague disquiet, an ambient dread. “Death,” as W. H. Auden put it, “is the sound of distant thunder at a picnic.” That is, incidentally, one of the quotes featured by WeCroak, the app I presume you are using, which accompanies its death

reminders with nuggets of literary wisdom from Kierkegaard, Pablo Neruda, Margaret Atwood, and others.

We live in an age of slo-mo crises, those that unfold at a tempo that makes them easy to ignore. Social security dwindles year after year. The glaciers are melting faster, but still at glacial speeds. The seas are warming at a rate that could boil alive the proverbial toad. Death lurks behind all of them. Occasionally, the direness of our predicament is made real through a natural disaster or a UN climate report, but the alarm bells fade with the rhythms of the news cycle. The Doomsday Clock—arguably the most deliberate attempt to keep our focus on these threats—is currently perched at 100 seconds to midnight, putting us at roughly a minute and a half, in the timescale of existential risk, from our final demise.

Death-reminder apps are essentially a Doomsday Clock for the individual. In fact, some of them contain actual clocks so that you can watch, in real time, your remaining hours slip away. The Death Clock, a website that's been active since 1998, predicts the day of your death, though its estimations are based on somewhat crude data points—your age, BMI, whether you smoke. Several years ago, the horror film *Countdown* imagined an app that was able to intuit, down to the second, the time of a person's death, with the user agreement serving as a deal with the devil. (The film's tagline: "Death? There's an App for That.") The movie inspired a real-life app built on the same premise—minus, obviously, the supernatural knowledge, but it freaked out enough people to get temporarily booted from the App Store.

WeCroak is not quite so morbid. Its inspirational quotes about mortality are meant to remind users to pause and take stock of what they're doing, a sort of companion to the many mindfulness apps. Its cofounder came up with the idea while in the throes of a *Candy Crush* addiction, and many users have remarked that the app, which tends to interrupt those hours whiled away on Twitter or TikTok, has forced them to confront how much of their lives is wasted on social media. The product, in other words, belongs to that ever-expanding category of technology that is designed to remedy problems that technology has created. If digital platforms remain our most reliable distraction from the crude facts of our mortality—so the logic goes—

perhaps we can channel the same tools to break through those psychological buffers and deliver us to a more enlightened comfort with our impending demise.

WeCroak, as you may already know, is partly inspired by a Bhutanese folk saying that claims that happiness can be achieved by contemplating death five times daily. Bhutan has often been ranked as one of the world's happiest countries, and WeCroak seems to be trading on a casual exoticism that is not uncommon in mindfulness culture, presenting Eastern traditions as the antidotes that will finally free us from the trance of modernity. The fact that it has only increased your anxiety, however, is not at all surprising to me. It's not so easy to simply will yourself to confront a truth that you've been acculturated to ignore. (If anything, the notion that we can reverse the entire current of Western mortality denial with a free app is more a symptom of our technological hubris than its tonic.) The Bhutanese practice of contemplating death has grown out of a larger cultural context that does not shirk from mortality, as evidenced by the country's elaborate funeral rites and the tradition of observing a 49-day mourning period. Bhutan's dominant religion, Buddhism, teaches that transcendence hinges not on escapism but on accepting the brute facts of existence—namely, the fact that life itself is suffering.

In the end, death apps are less a wake-up call than another false comfort, one that reflexively defers to the favored religion of our age—information. Given that we routinely rely on apps to predict the future, providing stats about what the weather will be like tomorrow or whether our favorite restaurant will be busy, it may seem natural to believe that they can also prepare us for the great unknown. But death remains the only landscape without an IP address, the one locale that you cannot research, the “undiscovered country” that remains absent from Google Earth. I suspect your anxiety stems in part from your awareness that the app, on its own, is not really addressing the heart of your fear. Surely you know, on some deeper level, that death can't be predicted or controlled.

That's not to say that you should immediately delete WeCroak. I'm ultimately skeptical of the notion that one can live entirely without illusions, and this is doubly true for those of us who are conditioned to

flinch at any whiff of the eternal void. Most of us will turn to one crutch or another to keep that knowledge at bay. If you resent relying on technology to fill the vacuum, there are plenty of other solutions. You might consider political engagement, committing your life to a cause that will continue to bear fruit after your death. There is always religion, the opiate of the masses. There is actual opium (along with the whole panoply of modern drugs), which has the added benefit of accelerating the deathward journey even as it dulls the pain.

If you remain intent on contending with your mortality, the best solution I can think of is simply to wait—if not for death itself, then for more life experience. I find it telling, and not particularly surprising, that most WeCroak users report being in their twenties and thirties, the decades of modern adulthood when death still seems abstract and far off. I am willing to bet, in fact, that you are in that age category yourself. Soon enough—sooner than you think—your body will start to break down. More and more of your peers will die. The milestones of middle age will prompt you to tally a dark arithmetic, weighing the years spent against the years that remain as you begin to comprehend, perhaps for the first time, the inflexible nature of time. This knowledge cannot be obtained through the consumption of facts and statistics; it resists the crisp utility of digital reminders. It is an existential awareness that comes only through the immediacy of lived experience. The poet Jane Hirshfield—whose words are included in the library of WeCroak quotes—writes in her poem “The Present” of how it feels to finally reckon with the fragility of life, an experience that is every bit as illuminating as it is unnerving. “How fine is the mesh of death,” she writes. “You can almost see through it.” Almost.

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[Virginia Heffernan](#)

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Jan 5, 2022 8:00 AM

In Praise of Unglamorous American Invention

Forget Blue Origin, Silicon Valley, and unicorns—small but mighty innovations are the true breakthroughs of human ingenuity.

Illustration: JOSIE NORTON

If mousetrap tech is still the paradigm of Yankee ingenuity, it's surprising how sluggish murine-assassination R&D is. The avant-garde “no touch, no see” black-box traps that electrocute mice may seem impressive, but in my experience they only work once—and they're nearly \$20 apiece. The trap that still tops best-of lists is roughly the same as the one patented by James Henry Atkinson in 1899: a cheap quick-release spring that's triggered by a naive rodent, and instantly snaps its neck.

But three other household tools have improved, and vastly, since Victorian times: humidifiers, glue, and eyelash enhancers. All this ebullient disruption has taken place in the vapor, adhesive, and eyelash “spaces” without incubators, accelerators, fortresses of secrecy in Palo Alto, investor decks, NDAs, or glossy magazine stories about the genius of a bright-eyed, extravagantly capitalized but ultimately [fraudulent unicorn](#). Improvements in ordinary things may be no [Blue Origin](#), but that's because they're better: more useful, less hubristic, and far, far cheaper. Just how Americans should want our secular miracles.

As I drifted off to sleep the other night in a romantic mist supplied by my bedside humidifier, I was hit by a bolt of wonder. How in the world does my \$40 machine make vapor of water so fast? To become gas, water needs

to be agitated, typically with heat, but there was nothing heating or hot about this device. How can water get so instantly riled up that it transmogrifies without any visible means of riling?

The American Association for Respiratory Care's Virtual Museum of Humidifiers, home to historians of human-made humidity, has answers.

In the 1930s, there was a French enamel steam inhaler called the Inhalateur Nicolay, which was essentially a [big teacup](#) with a muzzle-sized straw. Its logo shows a bearded figure demonstrating how to use the new device, into which you pour hot water; he looks like Lenin with a hookah. In the 1940s, Du Pont's Humidicrib—which used electricity to heat the water—promised no less than life: “to greatly increase the premature infant's chance of survival.” The December 1959 issue of *Inhalation Therapy*—the bible of the field—showed an ad for a cold-vapor machine, animated by the “high velocity impingement atomization of liquid particles.”

But those are all antiquities. The breakthrough of the contemporary humidifier is ultrasonic technology.

That's right: The trick to mind-blowing modern humidified air is sound. Ultrasonic humidifiers like mine contain transducers that pulse at a frequency well out of reach of human hearing, and those transducers are connected to a part, usually metal, that's submerged in a waterbed and converts the signals into movement. As the part vibrates faster, water can't keep up, and droplets detach from it, creating small vacuums. Air bubbles then form in what is known as cavitation bubble implosion, which I imagine as the popping of a constrained balloon, which further disturbs the water, breaking up otherwise orderly ripples caused by the sound vibrations. Water droplets lose their integrity and dissipate, escaping the machine in a fine mist. All of this happens at about the speed of sound—no scalding-hot water, and far less energy than is required to boil water all night. I clean mine every day and use distilled water because ultrasonic machines tend to aerosolize everything, including bacteria and minerals. This little bedside beaut costs far less than a year of melatonin, and it would let me sleep perfectly if I didn't keep waking up to contemplate its ultrasonic wonders.

Glue is not generally top-of-mind for me, which is why when my partner, Richard, presented me with a beautiful cutting board he'd made—hard Eastern maple, shot through with swerving purple veins of African padauk—I thought trees must just grow in extremely intricate ways I'd never noticed. Only when I heard him and his fellow woodworkers talk about “glue-ups” did I realize that a fierce adhesive was involved in blending woods, and the wonders of this substance are sorely diminished when we call it by the name best used for Elmer's.

Wood glue has—again with little fanfare—turned extraterrestrial. There are names attached to radicalism in adhesives: Mildred Bonney and Langdon T. Williams, the couple that founded the adhesive company Franklin International in 1935 in Columbus, Ohio, which released its flagship product, Titebond, in 1955. Titebond is a polyvinyl acetate (PVA) glue. It swells the fibers of wood pieces, so they intertwine; as the glue dries, the fibers shrink to their normal size, but they're now so entangled that the bond is virtually unbreakable.

While some luthiers still use animal glue when they build stringed instruments—yes, the kind rendered from animal hides—most woodworkers have switched to PVA, and especially Titebond, and especially (for projects that need it) Titebond III, which inspires arias of awe all over the woodworking internet, as it bills itself as fully waterproof, though admittedly some pundits have doubts. It also has a vast “open time,” meaning it stays gluey and doesn't dry even if you dither over how to arrange your wood for a full 10 minutes. Titebond II gives you a mere five.

But the real breakthrough with all the Titebonds is, of course, the bond. How much cleavage, compression, flexure, impact, tension, or shear is required to break the plane of a Titebond bond? This is measured in pounds per square inch, and Titebond III takes up to 4,000 lbs to break. Two freaking tons. Hardwood will break before this glue.

From glue to eyelashes. And though old-fashioned false eyelashes do require glue, it's far weaker than Titebond—and that's enough thinking about hard-sealed eyelids. What's new in eyelashes is a synthetic prostaglandin analog called bimatoprost. (A synthetic prostaglandin analog is also the active ingredient in misoprostol, one of the pills approved for

self-managed abortions.) Where chemical engineers can spell out how ultrasonic machines and PVA glue work, bimatoprost is a happy accident, and something of a mystery. Essentially, ophthalmologic researchers were working to reduce pressure in the eyes of glaucoma patients, and they discovered that bimatoprost relaxes the ciliary—the anxious muscle in the eye that chronically contracts when we read on our smartphones—which caused the outflow of aqueous fluid inside the eye. They were surprised to find that this movement of plasma-like fluid also served as Miracle-Gro for eyelashes.

As the invention of technology that can grow human hair seems to be the highest aspiration of humankind, this was a thrill. “Hypotrichosis,” or what the National Institutes of Health calls “an inadequate amount of eyelashes,” is the disorder bimatoprost treats, which can be seen in people with alopecia, but of course the compound has more vain applications. Excitingly, bimatoprost could even trigger hypertrichosis—excessive eyelash growth, the generation of a lush, abundant fringe over the eye that obviates the need for the thickening paint of mascara. “These hairs,” purrs the NIH study, “had a more robust appearance, were longer, thicker, and more heavily pigmented, and arose at a more acute angle from the skin than in the control eye.” The only catch? Hypertrichosis caused by bimatoprost sometimes comes with “irregular pattern of lash curling.” OH HELL NO.

Eyelashes, as everybody knows, are supposed to twirl up to the heavens in unison, like Minnie Mouse's. And here we have a case where “the vellus and intermediate hairs had transformed into terminal hairs, and produced the appearance of new rows of terminal eyelashes in the lid margin”! (Humans are those primates who give earnest, scientific names to discrete precincts of 10-mm hairs on tiny flaps of skin on our faces.) Fortunately, this irregular pattern is a rare effect, and nothing that can't be remedied with what William Joseph Beldue patented in 1945: the eyelash curler. Diligently paint on that prostaglandin analog, in the form of a product like Latisse, and then clamp on Beldue's contraption. You'll get the full Minnie effect. We're still looking for better ways of catching mice (Titebond glue traps would still be glue traps, which are horrific), but for now a better way of catching mouse eyelashes will have to do. The arc of eyelash history is long, but it bends toward a pleasing curl.

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[Andy Greenberg](#)

[Culture](#)

Dec 1, 2021 6:00 AM

The Matrix Is the Best Hacker Movie

Most people point to *Sneakers*, *Hackers*, or *WarGames*. They're all wrong. The Wachowskis actually invented the ultimate cyber superhero.

ILLUSTRATION: OLEG BUYEVSKY

In the spring of 1999, a 20-year-old hacker named [Eva Galperin](#) and her boyfriend walked into a screening of [The Matrix](#) at a theater in San Francisco, and walked out with a sense that they had just seen themselves—or, at least, who they could be. Galperin, at the time a Unix-focused systems administrator with black and blue dreadlocks, promptly bought herself a long, black, flared coat. Her boyfriend purchased a pair of Oakleys.

But it wasn't just the movie's fashion sense that spoke to them. Galperin felt it represented the experience of hacking in a way she'd never seen before. Neo seemed chosen to undertake his superheroic journey because he understood that “by interfacing with this black screen with glowing green writing on it, he could change the world in ways that it was not necessarily meant to be changed,” says Galperin, who works today as the director of cybersecurity at the Electronic Frontier Foundation. “I definitely came out with the feeling: Our people made a film.”

For years the generally accepted canon of classic hacker movies has been a kind of holy trinity: 1983's [WarGames](#), with its digital delinquent caught up in Cold War geopolitics; the 1992 computers-and-cryptography heist film [Sneakers](#); and 1995's teen cyber-hijinks thriller [Hackers](#). With a couple of decades of hindsight, however, it's well past time to recognize that *The*

Matrix has in some ways eclipsed that triumvirate. As other hacker films ossify, turning into computer cat-and-mouse-game time capsules, *The Matrix* has become the most abiding, popular, and relevant portrayal of hacking—a brain-plug jacked so deeply into our cultural conception of the genre that we've almost forgotten it's there.

Fans of those other films will point out that *The Matrix*'s goth-garbed flying kung fu fighters don't hack much in the literal sense. Yes, Neo starts the film selling digital intrusion tools stored on MiniDiscs, and in the sequel Trinity realistically uses the scanning program Nmap to breach an electric utility server. But those moments are only brief winks at the real world of cybersecurity.

The real hacking in *The Matrix* is metaphorical. The red-pill lesson Morpheus gives Neo is that a user in a digital system doesn't have to abide by its terms of service. For those who understand the underlying truth of a virtual environment—its technical reality, not the illusions described in the user manual—rules like gravity are not immutable laws but polite conventions. “Some of them can be bent,” Morpheus tells Neo. “Others can be broken.”

In most real-world hacking, that rule-breaking plays out within the uncinematic frame of a computer screen. *The Matrix* expands that computer to envelop reality itself; the virtuosic bending and breaking of digital rules naturally becomes a kind of physics-defying wushu.

“*The Matrix* shows the universe that software can create,” says Dino Dai Zovi, a well-known hacker and security researcher who cofounded the security firms Trail of Bits and Capsule8. “And the more that software controls everything in our lives, the more awe-inspiring it becomes to have power over that software.”

This concept of hacking transcends the technology of any particular era, which explains why hackers, years later, still resort to the movie's analogies to explain their work. When University of Michigan researchers exploited a chip's electric leakage to hide a backdoor in it in 2016, they described it as “outside the Matrix.” When security researcher Joanna Rutkowska showed

she could trap a victim computer inside an invisible layer of software under her control, she dubbed it a “blue pill” attack.

“I can use *The Matrix* to explain, well, that's the woman in the red dress that everybody sees, but a hacker can see the code that renders that woman and change the color of her dress,” says Katie Moussouris, a renowned security researcher and CEO of Luta Security. “And even though you, the programmer, didn't mean to allow that, it's possible because I can inspect what's really going on under the surface.”

Most of all, *The Matrix* captures the *feeling* of hacking, says Dai Zovi, who first saw the film when he was a 19-year-old college student. A year later, he was working as a systems administrator for an ultra-early social media company called SuperFamilies.com, which had a few extra Sun Microsystems workstations lying around. One Friday he asked if he could take one home to mess with it—and found a memory corruption vulnerability in its software that he spent an entire spring break learning to exploit.

When he had finally succeeded, Dai Zovi experienced for the first time what it felt like to fully take over a piece of code with a technique he'd invented, making it do whatever he wished. He compares it to when Neo leaps into Agent Smith's body, explodes him, and then stands silently in his place while the world subtly bends around him. “He does this flex, and the screen sort of bubbles, like he warps spacetime,” Dai Zovi says. “When you write your first exploit—or your hundredth or thousandth—you feel that flex. You want to run it a million times once you perfect it, to get that feeling of power and capability.”

Hackers don't quite wield superpowers in our reality just yet. But as networked computers permeate even more physical objects—our cars, home devices, and even critical infrastructure like electric grids, water supply systems, and manufacturing—modern life is becoming more Matrix-like all the time. The ability to control those computer systems becomes a skill that can alter the real world.

Unplugging from that pervasive computing is, for most of us, already no longer an option. Better, perhaps, to don your flared coat, dive into the

digital world, and start bending some spoons.

More from WIRED's special series on [the impact of the *Matrix* franchise—and the future of reality](#)

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[Amy Webb](#)

[Science](#)

Dec 1, 2021 6:00 AM

Welcome to the (Synthetic) Meatspace

Reactor-grown nuggets, human-edited genetic code, and new mRNA technologies could change our relationship to life itself.

ILLUSTRATION: CHRISTIAN GRALINGEN

Midway through *The Matrix*, Cypher glides a knife through an enormous steak, gazes at the hunk of meat dangling off his fork, and acknowledges that his reality is not, well, real. That steak is a construct, part of a digital program telling his brain that it is “juicy and delicious.” Angry and disillusioned with the harsh, scorched real world, Cypher asks for safe passage back to a virtual one, where he'll once again be fed a steady stream of preprogrammed electrical signals to be interpreted by his mind as a luxurious experience.

That scene stayed with me, back in 1999, after the credits rolled and I exited a Tokyo movie theater not too far from Akihabara, a dense hub for vendors selling electronics, video games, and experimental displays, all of which presaged a [Matrix](#)-like future. We'd escape into a digitized reality, using headsets or wires, to frolic in virtual landscapes.

Two decades later, something unexpected looms: The future of reality will be virtual, yes, [but also synthetic](#). Starting with components from the natural world—DNA, more basic molecules, cells—scientists are already altering biology, performing a kind of alchemy that allows these materials to serve a new or better purpose. Cypher's future meal will not be a digital construct but a physical one, synthesized from animal cells.

And scientists are synthesizing more than just dinner. The opportunities for breakthroughs in medicine, human performance, and materials science are enormous. But biology has a tendency to evolve in unexpected ways. Our new designs for life have the potential to morph into unrecognizable mutations of what we see today, leading to a cascade of unintended consequences.

The forces driving the synthesized meat movement are practical. Modern agricultural systems are helping destabilize Earth's climate and ecosystems, while extreme weather events add immense uncertainty to farming and ranching. Scientists at Oxford and the University of Amsterdam have estimated that cultured meat would require 7 to 45 percent less energy, occupy 99 percent less land, and produce 78 to 96 percent less greenhouse gas than conventional animals farmed for consumption.

A synthetic-biology-centered food supply mitigates greenhouse emissions in other ways too. For one thing, it promises to shrink the distance between various operators in the supply chain. Once eaten only in Japan, sushi now requires a CO₂-intensive operation of commercial fishing grounds, fishermen, freezers, temperature-controlled airplanes, and refrigerated trucks to bring raw fish to the masses. Synthetic tuna would remove most of those steps while coming close to the real thing; Finless Foods, based in California, is already developing cultured bluefin tuna meat. In the next decade, large bioreactors might be situated just outside major cities, producing cultured meat to be used by schools, hospitals, and perhaps even restaurants and grocery stores. Sea life currently threatened by overfishing could once again flourish in our oceans.

But once we're able to synthesize meat, we'll face a novel regulatory challenge. Theoretically, we'll have the capability to culture meat from any animal, which means that some people will choose to culture and consume animals we'd never consider eating today because of their high level of intelligence, like dolphins, chimpanzees, and elephants. Someone, somewhere, might just attempt to make cocker spaniel kebabs, which, technically, will fall outside the jurisdiction of current regulatory agencies. A ban on certain synthetic meats might go into effect, but a black market

and an underground speakeasy scene for thrill-seeking diners would potentially emerge.

Your favorite wine, beer, and spirit is about to be synthesized too. If, like me, you're a bourbon drinker, you know how important the aging process is—seasonal temperatures constrict and expand the wood of the barrel, producing rich flavors over several years. If something goes wrong during that long process, it can be financially catastrophic for the distiller (not to mention heartbreaking for the drinker). But a synthetic booze, designed using artificial intelligence to identify patterns in a massive data dump of possible style and flavor combinations, would reduce the uncertainty of waiting. A synthesized whiskey could be made out of its molecular components to have the characteristics of a product from a Kentucky distillery, but be bottled in a lab in San Francisco. Bay Area companies like Bespoken and Endless West are producing engineered spirits now.

Synthetic flavors are going to call into question what we think of as authentic and good, and what roles humans must play in cultivating what we eat and drink. We assume that consumers will pay for craftsmanship, and that may still be true in the future, with a twist: What if they value chief bioscientists and their work more than master brewers?

If we can see beyond the haze of our synthetic Old Fashioneds, the current moment—in which we are learning to manipulate molecules, engineer microorganisms, and build biocomputing systems—is the start of a new era in the evolution of civilization: the Biological Age. What we build during this new age will unlock new business opportunities, mitigate or even reverse environmental damage, and improve the human condition in countless other ways. In May 2010, scientist J. Craig Venter and his team announced an astonishing discovery: They could destroy the DNA of an organism called *Mycoplasma capricolum* and replace it with DNA they had written on a computer that was based on another similar bacterium, *Mycoplasma mycoides*. Using special software, DNA sequences are loaded into a sort of text editor for DNA code. After the DNA is written or edited to a researcher's satisfaction, a new DNA molecule is generated from scratch using something akin to a 3D printer. What I'm describing isn't

cloning life but, rather, redesigning it using synthetic biology, a new field of science that reengineers organisms to have new capabilities.

Venter's team named their 907-gene creature JCVI-syn1.0, or Synthia, for short. It was the first self-replicating species on the planet whose parents were, technically, computers, and the project was designed to help the team understand the basic principles of life, from the minimal cell up. In 2016, Venter's team created JCVI-syn3.0, a single-celled organism with even fewer genes—just 473—which made it the simplest life-form ever known. The organism acted in ways scientists hadn't predicted. It produced oddly shaped cells as it self-replicated. Scientists came to believe that they'd taken away too many genes, including those responsible for normal cell division. They remixed the code once again, and in March 2021 announced a new variant, JCVI-syn3A. It still has fewer than 500 genes, but it behaves more like a normal cell.

These variants are now considered by some to be a new branch on the tree of life—one where humans redesign and shape novel species. This level of control unlocks huge new opportunities. We've already had a glimpse of one, in the form of [messenger RNA](#), found in the Pfizer-BioNTech and [Moderna Covid-19 vaccines](#). Lab-manufactured mRNA delivers a set of instructions to cells that help them thwart the virus's attack. This approach—using synthetic RNA—is far more effective and adaptable than long-standing vaccine protocols. In effect, Moderna and BioNTech are crafting genetic instructions that can be written like software and packaged into the equivalents of nanoscopic USB drives. Once these biological drives are inserted into cells, those cells dutifully download mRNA instructions, translating a string of letters into a protein. The mRNA is then (metaphorically) ejected, and the cells produce certain components of the coronavirus in order to kick-start the immune system. Such vaccines would potentially be safer and easier to control, because unlike gene therapies, which can lead to permanent or even inherited genetic changes, mRNA only exists in our cells ephemerally, like a disappearing Instagram story. These vaccines for Covid-19 are just the first of many wonders that tomorrow's bioeconomy will create.

Using mRNA, scientists could instruct the body to build up its immunological defenses to find and kill cancers. Long before they were making Covid-19 vaccines, both Moderna and BioNTech were researching just that. After analyzing a tissue sample from a cancerous tumor, the companies run genetic analyses to develop custom mRNA vaccines, which encode protein-containing mutations unique to the patient's tumor. The immune system uses those instructions to search and destroy similar cells all throughout the body. BioNTech is currently in clinical trials for personalized vaccines for many cancers, including ovarian cancer, breast cancer, and melanoma. Moderna is developing similar cancer vaccines. Both companies understand that the most powerful drug factory on Earth may already be inside you. We just need to figure out how to harness it.

Biology is the most important technology of this century. However, unlike digital or inorganic physical technology, which tends to degrade or to seize up if not maintained, biology often self-sustains, even when we don't want it to. Here's where those unintended consequences come into view. Creating a minimal viable genome, or any other novel organism, could lead to a cascade effect and be impossible to manage in the wild, though the possibility of JCVI-syn3.0 escaping and causing harm is low. But what happens when engineered genes mix with wild populations and native species? So-called outcrossing could lead to new types of weeds, or a new pathogenic microorganism that could spread disease to other animals. A lab accident could result in today's harmless laboratory bacterium becoming tomorrow's ecological catastrophe.

The technologies used to edit and rewrite life are already in use, in some unexpected ways. In 2017 researchers at the University of Tokyo and Stanford University reported that they had injected a rat embryo, which had been edited to grow without a pancreas, with special mouse stem cells. As the rat matured, it formed a pancreas made entirely of mouse cells. The team then transplanted cells from that pancreas back into a mouse that had been given a drug to cause diabetes and cured it of the disease. In a more worrisome milestone in biology, in 2021 scientists at institutes in China, Spain, and the US announced they had grown macaque monkey embryos that were injected with human stem cells. They grew in the lab for as long as 20 days before dying.

There is a term for these synthetic, hybrid life forms: *chimeras*, which in Greek mythology were part lion, part goat, and part serpent monsters. And a monkey-human hybrid is an ethical minefield. At some point, such chimeras will inherit qualities that are somewhere between humans, on which experimentation isn't allowed, and animals, which are often bred specifically for research. We don't have a system in place to define “human” characteristics in a world of animal-human chimeras. How will we decide when an animal becomes *too* human? What if chimeras escape and outcross in the wild?

Depending on where you stand, our coming synthetic realities land somewhere between “really exciting” and “gravely concerning.” The *Matrix* movies urged us to wake up and resist authoritarian rule. In our quest to break free of constraints, to rewrite life as we see fit, we may find ourselves grappling with an inverse problem: a total lack of control. Within the next decades, we will need to make decisions, like how to rethink our global supply of food and whether a commercial entity should be given the keys to evolution. If we're not careful, we might cleave society in harmful new ways. What if the digital divide that so worries people today is followed by a synthetic divide, in which only the wealthy enjoy the benefits of enhanced medicine and improved bodies? With powerful biotechnology systems in place, to whom will we grant the authority to program life, or to create new life-forms? As individuals, we have free will and a responsibility to make good choices about the coming bioeconomy, which we will need to survive on this planet and beyond. The code for our futures is being written today. It is where humanity's new origin story begins.

More from WIRED's special series on [the impact of the *Matrix* franchise—and the future of reality](#).

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Dec 1, 2021 6:00 AM

WIRED Peers Into the Future of Reality

Two decades after *The Matrix*, technologies have emerged that make us question what is real—in ways stranger, if less sinister, than the movie imagined.

The first Matrix movie introduced a generation of sci-fi fans to an ancient philosopher's saw: What if your entire reality were a deceit? Two decades on, the film's plot—free-thinking renegades attempt to expose the lies behind an oppressive system—is [as timely as ever](#), but its conceptual premise feels almost quaint. The technologies that have emerged since then do indeed raise the question of what is real, but now they do it in ways that are stranger than even the movie predicted, if rarely quite as sinister.

Your day-to-day reality is an increasingly synthetic experience: Computerized voices inhabit your [smart speakers](#), [deepfakes](#) bring dead movie actors back to life, and AI-generated artworks go for eye-watering prices at auction. The simulacrum is extending into food too: Supermarket shelves already contain countless vegan substitutes for meat and other animal products, and before long “real” meat, grown in a lab, [will join them](#). You can inhabit virtual realities and augment your physical one with virtual characters ([Pokémon Go](#)), street signs (Google Live View), or furniture (Ikea Studio). All your social media profiles may be real, but does any of them reflect “the real you”? The same question goes for the profiles you can't even see—those stitched out of data held by credit card companies, shopping sites, or search engines. Each one is a virtual version of you that influences your physical life and, if there are errors in the data,

makes you out to be someone you're not. And now, everyone is suddenly talking about building this thing called “[the metaverse](#).”

In short, things are already weird, and they're going to get a whole lot weirder really fast. So we decided to use the release of *The Matrix Resurrections* as a springboard for a special issue of WIRED exploring the future of reality—one in which the question is not “What if we're all living in a simulation and don't know it?” but “What happens when we're living in a simulation and in reality simultaneously, and we know it, but we have trouble telling them apart?” In which case, it doesn't matter whether you take the red pill or the blue one: We're all going down the rabbit hole either way. —*THE EDITORS*

More from WIRED's special series on the impact of the *Matrix* franchise—and the future of reality

[Yahya Abdul-Mateen II](#) Is Ready to Blow Your Mind
At the End of the World, It's [Hyperobjects](#) All the Way Down
Can a [Digital Reality](#) Be Jacked Directly Into Your Brain?
The 10,000 Faces That Launched [an NFT Revolution](#)
[The Metaverse](#) Is Simply Big Tech, but Bigger
The Matrix Is the [Best Hacker Movie](#)
It's Time to Reimagine the [Future of Cyberpunk](#)
'[AR Is Where the Real Metaverse](#) Is Going to Happen'
The Most Efficient Way to [Debug the Simulation](#)
What *The Matrix* Got Wrong About [Cities of the Future](#)
Welcome to the [\(Synthetic\) Meatspace](#)

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[Paul Ford](#)

[Ideas](#)

Dec 1, 2021 6:00 AM

The Most Efficient Way to Debug the Simulation

Look, some of these tickets just have to be marked WONTFIX so everyone can move on.

Illustration: Elena Lacey

This article is from WIRED's special series on [the impact of the Matrix franchise—and the future of reality](#).

== NEW MEETING TRANSCRIPT AVAILABLE ==

===== “SIMULATION NEXT STEPS” =====

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===== SINGULARITY STANDARD TIME =====

Hello, everybody.

It's great to see you all in one place for the first time. I've been doing my best to learn your names, but I'm terrible with hexadecimal, so bear with me. Before we start, a quick housekeeping note: I know you're used to holding these stand-up meetings once per Earth extinction event, but I think we need a more agile cadence. Let's try Tuesday mornings. Look out for the calendar invite.

I'd like to begin by thanking each of you for the warm welcome you've given me since I took over as product manager. Like I told the Stakeholder this morning, I can't imagine a team I'd want to lead more. While I know your last PM had their own way of working, and many of you enjoyed the flexibility and latitude they gave you, I do want to remind you that they have been erased. So this is truly a fresh start for all of us.

Whenever I come on board as a PM, one of the first things I like to do is clean up the ticketing system. Too many open tickets can make it hard to see priorities and set shared goals. We currently have 2.37 trillion of them outstanding. At this stage I just want to call out a few showstoppers and explain my thinking. We'll be working through the rest in subsequent stand-ups.

ERTH-0019, “World peace.” Look at the length of this thread! Obviously everyone wants this, because it seems like every engineer and designer had an idea or five to contribute—but no one wrote any code or broke it down into milestones. You'll hear me say this a quadrillion times, so start counting: **Visions are not goals**. If I can't see a straightforward way to make incremental progress and measure success with consistent, reliable metrics, I will remove a ticket. So seriously: Marking WONTFIX. Also in this category: HUMN-9991, “End war.”

CHEM-1083, “Delete most silicates.” Great ticket, but why didn't anyone step up to implement it before it was too late? We knew from prior simulations what would happen if they discovered semiconductors: They'd develop transistors and computers, figure out Moore's law, and pretty soon Elon Musk would be on Twitter. Imagine the number of wasted development cycles we could have avoided if we'd just replaced all the quartz and silicon with, I don't know, calcite. It's too late to do anything now; if we remove the silicates, they're going to realize they're in a simulation, and we'll have broken the Stakeholder's rule.

RLGN-3944, “Make prayers work.” I know the original spec called for this, but ultimately it didn't land in early releases, and implementing it now would be a huge lift. We've spent all this time building out a big globalized economy, and suddenly we're going to let anyone who closes their eyes and makes a wish be a billionaire? Plus there are a ton of edge cases that I don't

see captured: Sure, someone could pray for Grandma to live, but for how long? What if not everyone wants to see her thriving? Marking WONTFIX and archiving.

MNEY-3848, “Replace simulated real currency with simulated digital currency.” This is one of those tickets where engineers make up the solution to a problem that exists only in their heads. There was one galaxy I managed where the interplanetary currency was denominated in shrieks of pain (wedding gifts were a particular challenge), but even that made more sense than the blockchain. That said, we're in it now and we need to see this one through. Leaving the ticket open and looking for ideas.

ERTH-4873, “Fix Versailles.” Great example of a badly worded ticket. It was filed in 1927, so the original intent was clearly to lower the financial burdens on Germany after the First World War and avoid a second. Instead, an engineer and a designer spent 20 years shaping the topiary at the gardens of Versailles, which is an edge case at best, and by the time anyone noticed, we were down, what, 70 million users? This is not what the Stakeholder is paying for. Archiving.

PNGA-8901, “Add more ice to the Arctic.” Another good ticket, and I can't figure out why it was ignored. If we'd done this we'd have much less mess on our hands.

MAML-0784, “Squirrels but with spider legs.” This is one I just hate. There's no use case, no market demand, yet for some reason at least three of you believe this sim needs eight-legged squirrels. Also, why is it sized at two months of work? It's an afternoon in the modeler for any designer. So I can't decide whether I'm more annoyed that it was proposed or that it didn't happen. There are millions of tickets like this. Not even marking them WONTFIX, just deleting.

I'm also closing out “Elect a dinosaur president” (Was this serious?); “World peas” (duplicate of ERTH-0019); “Have just one gender and race” (I've tried this and it was far, far worse than you might expect); “Make a new religion based on science” (Fun idea, but you have no idea how insufferable it gets); “Introduce generalized artificial intelligence” (When

we let them do that they figure out it's a simulation! Remember what the Stakeholder pays us for!).

In general, I feel that this group has lost track of the Stakeholder's mandate, which is to build the most ridiculous, grimly comical universe possible within physical law. I did hear in my first meeting that they liked the US health care system, Enlightenment-era sea piracy, and cats. They hated the US Civil War (too serious), squirrels (I guess that's why someone suggested spider squirrels?), and Facebook (unusable). Overall, it seems like this has been a disappointing experiment, which is probably why it's been so hard to get resources to expand it beyond just this one planet. I know you all feel that. Stick with me, though. At my last universe, I managed to spin out over 30 galaxies. Or you can be harvested and turned into metaversal cognicurrency. Your call.

I may ask for some nights-and-weekends work up front, but know that I want us all to get onto a normal schedule. It's clear that we need to be communicating much more frequently. I'll be organizing some epics, and I don't mean HIST-0003, "Send the Bull of Heaven to attack Gilgamesh." (Seriously, let's not go there again.)

Also I know you all put a lot of work into it, but we should probably go ahead and sunset the moon.

See you Tuesday. I'll bring coffee.

More from WIRED's special series on [the impact of the *Matrix* franchise—and the future of reality](#).

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[Nicholas De Monchaux](#)

[Ideas](#)

Dec 1, 2021 6:00 AM

What *The Matrix* Got Wrong About Cities of the Future

Where the movie foresaw a distinction between digital and physical reality, modern cities are merging them, and not necessarily in a good way.

ILLUSTRATION: PAULINA ALMIRA

Like neo's pink, hairless body in [The Matrix](#)'s great reveal, cities have been invaded by tubes for nearly their entire lives. Over the centuries, water pipes, gas pipes, steam pipes, electricity cables, and air ducts have crept across buildings and landscapes, coursing through walls, floors, and sidewalks on their way to making the modern world.

By a long margin, the water came first. Earthen conduits moved stormwater in Xi'an, China, millennia ago; lead tubes led drinking water under the stone-paved streets of classical Rome. In response to the waterborne pandemics of the 19th century, the modern European and North American city became defined by sewers and drains so extensive as to be beyond imagining. Today, when water tumbles out of the tap into your sink, it is but a cameo turn in an epic journey from faraway reservoir through final sewage treatment, across dozens—even hundreds—of miles, and months or years of time.

Like the blood vessels of our own bodies, the pipes and wires of modern buildings and cities structure our lives while remaining almost entirely hidden. Yet they inexorably define the spaces we inhabit. These conduits bring us the ubiquity of suspended ceiling grids—designed to screen the mess behind. They also brought us the grand expanse of the Champs-

Élysées—engineered to cover the enormous masonry sewers that ushered in Paris' ultimate triumph over cholera.

Today's urban infrastructure is the latest step in this long history, but unlike the tubes and wires of the past, it doesn't merely shape the city. Rather, it presents challenges more akin to the larger conflicts of *The Matrix* itself—between the city's real body and a newly present, virtual reflection of it.

This new infrastructure is one of information. While cities have always been defined by the flow of ideas, for most of human history these were stored in our heads, or in objects we carried—scrolls, tablets, books, and paper. In the Industrial Age, however, huge swells of productivity and connectivity were unleashed by the machinery of connected data—from pneumatic tubes for paper telegrams to the mid-century telex, the wired telephone infrastructure, and the wireless networks now displacing it.

This architecture of media and information has transformed public and domestic space—whether in the form of the phone booth, the Wall Street trading floor, or the TV-centric layout of our living rooms—just as surely as the fountain and the sink did in their days. An x-ray of a skyscraper would reveal an agglomeration of hundreds of miles of cable and conduit wrapping around the structure, enabling human beings to live in densities greater than at any point in human history and connecting their bodies and minds to a vast, shared system of resources and communication.

Yet one constant throughout these centuries of development, extending into the Information Age, has been the premise that infrastructure is a shared, public good. In the long history of Rome, the link between flowing water and good governance has always meant that, even in a modern drought, the city's mayors turn off the *nasoni*—Rome's ubiquitous public drinking fountains—at their peril. In the 1970s, contracts were handed to US cable television providers only in return for the promise of public programming—from school board hearings to city council meetings. This balance of real and virtual, public and private, remained fairly constant for most of the 20th century.

What's more, the public good of shared infrastructure includes something more intangible and encompassing than the simple provision of stuff. By

providing the same thing, in the same way, everywhere, traditional infrastructure opens up a space of innovation—whether for business owners or appliance designers or even sidewalk vendors—in which further experimentation and invention is possible. Whether street grid or electricity grid, this foundation of public infrastructure is what enables much of our global culture's inventiveness, resilience, and meaning. It makes neighborhoods and collaborations possible.

It is not just the pervasiveness of infrastructure but its relative neutrality that is at the core of such possibilities. When you can walk everywhere, you might end up wandering anywhere. You see the whole city on your way, but you are, to all who don't yet know you, whoever you wish to be. And architecturally, the space you find, empty but with utilities, is not a liability so much as a cultural and social possibility. Just as much as running water, the city's infrastructure supports the serendipity, anonymity, and reinvention at the core of all of our best possibilities—and the city's generative role in our economy and society.

This is also where the transition to a third age of information-led city infrastructure represents a break with the past—and where *The Matrix*, for all its prescience, likely misread the future.

In 1999, the virtual world of computing was still something we thought of as quite separate from our real bodies and cities. As in *The Matrix*'s own influences—William Gibson's cyberspace, [Neal Stephenson](#)'s Metaverse—a digital, networked reality was another domain, unconstrained by limitations like space and gravity and untethered from our real-world selves. *The Matrix*, accordingly, is premised on a clear division: between reality, where the rebels' ship coasts through underground caverns in a postapocalyptic wasteland, and the virtual realm of city streets and office buildings in which most people live out their simulated lives. In today's landscape of urban data, by contrast, the effect of technology working its way into every body, object, and environment has been to create a parallel world that is bound indelibly to the real one—but, like the Matrix, still operates by very different rules.

This new world is inhabited by our digital shadows. They follow our steps in the real one and are born from the data trail we leave when we post on

social media, search on Google Maps, order things from [Amazon](#), or leave reviews on restaurant sites. Some companies now favor the phrase “digital twin” to describe this doppelgänger—not even our ghost, but our constantly reshaped reflection.

Yet the virtual city is a mirror that distorts as much as it reflects; our virtual shared space remains radically different from our physical one. Offline, our infrastructure is largely public, our movement is still mostly free and without surveillance, and laws govern our interactions. Online, we exist in an entirely privatized world with weak governance, few civil liberties, and an entirely commercial *raison d'être*. To simply gain access to today's digital environments, we have allowed a degree of control and intrusion—the tracking and storing of every fragment of our online lives—that we would never accept in what we still refer to as “reality.”

Much of the blame for this predicament lies precisely with the nostalgic 1990s idea, implicit in *The Matrix*, that our real and virtual selves are separate. But, as should be obvious by now, they are not. Indeed, our compromises in the digital realm are what allow [Google](#) and [Facebook](#) to transform our data into supra-governmental economic might in the physical one. While such companies are not powered by anything quite so literal as the hibernating human batteries of the movie's dystopian towers, they do subsist on our humanity—the extracted value of our relationships, ideas, and experiences.

This power is now evident in the shaping of our cities as well. The effects are sometimes subtle, like expanded building lobbies for package delivery or the closed storefronts of local merchants put out of business by online retailers. Sometimes they are more dramatic. When Egyptian activists used Facebook to coordinate protests in Tahrir Square a decade ago, we marveled at the virtual world's ability to reshape civic space. When social media algorithms, optimizing for sustained attention and outrage instead of truth or transparency, helped drive people toward the [US Capitol riot](#) of January 6, 2021, the events left their scars in the form of fences around the Capitol.

Compared with such upheavals, the changes to our behavior and environment wrought by something like Google's Live View, which overlays walking directions on the view through your smartphone camera,

may seem mild, or even useful. When Google points us toward the perfect coffee shop or Amazon suggests those just-right mugs or Facebook shows us things that consistently pique our interest (and outrage), it appears to us as coincidence. But what we are actually experiencing is the opposite—the optimization of our attention through surveillance. It exists in contrast to the serendipity we experience as we wander a city, in which boredom, chance, and the ability to inhabit different, unexpected versions of ourselves and our experience are all instrumental. And it is the polar opposite of the anonymity, and opportunity for reinvention, that the city best affords.

Consider, once more, *The Matrix*. Twenty years on, one of the most essential but anachronistic elements of the plot structure is the idea that Morpheus' crew can relatively easily evade surveillance in the virtual world they occupy. The spaces most celebrated by the film—dingy, fabulous nightclubs, stylish down-at-heel neighborhoods—are those of transgression, invention, and remaking of the kind the movie as a whole celebrates. Today, the prevalence of surveillance in our digital lives and the growing use of AI-powered technologies like facial recognition scraped from social media profiles to track our real bodies make the prospect of such easy digital anonymity seem as dated, if charming, as the film's Nokia banana-phones.

In the later Matrix movies, the walls between the real and virtual world collapse, and the human-battered AI juggernaut comes to its own kind of reckoning. In the fabric of our cities and landscapes, we face a reckoning too. As the infrastructure of the virtual world becomes ever more twinned with our physical reality, will the decisions and compromises we've made in virtual space come to define our physical one? Or will we instead begin to bring some of the principles that have made civic space a public resource into the virtual world?

Today, some of the best prospects for doing so are afforded by activists, researchers, or journalists who use the tools of digital data collection to create graphics and visualizations that render visible that which we tend to overlook in today's urban environments—from the racial and social disparities between neighborhoods to the structures of informal transportation. Such work embraces the prospect that digital data can be a tool for more just, sustainable, and even beautiful cities.

With the third wave of urban infrastructure now upon us, we face a fundamental choice. On the one hand, we could continue to allow the optimization and exploitation of digital space by private companies to define our shared, civic reality. On the other, we could embrace the guiding principles that have best shaped cities across history—equal access, accountability, even anonymity—and demand them of the cities of tomorrow as well.

More from WIRED's special series on [the impact of the *Matrix* franchise—and the future of reality](#).

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[Madeline Ashby](#)

[Culture](#)

Dec 1, 2021 6:00 AM

It's Time to Reimagine the Future of Cyberpunk

In the 20th century, the genre imagined the body modifications and protective streetwear that could save us from our own future. Now it needs to envision humanity anew.

ILLUSTRATION: DEBORA CHEYENNE

Cyberpunk is like cyberspace: instantly recognizable, but so ubiquitous as to be intangible. An aesthetic movement and a commentary on capitalism, it can be a genre, a subjectivity, an adjective, a political approach, a time period. (Though the same could be said of the words *Renaissance* or *Victorian*.) It can tackle [artificial intelligence](#), embodied identity, digital immortality, or simply, in the case of Pat Cadigan's [Synners](#), whether a marriage can survive electronic pornography addiction. Like the best fiction, cyberpunk still slips on like a pair of fingerless gloves, even if—in the 21st century, partially situated in the future it imagined—it's hard to see where fiction ends and reality begins.

Despite all of this, cyberpunk often gets reduced to an aesthetic: black leather, mirror shades, implants—pieces of flare that look cool when lit by neon and computer screens. But to define cyberpunk by its look is to do it a disservice, especially since those sartorial choices are the whole point in the first place: armor against a world in collapse. In a future so hostile that no one is fit to survive, those who *do* have been fitted for something new—new brain, new heart, new nerves—perhaps in exchange for a lifetime of indentured servitude. Cyberpunk foretold a desperate world of unlicensed

physicians doing back-alley body modifications, and while so far all they do is perform illegal butt lifts, with [Crispr](#), who knows?

Perhaps the genre gets pigeonholed by its look because, going back to old testaments like [Neuromancer](#) or [Snow Crash](#), it seemed allergic to any talk of feelings. Ideas, sure; sentiment, no. Like the noir fiction with which it so frequently overlaps, cyberpunk is full of wounded characters whose pursuit of physical invulnerability keeps them emotionally unavailable to everyone but the audience. It's telling that people turned against the *Matrix* films when they had the audacity to be lushly, erotically romantic—when climaxes hinged on a hero knowing how to reach inside his partner and touch her just right. Viewers weren't ready for a Wife Guy who wanted to walk away from his messianic power; it was like watching an entire trilogy of *The Last Temptation of Christ*'s final 15 minutes, right down to the long hair and linen.

Still, 40-ish years since its incept date, cyberpunk maintains a vast claim on the aesthetic landscape—one often ironically divorced from the dark, anti-capitalist messages those visuals sought to convey. It has inspired video games like [Cyberpunk 2077](#) (naturally starring Neo himself, Keanu Reeves), an Urban Decay eye shadow palette characterized by deeply '90s duo chromes, a collaboration between Yohji Yamamoto and Adidas, and roughly 4 million posts on Instagram. For everyone who watched *Stand Alone Complex* on Adult Swim (or, let's be real, a DivX player), there's now a bespoke keyboard aglow with bisexual lighting, a liquid meal plan, or a “smart” vibrator. For everyone else, there's cottagecore.

Here's a fun game: First, check out *Mondo 2000*'s tongue-in-cheek 1993 piece “[R.U. a Cyberpunk?](#)” Note the abundance of straps, holsters, and handheld cameras. Then, go look at photos from January 6, 2021, or the bow-and-arrow-wielding protesters who took to Hong Kong's streets in 2019, or MRAPs rolling through Portland. Ask yourself: If a specific future has already happened, what happens to stories about that future? Now that time has caught up with them, are these visions simply contemporary literature, no more speculative than stories about donated kidneys and grown men dating high schoolers?

“Above culture, clothing, and genre, cyberpunk is a lifestyle that blends a combination of ‘low-key living’ with a deep understanding of social fabric backdoors and full access to high-tech gadgets,” fashion writer Mandy Meyer [wrote](#) in *The Vou*. Yossy, the founder of Japanese cyberpunk fashion brand Helvetica, has stressed that the clothing should use innovative materials yet be functional, [telling Shell Zine](#) it “should strengthen the wearer, like an exoskeleton, and at the same time be comfortable and not too stuffy or formal.” Mostly this means dressing like you live in Seattle, because in cyberpunk it's always raining.

In this regard it's difficult to discern the line between the influence of a genre on design aesthetics and the grudging march of time (and brands) into the endless fires and floods of the 21st century—a context wherein the tactical is practical. Dreams of jetpacks have been replaced by designs for bulletproof backpacks. From a genre perspective, the future resembles science fiction less than it does a murder mystery: A whole planet is dying while its inhabitants argue about who stuck which knife in.

Before cyberpunk was reduced to an aesthetic, it was a philosophy. Whereas earlier generations of science fiction located conflict outside the body, on the battlefield or in the stars, the post-Watergate, post-*Roe v. Wade*, post-Vietnam generation of mostly American sci-fi writers imagined that the next theater of combat would be the human body and mind. Today, when it seems like every Facebook group is a Potemkin village and Texans can put bounties on abortion providers, that suspicion seems well warranted.

The most prescient aspect of cyberpunk was not any one particular innovation, like razor fingernails or brain-machine interfaces or even a ubiquitous metaverse awash in pornography, advertising, and the viruses endemic to both. Instead, it was the genre's focus on the ongoing commoditization of human workers by a narrowing field of multinational corporations. Instead of creating same-jackboot-different-day dystopias like [Logan's Run](#) or [Make Room! Make Room!](#), cyberpunk writers asked, “What if capitalism is the dystopia?”

Some of the most influential texts in the genre are about labor and bodily autonomy. [Blade Runner](#) is a story about runaway slaves, and *Blade*

Runner: 2049 is about the reproduction of slaves. *Neuromancer* is about a man selling his hacker skills to earn back the full function of his body's nervous system. *Akira* features government experimentation on children's bodies so they can better perform militarized work. *Snow Crash* presupposes a Los Angeles populated with precarious gig workers delivering pizza. *Ghost in the Shell* wonders who truly “owns” a cyborg body if an employer pays for its upkeep. *The Matrix* operates on the premise that all human bodies can be “grown” into batteries whose primary purpose is to keep artificial intelligence functioning.

[Writing for Slate](#), Kelsey D. Atherton summed up cyberpunk's present-day parallels thusly: “Replace the Tyrell Corporation with Amazon and reframe the replicants as ‘essential services,’ and suddenly you have a world of workers terrified that their jobs are inherently a death sentence—moving straight from fiction to reality.” Technology studies scholar Damien P. Williams agrees: “I think cyberpunk is still relevant, but in a different way; rather than a warning about where we're headed, it's a mirror about where we managed to end up.”

Not everyone concurs. In the face of a burning planet, the idea of using technology to achieve immortality seems naive at best. Young people in China are “lying flat” instead of working, and refugee children in Sweden have “resignation syndrome”; in a world where despair is a #mood, the desire to extend life indefinitely is a little vampiric, if not simply gauche. “Cyberpunk was relevant and important to boomers obsessed with questions of law and order, and who were determined to avoid the realities of human aging and embodiment. In 2021, we have new and different mass obsessions, making cyberpunk seem quaint,” says Hugo nominee and Nebula Award winner Kelly Robson. “In conclusion, fuck cyberpunk.”

Considering the world has caught up with, if not surpassed, the genre's imagination, its place in fiction might be limited, or limiting, in the way that rehashing Tolkien might be limiting for a fantasy writer. This is one of the challenges of telling a future-set story: Eventually time catches up, like a rubber band snapping back into shape. And sometimes it stings. Readers often assume that authors are happy when they “predict” future events “correctly,” but rarely are we asked about the queasy feeling of watching

one's worst vision come to pass. [Describing](#) his debut novel for CrimeReads, Lincoln Michel says, “[The Body Scout](#) is an attempt to replace the ‘cyber’ in cyberpunk with flesh and look at what happens when the human body becomes the major realm of technological innovation and corporate control ... These days, the greatest dystopian novel might be the evening news.”

Just because cyberpunk's history looks like the present doesn't mean it can't point toward the future. Ten years after Bruce Bethke published his 1983 short story “Cyberpunk,” Octavia E. Butler released what is arguably one of the most influential novels in science fiction, [Parable of the Sower](#). It tells the story of a young Black woman named Lauren Olamina living outside Los Angeles in 2024, watching as an authoritarian president is elected, human rights eviscerated, company towns built, and old neighborhoods destroyed. Lauren does what heroes do: She prepares. She gathers her wits and her seeds and leads her community toward freedom and, ultimately in the book's sequel, the stars. Like most of Butler's novels, it shifted the narrative focus from individual rebellion and success to communal liberation and legacy. If cyberpunk warned about capitalism's cancerous late stages, *Parable* asked, “So what are you doing about it?” And while cyberpunk as a genre took on metaphors for slavery and autonomy, Butler's books examined the actual transatlantic slave trade.

Butler's fiction focused on, among other things, genetic engineering, the embodied experience of aliens and posthumans, what an individual owes to her family and community, power and its uses, terrible sacrifices in the name of survival. Recalling a dinner with her in *Essence*, author and scholar Tananarive Due says Butler expressed the central question of her work as “How can we make ourselves a more survivable species?” Although she is considered the mother of Afrofuturism, her narrative patterns also repeat across all of cyberpunk's genre successors: hopepunk, biopunk, solapunk, and more. She echoes in Nalo Hopkinson's *Midnight Robber*, Premee Mohamed's *The Annual Migration of Clouds*, Louise Erdrich's *Future Home of the Living God*, Nnedi Okorafor's *Lagoon*, Becky Chambers' *The Long Way to a Small, Angry Planet*, Tade Thompson's *Rosewater*, L. X. Beckett's *Gamechanger*, and more. In Toronto, Black Lives Matter activists just purchased a 10,000-square-foot community hub for Black artists and

activists and named it the Wildseed Centre after one of Butler's books. Whether or not any of this qualifies as cyberpunk activity, it's still exemplary of what the movement could look like.

In her notes, Butler said: “The struggle is to hold it together, keep it alive, and teach it to be and do its very best.” She was summarizing Mother Olamina's ongoing mission, but she was also describing the 21st century in searing detail. This is the work of forward-looking science fiction. For better or worse, so much of cyberpunk's android dreams have come true. Now we have to imagine how to build ourselves anew.

More from WIRED's special series on [the impact of the *Matrix* franchise—and the future of reality](#).

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[Meghan O'Gieblyn](#)

[Ideas](#)

Nov 29, 2021 8:00 AM

My Music App Knows Me Way Too Well. Am I Stuck in a Groove?

WIRED's spiritual advice columnist on predictability, freedom—and the duality of rebellion.

Illustration: Michael Kennedy

One of the streaming [music apps](#) I use creates customized playlists for me, and it's scarily good at predicting songs I'm going to like. Does that make me boring?

—Playing It Safe

Dear Playing It Safe,

I once read somewhere that if you want to slowly drive someone mad, resolve, for a week or so, to occasionally mutter, “I knew you were going to say that” after they make some casual remark. The logic, as far as I can tell, is that by convincing a person that their thoughts are entirely predictable, you steadily erode their sense of agency until they can no longer conceive of themselves as an autonomous being. I have no idea whether this actually works—I've never been sadistic enough to try it. But if its premise is correct, we all must be slowly losing our minds. How many times a day are we reminded that our actions can be precisely anticipated? [Predictive text](#) successfully guesses how we're going to [respond to emails](#). [Amazon](#) suggests the very book that we've been meaning to read. It's rare these days to finish typing a [Google](#) query before autocomplete finishes our thought, a

reminder that our medical anxieties, our creative projects, and our relationship dilemmas are utterly unoriginal.

For those of us raised in the crucible of late-capitalist individualism, we who believe our souls to be as unique as our thumbprints and as unduplicable as a snowflake, the idea that our interests fall into easily discernible patterns is deeply, perhaps even existentially, unsettling. In fact, *Playing It Safe*, I'm willing to bet that your real anxiety is not that you're boring but that you're not truly free. If your taste can be so easily inferred from your listening history and the data streams of “users like you” (to borrow the patronizing argot of prediction engines), are you actually making a choice? Is it possible that your ineffable and seemingly spontaneous delight at hearing that Radiohead song you loved in college is merely the inflexible mathematical endpoint of the vector of probabilities that have determined your personality since birth?

While this anxiety may feel new, it stems from a much older problem about prediction and personal freedom, one that first emerged in response to the belief in divine foreknowledge. If God can see the future with perfect accuracy, then aren't human actions necessarily predetermined? How could we act otherwise? A scientific version of the problem was posed by the 19th-century French physicist Pierre-Simon Laplace, who imagined a cosmic superintelligence that knew every detail about the universe, down to the exact position of all its atoms. If this entity (now known as Laplace's demon) understood everything about the present world and possessed an intellect “vast enough to submit the data to analysis,” it could perfectly predict the future, revealing that all events, including our own actions, belong to a long domino chain of cause-and-effect that extends back to the birth of the universe.

[The algorithm](#) that predicts your musical preferences is less sophisticated than the cosmic intellect Laplace had in mind. But it still reveals, to a lesser degree, the extent to which your actions are constrained by your past choices and certain generalized probabilities of human behavior. And it's not difficult to extrapolate what predictive technologies might expose about our sense of agency once they become even better at anticipating our actions and emotional states—perhaps even surpassing our own self-

knowledge. Will we accept their recommendations for whom to marry, or whom to vote for, just as we now do their suggestions for what to watch and what to read? Will police departments arrest likely criminals before they commit the crime, as they do in *Minority Report*, tipped off by the oracular predictions of digital precogs? Several years ago, Amazon filed a patent for “anticipatory shipping,” banking on the hope the company would soon be able to correctly [guess our orders](#) (and start preparing them for dispatch) before we made the purchase.

If the revelation of your own dullness is merely the first stirrings of this new reality, how should you respond? One option would be to rebel and try to prove its assumptions false. Act out of character. When you have an inclination to do something, do the precise opposite. Listen to music you hate. Make choices that will reroute your data stream. This is the solution arrived at by Dostoevsky's narrator in [Notes From the Underground](#), who takes up irrational and self-damaging actions simply to prove that he is not enslaved to the inflexible calculations of rational self-interest. The novel was written during the heyday of rational egoism, when certain utopian thinkers believed that human behavior could be reduced to a series of logical rules so as to maximize well-being and create the ideal society. The narrator insists that most people would find such a world intolerable because it would destroy their belief in individual freedom. We value our autonomy over all the comforts and the advantages that scientific determinism offers—so much so, he argues, that we would seek out absurdity or even self-harm in order to prove that we are free. If science ever definitively proves that humans act according to these fatalistic rules, we would destroy ourselves “for the sole purpose of sending all these logarithms to the devil and living once more according to our own stupid will!”

It's a rousing passage, though as predictions go it's not especially prescient. Few of us today appear to be tormented by the comforts of predictive analytics. In fact, the conveniences they offer are deemed so desirable that we often collude with them. On [Spotify](#), we “like” the songs we enjoy, contributing one more shard to the emerging mosaic of our digital personhood. On [TikTok](#), we quickly scroll past posts that don't reflect our dominant interests, lest the all-seeing algorithm mistake our curiosity for

invested interest. Perhaps you have paused, once or twice, before watching a [Netflix](#) film that diverges from your usual taste, or hesitated before Googling a religious question, lest it take you for a true believer and skew your future search results. If you want to optimize your recommendations, the best thing to do is to act as much like “yourself” as possible, to remain resolutely and eternally in character—which is to say, to act in a way that is entirely contrary to the real complexities of human nature.

With that said, I don't advise embracing the irrational or acting against your own interests. It will not make you happy, nor will it prove a point. Randomness is a poor substitute for genuine freedom. Instead, perhaps you should reconsider the unstated premise of your query, which is that your identity is defined by your consumer choices. Your fear that you've become boring might have less to do with your supposedly vanilla taste than the fact that these platforms have conditioned us to see our souls through the lens of formulaic categories that are designed to be legible to advertisers. It's all too easy to mistake our character for the bullet points that grace our bios: our relationship status, our professional affiliations, the posts and memes and threads that we've liked, the purchases we've made, and the playlists we've built.

What remains more difficult to predict are the qualities that make you truly distinct: your thoughts and beliefs, your personal history, the unspoken nuances of the relationships that have made you who you are, and the unbounded expanse of moral and imaginative possibilities that constitutes your own mind. Attending to those aspects of yourself is the work of a lifetime—and far from boring.

Yours Faithfully,
Cloud

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[Virginia Heffernan](#)

[Ideas](#)

Nov 26, 2021 8:00 AM

Why Is It So Hard to Believe In Other People's Pain?

People—and groups—who are suffering are often dismissed. Scarry's axiom might help us understand why.

Illustrations by Santos Shelton

Hostile suspicion of others, encompassing everything from the position of their mask to their stance on mandates, has marked this wretched pandemic from the start. Now, in perhaps the unkindest cut, suspicion is aimed at people with [long Covid](#)—the symptoms that may afflict as many as a third of those who survive a first hit of the virus. One theory is that [Covid](#) infection riles up the body's defenses and can leave the immune system in a frenzy, causing shortness of breath, extreme fatigue, and brain fog. In [The Invisible Kingdom](#), her forthcoming book about chronic illness, Meghan O'Rourke reports that doctors often reject these symptoms as meaningless. When medical tests for these patients come up negative, “Western medicine wants to say, ‘You're fine,’” says Dayna McCarthy, a physician focused on long Covid.

This is not surprising. Skepticism about [chronic conditions](#), including post-polio syndrome and fibromyalgia, is exceedingly common—and it nearly always alienates patients, deepens their suffering, and impedes treatment. Until researchers can find the biomarkers that might certify long Covid as a “real” disease, the best clinicians can do is listen to testimony and treat symptoms. But the project of addressing long Covid might also be served by a more rigorous epistemology of pain—that is, a theory of how we come to believe or doubt the suffering of other people.

In her 1985 book [*The Body in Pain: The Making and Unmaking of the World*](#), Elaine Scarry makes a profound assertion: “To have great pain is to have certainty; to hear about pain is to have doubt.” Because the claim illuminates both pain and knowledge, and because women rarely attach their names to philosophical assertions, I’d like, belatedly, to dub this elegant proposition “Scarry’s axiom.”

The axiom came to mind this fall for two reasons: I was trying to support a friend with long Covid, and I participated in a forum about how the media contends with racism. It was the second experience that illuminated the first and suggested Scarry’s axiom as a way to understand the acute distrust that now pervades our pluralistic country.

At the forum, a socialist and a libertarian each lodged complaints. The socialist charged that the media’s focus on racism leaves out a more significant battle—the never-ending class struggle. The libertarian argued that the media’s focus on race fails to understand the individual, with his or her pressing fear of death and aspirations to art, money, and transcendence. The libertarian then took shots at easily offended undergraduates who put emotion before reason and are forever getting “offended” and needing “safety,” which he said were postures incompatible with education.

This familiar debate ground on. As far as I can tell, no one on any side—and I disagreed with both the socialist and the libertarian—ever budged. But perhaps that’s because we kept missing a truth in front of our faces: that we were all dismissing as somehow less than real the pain of others while elevating our own, and that of our confreres, as hard fact.

As Scarry’s book makes clear, this dynamic of doubt holds for both emotional anguish and physical pain. Microaggressions toward another tribe? Those can’t be so bad. But setbacks to a meritorious individual’s fortune-building efforts and attacks by sniveling critics and cancelers? To a libertarian, those represent authentic agony. Rich tech bros who complain of loneliness and despair? These strike socialists as entitled elites, weeping over their dented Teslas while the working class are trapped in debt.

But Scarry’s axiom does more than conjure what some call the oppression olympics, the demoralizing squabbles about which demographic deserves a

gold medal for the greatest suffering. By the axiom, it's not that some forms of pain are more acute than others; it's that some pain seems undeniable while other suffering appears fraudulent.

You can see why this renders futile the well-intentioned empathy-building exercise in which students listen while classmates share trying personal experiences. Before we even think of empathizing with others—an advanced psychological operation—we have to confront a deeper problem: We don't even believe them. Paradoxically, the more insistent or dramatic an account of suffering is, the more likely listeners are to fear that they're being manipulated. If that anxiety about coercion is then conveyed as doubt (“I'm not buying it”), the original sufferer may perceive their listener's irritability as nothing but a cover for cruelty or gaslighting. And on it goes. This belief-doubt spiral is especially common in America, or on the internet, where no single idiom exists for the credible expression of pain.

Scarry argues that any response that meets the statement “I am in pain” cannot reflect the same degree of pain (since it's not in the respondent's body), and thus may strike the pained person as insufficiently understanding. The pained person might then decide that the best way to call attention to their affliction (the better to get relief from it) is by inflicting a little pain on the other party: snapping, shouting, crying, or turning away. Two people end up in pain—one with aches, the second with aggravation. Each is suspicious of the other. And each experiences the other as a source of pain instead of a salve for it.

This is on display in American medicine and politics, but it's cartoonishly clear in sports, especially pro soccer, which includes hammy performances of pain that fall outside the usual idiom of American athletics. While Americans love to exaggerate aggression, and consider flexing (trash-talking, posing, menacing an opponent) mostly wholesome, they famously disdain the common European move of exaggerating injury, or flopping. As Eric Levenson wrote in *The Atlantic* in 2014, American athletes fail at “selling their falls” with arias of agony, and try to pass off their refusal to flop as a “moral victory to cling to when they inevitably lose.”

Why is this?

The refusal to cry out in pain seems grounded in an entrenched anxiety related to Scarry's axiom: What if all pain is an act, even our own? Seen this way, preserving skepticism about other people's groans and wails may be a shield against guilt. If we believe in another's pain, after all, we may feel obliged to fix it, or take on the blame. Here's where the debate about representations of racism comes in. A case study is the far-right complaint (in dubious faith) that white kids who are taught critical race theory are being guilt-tripped about the suffering of races to which they don't belong. In the unusual quest of Americans to feel no guilt, many of us are quick to forcefully repel claims of pain. We don't only have doubt, as Scarry's axiom has it; we cultivate that doubt and extend it to the suffering of others.

The answer, obviously, is not to stop expressing or acknowledging pain. The speech act known as complaint is not an accusation or a demand for remedy. Rather, it's a plea for witness, a request to be paid the simple courtesy of belief. O'Rourke, who herself suffers from chronic illness, describes the intense loneliness of being doubted. That loneliness is deepened when listeners panic about being manipulated and can't even accept a description of pain as plausible or interesting, lest they spiral into helplessness and self-recrimination.

People who high-handedly dismiss long Covid patients using words like “you're fine” must dial down their anxiety about being tricked or trapped. This pandemic-ridden country has not been fine for a long time, and to recognize that is not to be a fool, but to be sane.

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