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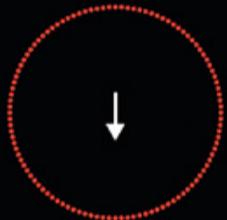
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WIRED

This is Nathan Wolfe.

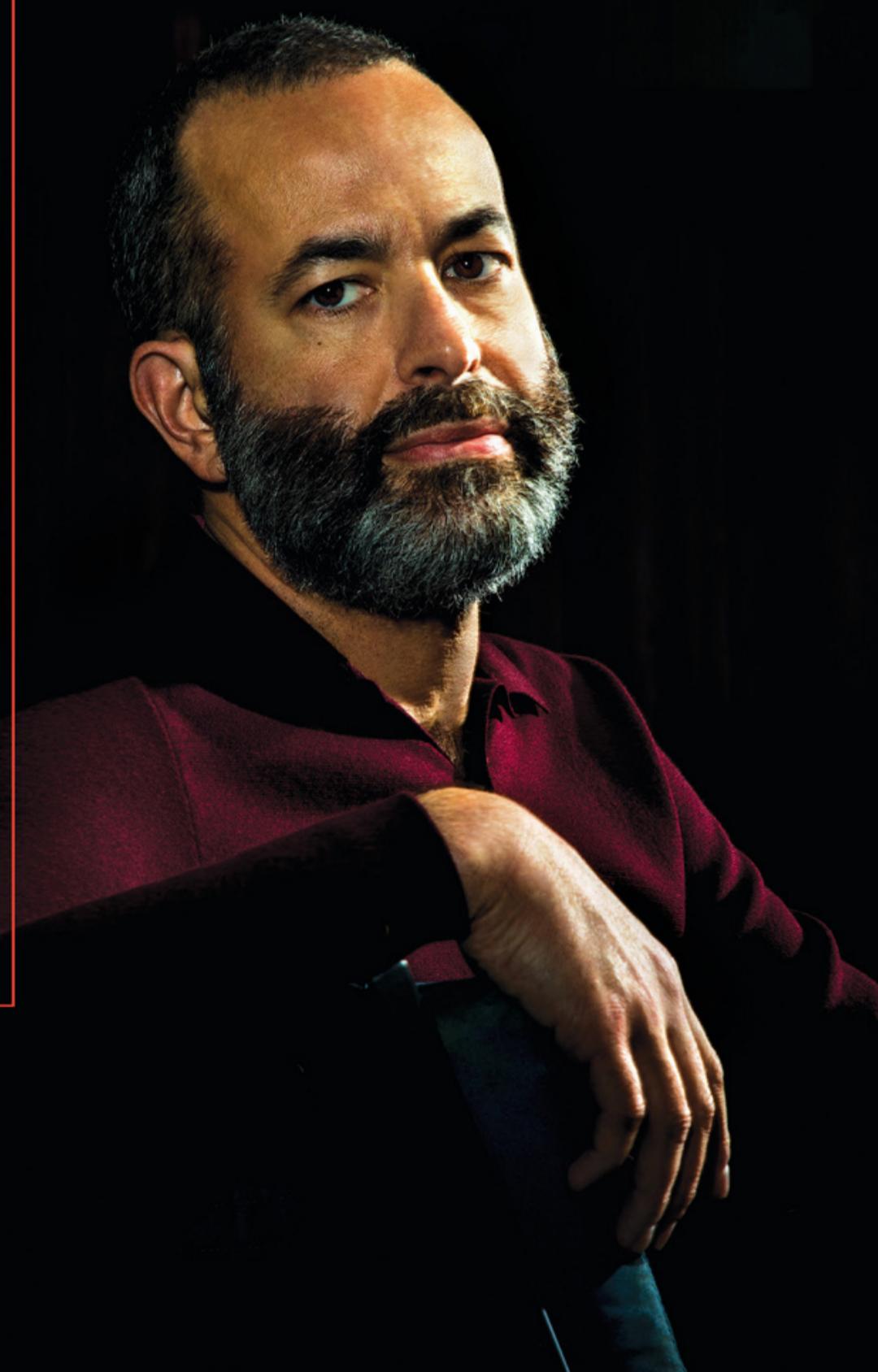
We should have listened to him.

JUL/AUG 2020 ■ USE PROTECTION



The virologist helped crack an impossible problem: how to insure against the economic fallout from rare but devastating pandemics. The plan was ingenious. So why are we in this mess?

by Evan Ratliff





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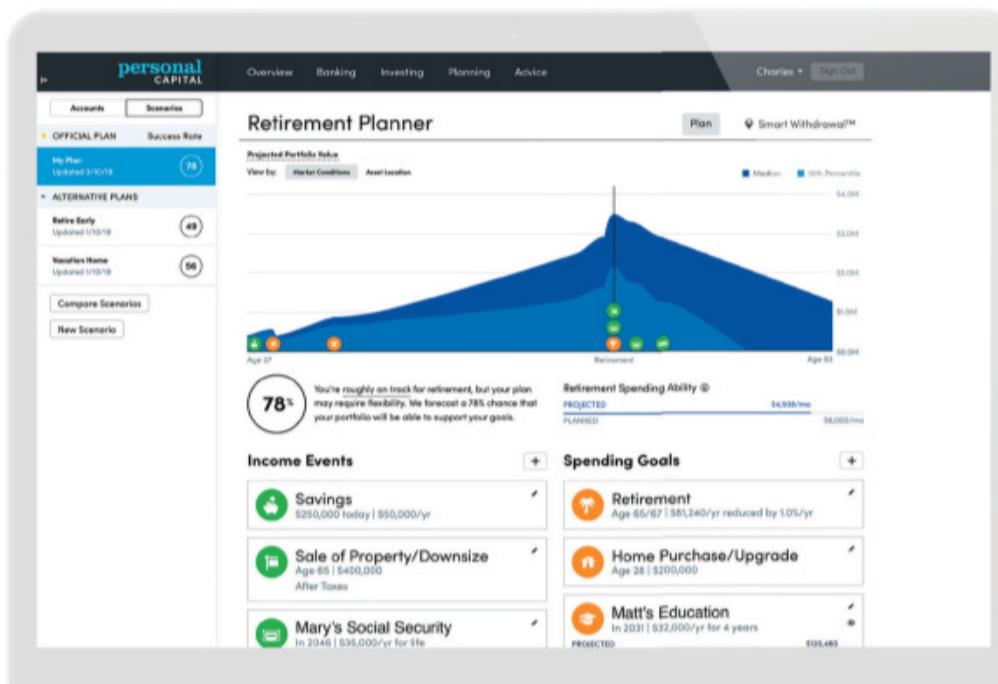
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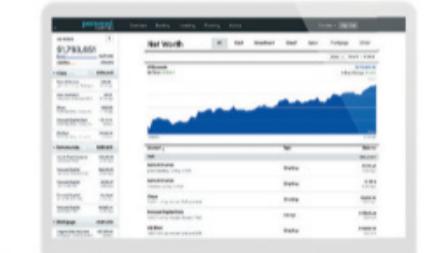
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A LIFE JUST OUT OF REACH

At 37, my childhood friend Brian Wallach was diagnosed with ALS. Then he started tapping a lifetime of connections to give hope—and help—to fellow sufferers.

by Brian Barrett

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Trolls, hackers, and a real pandemic plague the sequel to a videogame about a pandemic.

by Darryn King

P. 40 GLOBAL INDEMNITY

An ingenious insurance plan could have helped save the economy. So why are we in this mess?

by Evan Ratliff

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WHAT HAPPENS NEXT: SCIENCE, TECHNOLOGY, AND LIFE IN THE WAKE OF COVID-19

Stories of a world—and a future—transformed by a viral cataclysm.

by Laurie Penny, Steven Levy, Gideon Lewis-Kraus, Chris Colin, Maimuna S. Majumder, and more

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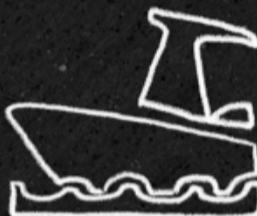
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ELECTRIC WORD

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ON THE COVER



Photograph
by Christie Hemm Klok

Behind the Scenes

"Shooting outdoors can complicate things," says Christie Hemm Klok, who photographed Nathan Wolfe from a safe distance in his Bay Area backyard. For example, there are bees outdoors. "When I saw the bee, I really wanted to get a shot of it." And so she did. (No virologists were stung in the making of this magazine.)



MIND GRENADES

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by Virginia Heffernan

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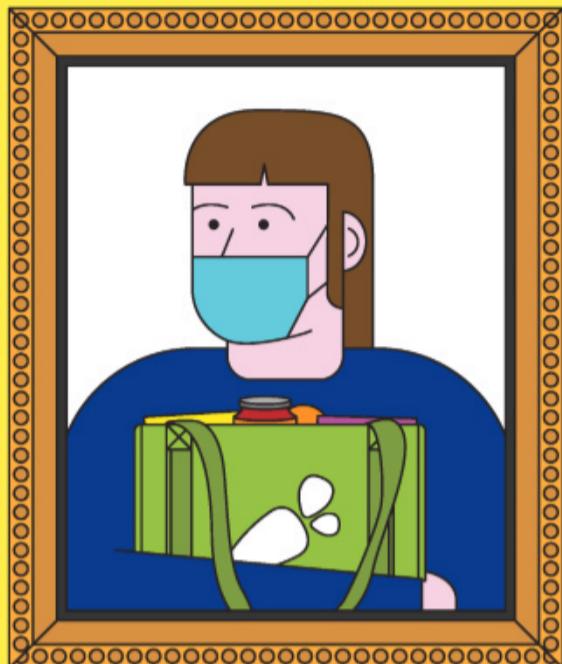
SIX-WORD SCI-FI

P. 88 Very Short Stories
by WIRED readers



TOTALLY WIRED

DIARIES OF AN
UNBRIDLED DIGITOPIAN



Reorder, press the plus sign on the milk, chicken fingers, and Coho salmon I received last week (and 19 other times, the app tells me), and thrill to the affable haptic *boop* in my palm. In something like 74 seconds, the fever called living breaks, groceries ordered.

Then the true magic: interfacing with my shopper. They take you back to the Long-Before Times, pre-1920s, when hungry humans were at the mercy and whimsy of grocers who shopped for them in the store's back room—only now they text you aisle-by-aisle updates. Dana says they're out of the habanero salsa, so he sends you a photo of a possible substitute. It's Papalote Mexican Grill's tomatillo salsa. "This is a party in a jar," he says. Add a marg mix, too!

Even the mistakes are gifts, portals to new ways of being. I order panko crumbs, I get matzo meal. Ciabatta changes to challah and charges my chakras. A lemon the size of a gumball arrives one week; the next, I consider chaining The Lemon to the cutting board, lest it squeeze me to death in my sleep—but now there's lemonade to be made. I want baking soda, I get yeast. You get what you knead.

What kingly, unbound power! Soul-souring, at the same time. Amid the pandemic's horrors, there are horror stories of faceless couch-bound gremlins tempting Instacart shoppers with plump tips, only to snatch them away once their grub has arrived. Shame should soak their veins for not celebrating, not bowing down to this miraculous workforce, high couriers of our honey-dipped grahams.

These frontline nourishers are caught between beautiful technology and broken people. Fixing Instacart requires fixing ourselves. How? Shoppers often give us clues. Yanira S. recently sent me a photo to mark the end of our time together: my bags, packed with Tetris-champion tidiness, snug in the lobby of my building. In the upper right, her masked face is reflected in the front door, her weary eyes already moving on to her next delivery. I am reminded of the countless journeys within each bag, sweat on strawberry fields, white-knuckling the seas, the colossus of toil and genius to bring the universe to my kitchen. May your tips match the magnitude of the effort.

RIPLEY D. LIGHT
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Ripley D. Light

Young couples squabbling over organic vs. not, misaligned wheels screeching down laminate aisles, overhead lights casting an enervating pall over the proceedings, and only 17 more items on the list to go: The modern grocery shopping experience has never failed to live up—which is to say down—to that piercing DeLilloism from *White Noise*: "Here we don't die, we shop."

But that, friends, was the Before Times. At our peril, we were, dubiously blessed with the privilege to sniff cilantro with unmasked nostrils, to glovelessly test-squeeze avocados beside strangers sneaking bites of blueberries. The only consolation was the illusion of efficiency, of pleasing design, easing our way to self-destruction: what DeLillo called the supermarket's "psychic data."

Now there's hope for genuine salvation—in the *real* data of Instacart. I open the app, click

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WE

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RANTS AND RAVES



Picking Up Speed



In our May issue, Mohammad Ali returned to his home country of India to write about the social-media-fueled rise of the Bajrang Dal, a radical Hindu youth militia. Sandra Upson wrote about Lee Holloway, one of the founders of Cloudflare, and his tragic decline from a rare neurological disease. And Nicholas Thompson chased ever-faster personal marathon records—along with an understanding of why he needs to run.

Readers share their political analysis, good cries, and new goals:

RE: "THE INFLUENCER"

I belong to a Hindu family. In my earlier days I was told all the negative things about the Muslim community. I was young, so I believed that it was true. But since I moved to Delhi three years ago, my perception has changed, and I realized how I was misled. —Shrey Narang, via mail@WIRED.com

What's not well understood is how communal hatred is evolving in different parts of India. For example, over the last fortnight, Twitter has been awash with commentary espousing communal violence against Muslims. This violence has moved out of the shadows and is now preached by learned men and women openly on social media. This "democratization" of communalism is a landmark event, a large step toward making hatred a norm rather than an outlier. —Shriram Ramesh, via mail@WIRED.com

I'm Jewish, and it's just astonishing how many terrible parallels can be drawn between

RE: "WHAT HAPPENED TO LEE?"

"We'd never have been able to pull off what we did without him. I miss him every day."

—Matthew Prince (@eastdakota), CEO of Cloudflare, via Twitter

the Final Solution to the Jewish Question in the '40s and the Final Solution to the Muslim Question 80 years later. The world never learns. How sad that is. —Steve, mail@WIRED.com

I felt this article was biased. The apprehensions voiced by Vivek Premi are shared by many Hindus, even if they would not agree with his methods. Consider the killing of Kamlesh Tiwari, president of the Hindu Samaj Party in Uttar Pradesh, for "blasphemy" of the Islamic prophet. A mainstream Islamic organization arranged for the legal defense of the alleged assassins. In pockets of India, there is considerable fear among non-Muslims that they cannot express thoughts freely when it comes to Islam. But as the article shows, if the government was strong enough to prevent such criminality, then room for those like Vivek Premi also vanishes. —Vijay Ganapati, via mail@WIRED.com

RE: "WHAT HAPPENED TO LEE?"

In a word, beautiful. As a newly diagnosed Parkinson's patient, I see many similarities. I too wonder who I'll be in a few years. Thank you for this honest look at a man's nature and his own sad decline into a derivative form of his personhood. —KC, via mail@WIRED.com

I cannot imagine how he struggled to keep the loop in his mind from breaking. During this lockdown, I've regretted all the years I didn't go out of my way to cultivate strong social relationships. I also don't know what my Self is drifting

away, especially now that I'm really alone. —John Otu, via mail@WIRED.com

My husband developed dementia and succumbed to it. The feeling of loss is made worse by the feeling of helplessness. If only we could fight the condition effectively.—Billie Jo McCann, via mail@WIRED.com

RE: "OUTRUNNING MYSELF"

In 1972, frustrated by a brush-off from a boy, I ran around the school track to burn off steam. I came off the track exhilarated, and began my running career. I qualified for and ran the Boston Marathon a few years later. Discovering I liked distance more than speed, I ran two ultramarathons. While I was writing this, my 28-year-old daughter called to tell me about her daily run. She rattled off running times and said she was no longer in high school and didn't expect to run as fast as she had then. I told her about this story and reminded her that she shouldn't limit herself with self-imposed expectations. —Jan Burns, via mail@WIRED.com

I ran my first marathon in 2016 (3:56). I thought I might be able to extend my marathon career to the age of 38 if I was lucky. You're making me look forward to my forties. —Winthrope Wellington, via mail@WIRED.com

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IMAGINE ALL THE PEOPLE

America's transformation has been revolutionary collective action.

BY VIRGINIA HEFFERNAN

One morning in March 2020, Americans woke up to find all that was solid had melted into air. ■ Remember? The first change was simple but sweeping: 316 million people were urged to stay home. Nearly all of us did as we were told. We were stunned but compliant. It helped that we had nowhere to go. Schools closed. Workplaces closed. No March Madness, St. Patrick's Day parade, Houston Rodeo. ■ A nationwide metamorphosis of this scale had never occurred. The air was swarming with invisible pathogens that could devour our organs. Any innocent Joe could shed them by the billions. We had to take this strange new set of givens ➔



on faith. Act first, and ask questions later. Over the first weeks, public transportation slowed; airports emptied; hair grew straggly, gray, unbarbered. Getting and spending—the unstoppable feature of American life—stopped. J. Crew, J. C. Penney, Neiman Marcus filed for bankruptcy. Nearly one in four workers filed for unemployment. Around the world landmarks that don’t close closed: Carnegie Hall (est. 1891), the Church of the Holy Sepulchre (335), the Colosseum (80). Promising startups dissolved into dust; whole sectors, from real

“Our citizens work hard, but solely with the object of getting rich.” In the cramped unwillingness of Oran citizens to stop bowling, taking the streetcar, and going to work, Camus finds the sources of disease. A morally atrophied life becomes a physiologically atrophied one; and death is next.

Nevertheless, Camus goes on, “there still exist towns and countries where people have now and then an inkling of something different. In general it doesn’t change their lives. Still, they have had an intimation, and that’s so much to the good.”

of the radical has been subverted to capitalist ends. In May, Elon Musk, a master of the means of production if ever there was one, claimed with brio that he was willing to be arrested so Tesla could start making cars again. Not exactly civil disobedience. But the protesters and Musks, while maddening, are OK too—they throw into relief how committed most others are to taking a break from our current economy and politics, ideally so we can do it better next time.

The fine-grained scientific data that

We love our ruts, our rounds, our Instagram spats and set pieces. But we still got it. We can still enact dramatic, spontaneous, creative change—even when it comes at a steep cost to our homeostasis.

estate to higher education, revealed ominous and foundational cracks. On April 6, the top 10 box office gross at the movies was \$126, down from last year’s gross for the same date: \$53,912,988.

Emotional disorders, domestic abuse, and political unrest surged.

Albert Camus would have been pleased. Indeed, seen through a lens of something like “existentialism,” the collective willingness to set an ordinary life in flames and watch it go up in smoke is stark proof that humans have not lost our vitality and imagination. We love our ruts, our rounds, our Instagram spats and set pieces. But we still got it. We can still enact dramatic, spontaneous, creative change—even when it comes at a steep cost to our homeostasis.

Camus’ greatest condemnation of the afflicted townspeople in *The Plague*, his 1947 novel about a fictional epidemic in Oran, Algeria, is that they are hidebound.

Is it possible that America has proven to be a country with intimations?

Or more than intimations. Could we have, below the surface, a full-fledged revolutionary imagination—akin to the one that drove the maniacs of 1776 and 1789, 1968 and 1991—and the gall to act on it? Starting in March, market capitalism was brought to a screeching halt across America. The stock market crashed. Interest rates closed in on zero. Then, like the Grinch, our hearts grew three sizes. We expanded our capacity to care for the sick exponentially; creative volunteerism and altruism replaced the usual grind. America’s transformation has been revolutionary collective action.

At the same time, it is the people who wanted to resume their habits—employment, consumption, recreation, assembly, exhibitionism, classroom education, all of it—who called themselves radical. That too might have interested Camus. The pose

appears almost hourly is beguiling in part because it lets us envision the species as a species, which we had grown unaccustomed to doing. The dots and numbers are both dehumanizing—where, for example, is my own aunt, who died Easter weekend, in the case-fatality rate?—and superhumanizing. People on the graphs are elegantly aggregated and uniform; we are all the mammals that persist, sicken, recover or don’t, and sooner or later die. Some dots on these slides further represent bodies that have been risked to save the bodies of others. Every graph of coronavirus “hospitalizations” implies the service and sacrifice of unnamed others.

All of this makes me think of the set of way-out metaphors and once ascendant ideas proposed in the 1970s by James Lovelock and Lynn Margulis under the flower child name the Gaia Hypothesis. Lovelock and Margulis—inspiring to some, aggravating to others—described

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Earth in total as a self-regulating complex system that maintains the conditions for life on the planet. Have humans ever seemed so much a part of a self-regulating biosphere as when we, last spring, shaved down our identities, cultures, and routines to minimum viable products, and joined up with the global internet with the sole purpose of giving the novel coronavirus as little quarter and purchase in our cells as possible?

William Wordsworth wrote of the French Revolution: *Bliss was it in that dawn to be alive, and to be young was very heaven.* It's hardly been bliss, though there have been surprise raptures here and there, as when a baby was delivered by cesarean section from a sick mother in a Covid-19 coma; the mother revived after five weeks, when she met her newborn for the first time, and left the hospital with the baby in her arms. The oldest woman in Spain, Maria Branyas, who turned 113 on March 4, also recovered from the coronavirus—and went home, her title intact. ("In terms of my health I am fine, with the same minor annoyances that anyone can have," she said.) And always the astonishment of sacrifice: the Kansas farmer who, though his wife is highly vulnerable to infection, sent one of his five N95 masks to the governor of New York, where the contagion was then at its worst. Across the country, tens of thousands of first responders hazarded and sometimes gave their lives to go toward the virus the rest of us were fleeing.

What just happened? Wordsworth and his brothers-in-arms at the Bastille found that their bliss faded when the fighting subsided and the revolution's ideology had to be put into practice, which drained its poetry. Revolutions never come near to meeting expectations. Their gains get reversed, reactionaries reassert themselves, mafias and dictators exploit the disarray. And of course revolutions have casualties—sometimes in unbearable numbers. But Leon Trotsky's observation that revolution is the locomotive of history still seems about right. At the very least, we would do well to notice that we're in the middle of one. ■

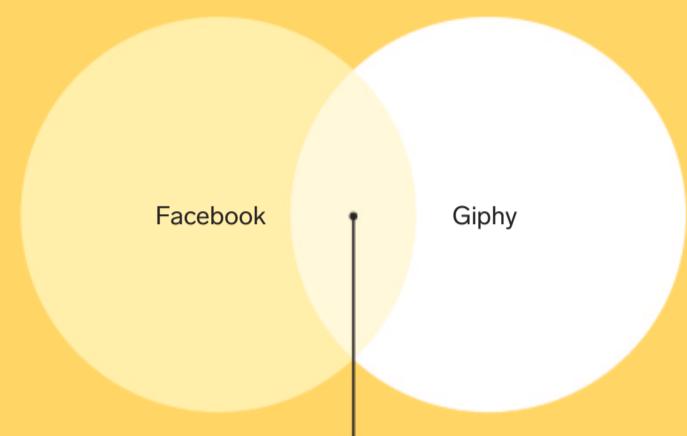
VIRGINIA HEFFERNAN (@page88) is a regular contributor to WIRED.



CHARTGEIST

BY JON J. EILENBERG

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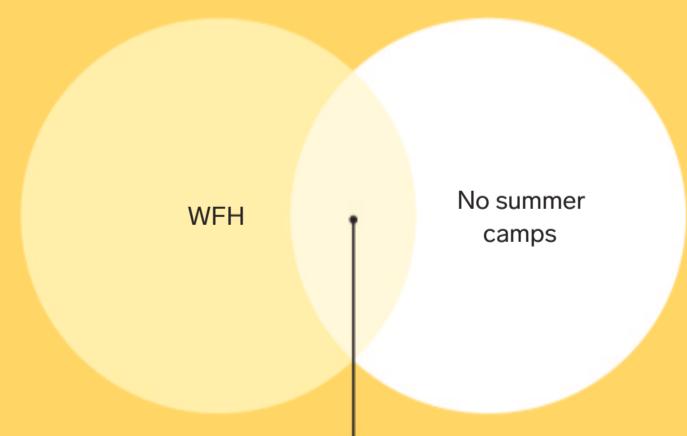


It's like your dad photobombing your TikTok.

WHAT WE LEARNED [AGAIN] DURING THE PANDEMIC



PARENTING



"Amelia, your new screen time limit is 57 hours a day."



INFINITE LOOP

Supply chains aren't just petroleum and extruders and cargo ships. You and I are part of them too.

BY PAUL FORD

I didn't grow up knowing about supply chains. It's not as if a parent sat me down and said, son, we need to have a conversation about how petroleum turned into your Boba Fett. But somehow supply chains are normal now—one of those things a reasonably sophisticated nerd is supposed to know about, like Crispr or blockchain. You can drop supply chains into a conversation and look wise. Walk around your house and pick up anything. Look at your roommate or spouse, even your dog, and say, "Wild to think how this got here, right?" ■ They're out of bananas at the deli? Supply chains. Your monthly box of fancy shaving supplies is late? No matches on Tinder? Supply chains. They're always there to explain things, like little mental farm sets (every cow is a billion cows).

The monomers are extracted and polymerized, until plastic oozes out of the extruder, and with some molding, your Boba Fett is born—but his journey has just begun. Journalists travel to Shenzhen to uncover supply chains in the same way that the British searched for the source of the Nile.

Supply chain worship is in many ways a modern religion. The best evidence of this is unboxing videos, the sacred communion between the humble individual box opener and the higher powers of manufacturing. It's a story so atavistic and pure that a pre-verbal child will watch wild-eyed in ecstasy as boxes are opened, plastic cases are separated, and finally some object, absolutely alive with newness, comes out of the box.

I always try to breathe in the air from the box at that moment, whether it's flat-pack furniture or a new six-button mouse. Consider: This object is made of dinosaurs and atoms, extracted from the earth through a variety of processes that are absolutely killing us, assembled by people who may not have many choices, wrapped in language and images produced by marketers, trundled through the world on a journey that our ancestors would have found miraculous. The last light that touched this set of screwdrivers was from a different part of the world. Sometimes I say a grace. *Thank you to the people who dug this from the earth, for the people who melted it, for the people who put it together, for the people who carried it to a boat, to the people who carried it into the warehouse. I am grateful for all the labor of strangers.* I've barely gone anywhere, but my stuff has seen the world.

Expensive things have provenance. A beautiful pricey chair is signed by its maker, maybe sold out of her workshop. She'll tell you exactly how the wood was reclaimed from old church rafters. But people are erased from mass-market things, probably because the stories are rarely so nice.

Yet you can, with Googling and poking around Alibaba, start to draw mental maps of where your things were born. You can see pictures from inside the factory. Not just commodities traders in a panic as the price of oil jumps up and down like a toddler, but actual people like you, humans with haircuts.

What becomes clear is that I, in my exalted role as American consumer, think of myself as the end-all-be-all terminus for all the world's supply chains. After all, the com-

mercials are for me, and the products are designed to fit my hand. The world makes, I take. But supply chains are people. And I'm part of them too. I'm not merely a consumer but a producer. I'm a writer. The words I write go on pages and websites. Audiences come, so advertisers follow. Their ads stimulate desire, so orders increase. More factories come online. More container ships are built. Oil fuels the boats. Particulate matter spews into the warming ocean breeze. All because of this one teensy paragraph.

Then there's all that data I make as I click on things or tweet, all my customer intent

near or far future, they'll pull a container out of the rising seas, scrape off the barnacles, and boot up the ancient hard drives to find a trillion lines in a log file. They'll see us for what we were: data points inside a vast system, idly buying nonsense on eBay, watching countless Twitch streams, downloading PDFs and nonfiction we never read.

"God," says one graduate student to the next, "they were terrible."

You can see us struggling with this lesson in humility as the virus runs its first lap: It is an absolute insult to our self-regard. It spits on the US free market and giggles, chuckles

And don't forget my organs. I've signed that little box on my non-driver's license for when I flatline. Out they come. Talk about unboxing!

and engagement that leads microwave vendors to chase me around the internet telling me about yet another microwave and offering to help me understand my AdChoices. And don't forget my organs—I've signed that little box on my non-driver's license for when I flatline. Out they come. Talk about unboxing! Although I doubt anyone will want this heart when I'm done with it. And there are those two fertilized eggs we left frozen at the clinic, to be donated to anyone who'd want them. We wrote a letter for whoever received them, a note to the future with very little hope of response. Off they went, those eggs, into a chain of medical custody purposefully obscured from the donors, until they grew into humans, or didn't, or maybe haven't yet.

Trade routes never leave us. We're still pulling amphorae out of the Adriatic, tracking the path of carnelian from the Ganges to Byzantium, wishing we could ride camels along the golden road to Samarkand. And just as often those are still our trade routes. They've been testing underwater data centers—just load 'em up and drop 'em in, to save on air-conditioning. I wonder if, in the

at China's Belt and Road initiative. It coughs all over our freedoms. People march with guns to show who's boss and you can feel it putting its head back and laughing uproariously, knowing that two weeks from now some of them will be very, very sad. Ships filled with unwanted oil float off the coast, and our PPE might as well have been on the bottom of the sea. There is no vaccine to unbox. Byzantium has turned our sails away.

And yet, my spouse came home two nights ago after a rare trip out of the house and brought with her a little frozen milk treat. New food! Wonderful variety! Reading its label, I learned it came from Lithuania, a sweet frozen cheese from Vilnian cows. From there our treat traveled frozen to New Jersey (the Lithuania of America) to be packaged, then was taken by truck to a tidy little grocery in Brooklyn called Baku Store. From thence to our table and onto our fingers, sweet and cold. The world is a guest in my house, and I am the world's guest too. ■

PAUL FORD (@ftrain) is a programmer, essayist, and cofounder of Postlight, a digital product studio.

KILLER MASKS

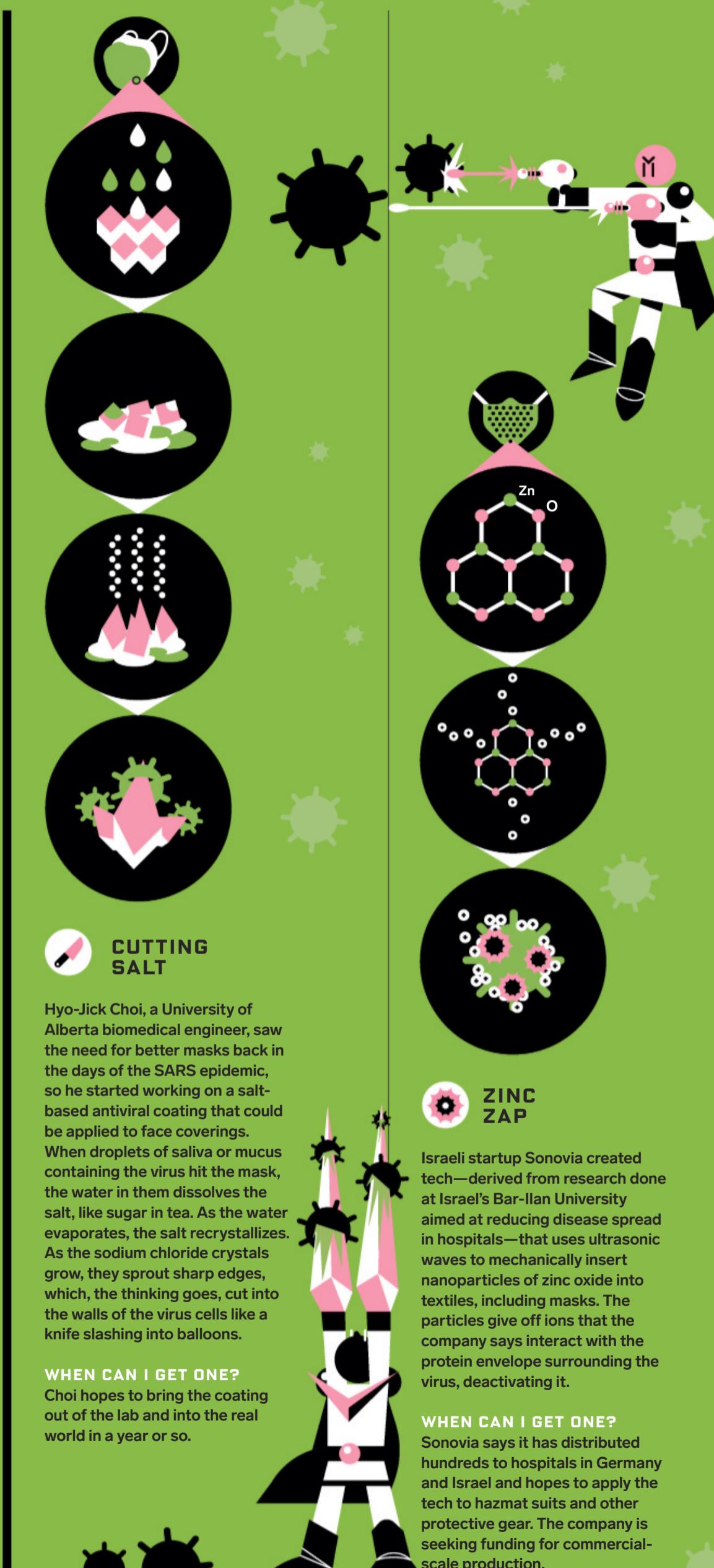
Across the globe, researchers are hoping fancy tech can protect us.

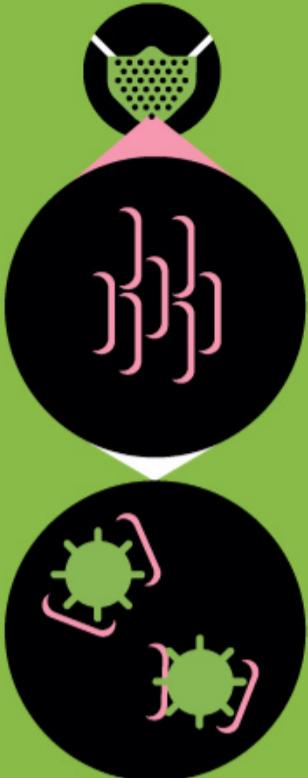
BY VINCE BEISER

Like a bunch of amateur bandits planning our first bank robbery, in the early days of the pandemic we struggled with the question of whether or not to cover our faces. Some officials insisted we should; others said the opposite. By early April public health experts more or less reached a consensus: Wearing masks helps limit the spread of coronavirus. But, they also agreed, you shouldn't get too comfy behind the mask you made from your pillowcase. Basic face coverings do little to stop the virus from coming *in*; they're mostly useful for helping to keep infected people from breathing the virus *out*. N95 masks, aka respirators, do a better job of intercepting incoming viruses. But once they do, the masks themselves can become infected. That's why, back in normal times, they were supposed to be used just once.

Normal times, of course, are long gone. In the Covid-19 era, we need better facial defenses. So engineers, researchers, and entrepreneurs from Israel to Hong Kong are hustling to bring us the next generation of face protection: masks that not only capture but kill incoming viruses.

Here are some of the most intriguing options—but buyer beware. While all of the research projects and products here appear to be based on legit science, none has been tested against coronavirus. The US Food and Drug Administration is in charge of approving medical devices including masks, and any that are said to have antiviral properties need the agency's thumbs-up before they can be sold to US customers. So far, the FDA says, it's not aware of any legit mask intended to neutralize the virus. Bottom line: Face covering or no, washing your hands and keeping your distance from others remains crucial to staying healthy.





NANODIAMOND NEUTRALIZERS

Master Dynamic, an engineering company in Hong Kong, is looking to insert nanoscale particles of lab-grown diamonds into masks. The company claims its specially created nanodiamonds can bind to the virus's envelope, disabling its ability to replicate.

WHEN CAN I GET ONE?

Master Dynamic hopes "optimistically" to get the masks to market this year. It expects them to be affordable for most consumers—nanodiamonds, smaller than dust specks, are cheap.

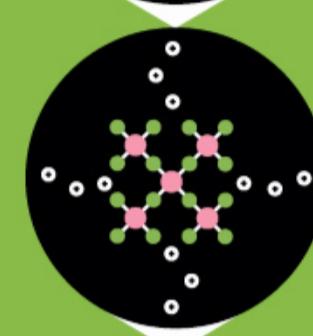
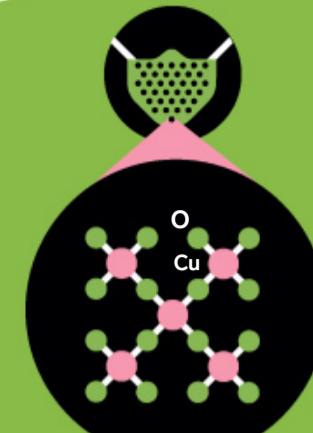
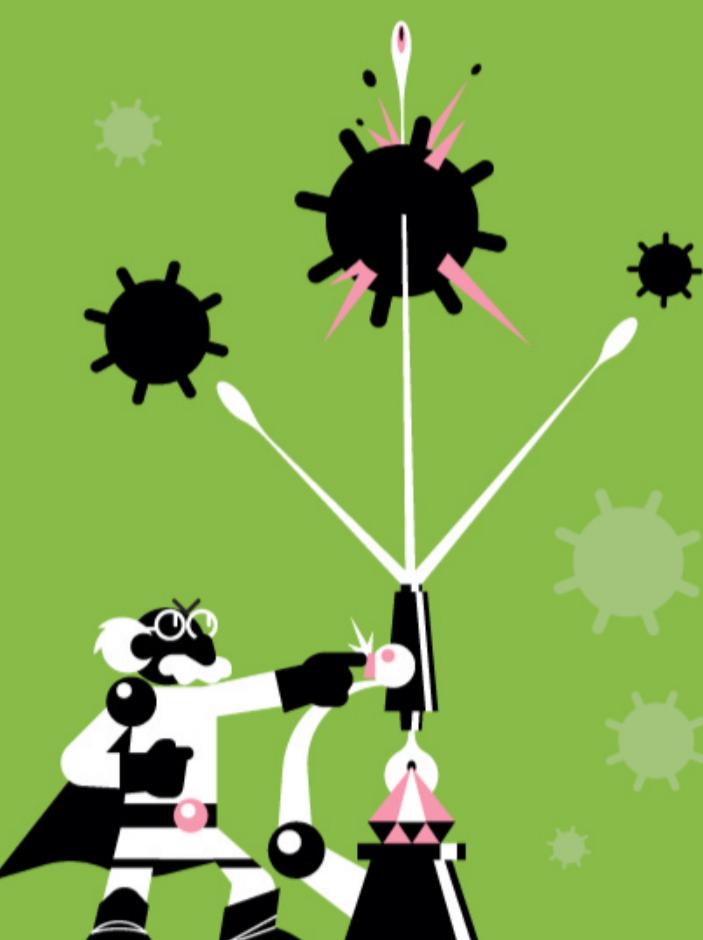


SHOCK THERAPY

An Israeli startup and researchers at Ben-Gurion University are developing a filter containing laser-induced graphene, a porous, conductive foam that they say can capture bacterial and viral particles. Running electricity through the conductive graphene would then kill the microbes. The team planned to target the air- and water-filtration market, but then came Covid-19, so they started looking at adapting the tech to masks. The idea is, you wear a graphene-infused mask out and about, and once you're safely home you disinfect it, perhaps by plugging in a USB input.

WHEN CAN I GET ONE?

"Validation and more research is needed," says BGU's Christopher Arnsch. There's also the question of whether the masks can be produced cheaply enough to be commercially viable.



FATAL FIBERS

Argaman Technologies, an Israeli textile research company, claims its BioBlocX masks contain cotton and polyester fibers embedded with accelerated copper oxide particles. Similarly to Sonovia's tech, Argaman says that when virus particles hit the mask, positive ions from the copper attach themselves to the virus and destroy its ability to replicate. The masks also include a layer of a nanofiber membrane that allegedly filters out pathogens.

WHEN CAN I GET ONE?

The company sells to the public via its website. But remember, at press time, the FDA hadn't given a thumbs-up to any antiviral mask.



ENERGY STARS

To cut the carbon, web designers are cutting the code. Call it green programming.

BY CLIVE THOMPSON

Danny van Kooten is a Dutch programmer who decided to reduce his carbon output by no longer eating beef or flying. Then, five months ago, he made a change that had an even bigger impact—and it took only a few key-strokes. ■ Van Kooten is the author of a popular WordPress plug-in that helps website owners use the mailing-list service Mailchimp. Install van Kooten's plug-in and visitors can sign up for your Mailchimp list directly via a form embedded on your site. His plug-in also makes the site slightly larger by adding several thousand more lines of code. Every time someone visits your page, a server has to send part of van Kooten's code to their browser. Sending data to a browser uses energy; the less code you send, the less energy you use. ■ So van Kooten decided to slim things down. He "refactored" his plug-in, making it more efficient, so now it sends 20 KB less data. Overall, the site would use a little less energy every day. ■ Of course, 20 KB is a teensy reduc-



tion. But since 2 million websites use his plug-in, it adds up. By his crude estimate, trimming the code reduced the world's monthly CO₂ output by 59,000 kilograms, roughly the equivalent to flying from New York to Amsterdam and back 85 times.

Not bad for two hours of hacking. "The code thing has been by far the biggest thing I could do," he marvels, "and it's crazy, because it takes a lot less effort than not eating any meat."

Van Kooten's aha moment is one being shared by web designers around the planet. They call it "sustainable" software design, and it's propelled by technologists measur-

designers at Mightybytes reported.

Even our throwaway habits can add up to a mountain of carbon. Consider all the little social emails we shoot back and forth—"thanks," "got it," "lol." The UK energy firm Ovo examined email usage and—using data from Lancaster University professor Mike Berners-Lee, who analyzes carbon footprints—they found that if every adult in the UK just sent one less "thank you" email per day, it would cut 16 tons of carbon each year, equal to 22 round-trip flights between New York and London. They also found that 49 percent of us often send thank-you emails to people "within talking distance."

Our throwaway habits can add up. If every adult in the UK sent one less "thank you" email per day, it would cut 16 tons of carbon each year.

ing the energy budget of nearly every swipe and click in our information ecosystem.

It's a target-rich environment. Because so much of our lives is brokered by software, tiny nips and tucks can be transformative. They can even be quite lovely: This spring, a group of students designed an Instagram filter that reduces the file size of a photo you post by 40 percent. It turns the image into a retro pointillization reminiscent of a mid-century black-and-white newspaper photo. The goal wasn't just to save energy but to produce something so cool-looking that people would "want to use it," as Danique de Bies, one of the students, told me.

Recoding our digital world to use less energy often makes it more pleasant too. Consider, say, all that ad code that bloats websites—megs and megs of crap. We hate it for spying on us, but it also slows page loading to a crawl.

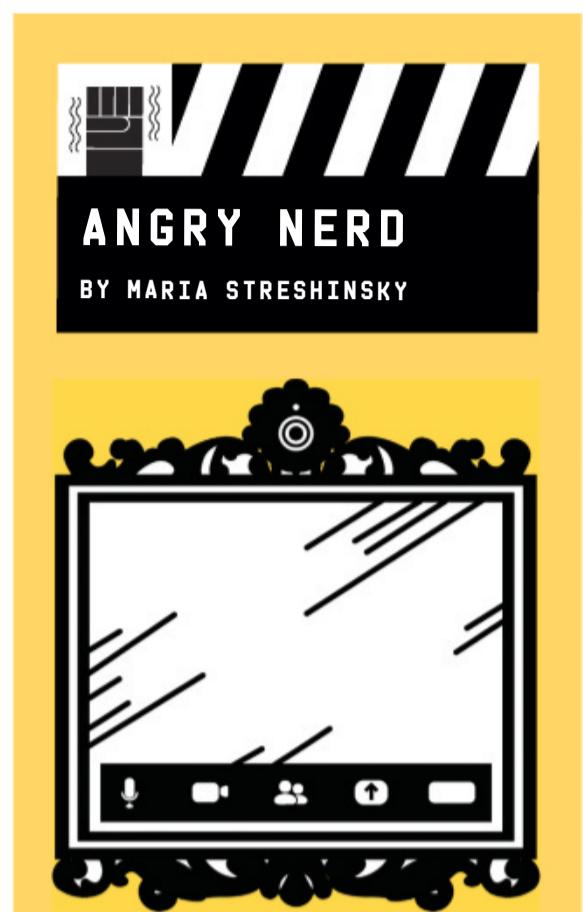
"It's constantly pinging servers; it's not very efficient," says Tim Frick, founder of Mightybytes, a green web consultancy. "All of that information really adds up." When the European Union's regulations forced US companies to remove some tracking code from their sites for European visitors, *USA Today*'s homepage shed 90 percent of its data size and loaded 15 times faster, as the

We can lower our carbon output if we'd just take the headphones off for a minute and stop behaving like a bunch of morlocks.

Granted, there's an obvious rejoinder to this design movement: Why focus on individuals? To hit really juicy targets for carbon reduction, look to big infrastructure. Sixty-one percent of all online activity comes from purveyors of video. (Netflix alone accounts for 13 percent of it.) Bitcoin's annual emissions are roughly those of Sri Lanka. Or look at AI. Training a single AI model can generate up to five times the lifetime CO₂ of a car, as research by computer scientist Emma Strubell and her colleagues has found. Those areas need efficiency overhauls—now.

But even if small design tweaks don't zero out the belching emissions of movies or bitcoin, they are still worth talking about. It's good to shine a spotlight on the CO₂ footprint of our daily software—it makes the value of lower-energy code feel tangible. Imagine if websites ditched their tracking bloatware and ran badges boasting about their spiffier performance and lower carbon footprint. Competitors would be green—with envy. ■

CLIVE THOMPSON (@pomeranian99) is a WIRED contributing editor. Write to him at clive@clivethompson.net.



MIRROR, MIRROR ON THE MONITOR

The skin above my left eyelid is migrating. Where it's headed, I'm not sure. All I can glean from the giant image of me on Zoom is: downward. Perhaps the skin is seeking rest on the pillows that have appeared below my eyes. (Hello, my wrinkly Eastern European foremothers—I see you in my face.) Day after day, for eight, nine, 17 weeks now, logging on and off and on again, waiting for coworkers to arrive in endless Zoom rooms, there I am. Staring at me. I've seen the droop drop, the lines etch, the chins multiply. Oh, those chins! Between meetings, I feel their weight. Even when I turn the camera off, walk away, the insecurities follow. My mind disobeys reason and wanders to them, ad nauseam. Blam: It's like I'm 20 again, spending far too much time in these tedious loops. The gift of being extra decades older is you live through shit-happened (and therapy), and with that comes the knowledge of what is and is not truly important. *Important:* the health of my family members, people losing their jobs. *Not important:* the state of my face folds. (Debatably important: which wrinkle cream to buy.) Yeah, yeah, I know. Filters, backgrounds, soft lighting, \$4 apps that can frame me in complementary colors. Or, hell, just turn off the video so I can't see myself or be seen. Can't do that, though. You might as well tell me to turn off my face walking down the street. Zoom is life now. I see you, you see me. Still, I hear that it might be safer during a pandemic to Zoom in masks.

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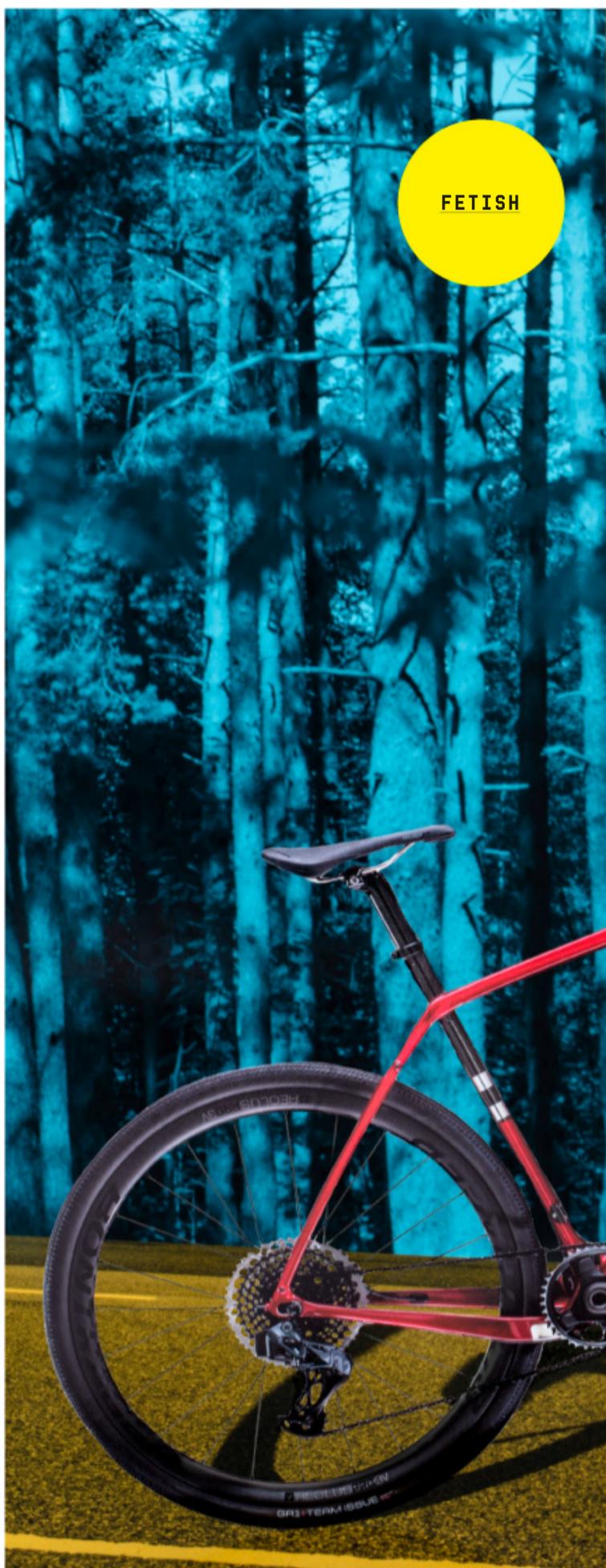
PHOTO BY PAUL RAISIDE

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Fresh Spin

Neither brutal headwinds nor deep gravel can deter this adventure bike, which is equally graceful on gnarly roads and scenic country lanes. —Stephanie Pearson



TREK CHECKPOINT SL 7

When it's OK to go out and about, do so carefully by choosing an activity that by its very nature is socially distant. Like cycling. Trek's new carbon adventure bike, Checkpoint SL 7, is a good accomplice that gobbles up any type of road you put under it. The IsoSpeed frame is forgiving, with some flex at the point where the seat tube and top tubes meet, just beneath the saddle. This design soaks up bumps on rough terrain without sacrificing the snappy responsiveness I expect from a high-performance two-wheeler. The bike's new SRAM 12-speed wireless electronic drivetrain gives it at least 20 hours of cable-free shifting per charge and lets cyclists hyper-tune the controls by adjusting the shift points through Trek's companion mobile app. The dropout—where the rear hub attaches to the frame—lets you nudge the wheel backward up to 15 mm, making the bike a little more stable when it's loaded up with enough bags, water, and gear for a long and wild ride.

\$6,000

LEVEL
UP

Look, It's a Bird

Whether you're hiking in the forest or just watching from home, these binoculars are the best ways to bring your feathered friends closer. —Scott Gilbertson

\$90

Economy**PENTAX AD 8X25**

These are the best budget binoculars I've tried, and they're a good starting point for fledgling birders. They're lightweight (10.6 ounces), with fog-proof optics that are well-padded to protect against accidents. The field of view is wider than on more expensive models, but that's not a bad thing for newbies—you'll be able to find your subject quickly when you bring the binoculars to your eyes. The smooth focus knob makes it easy to dial in the view, and the image is clear, with little of the purple fringing at the edges that can be found in the lenses of cheaper models.



\$2,199

First Class

LEICA 10X42 ULTRAVID HD-PLUS

The Bugatti of binoculars, Leica's Ultravids will make you the envy of your birding buddies. I know what you're thinking: Are they worth the price? Yep. The precision optics, made of fluoride glass, provide better clarity and sharpness than any other pair I tried—which is exactly what you'd expect from Leica, maker of iconic high-end cameras and hunting scopes. They also have a coating that repels water and dirt. If you can afford them, you won't regret the expense.

\$330

Business

NIKON MONARCH 5

10X42

These binoculars are the perfect upgrade from less expensive, compact models. Long one of the most popular pairs on the market, the Monarch 5 is still light enough (21.5 ounces) to carry easily on all-day hikes. The rubber coating ensures they don't slip and slide in your hands, but the real reason to buy them is the optical clarity—the image quality is a dramatic upgrade from the cheaper options you'll find out there. Details are crisp, focusing is fast and precise. Nothing else in this price range will make a bird's feathers look so fabulous.

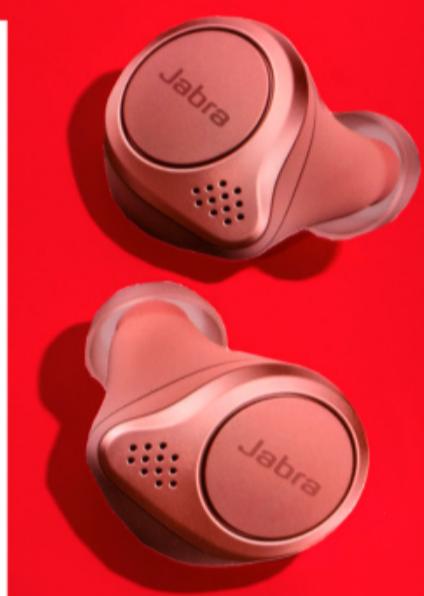
Runner's Hi-Fi

These in-ear headphones are made for working out, with sweatproof designs that stay put when things get steamy. —Parker Hall

\$200

JABRA ELITE ACTIVE 75T

A sure path to peace of mind is to choose earbuds that are as rugged as possible. The Jabra Elite Active 75t are rated as fully dust- and waterproof. Ergonomic design made them super comfortable on my runs and indoor workouts, with multiple eartip sizes that all but guarantee a perfect seal for the whole 7.5 hours of battery life. You may remember being embarrassed by your parents' Jabra hands-free phone earpieces a decade ago, but those years of telephony experience means these buds sound fantastic and work exceptionally well for calls and Zooms. (But you should really log off and get outside.)



LEVEL UP



\$30

JLAB GO AIR

It's awkward to spend a fat stack of cash on something that could tumble down the storm drain when you zig to avoid someone's 6-foot safety zone. That's why I love the JLab Go Air. The wirefree earbuds have the same five hours of battery life as Apple's AirPods, with comfy silicone eartips and water resistance that laughs off sweaty workouts—all for the price of three super burritos. They're not the best-sounding earbuds around: They lean heavily on bass, but that low-end energy can actually help you get through a jog. The best part? You won't stress too hard when one of them inevitably goes missing.

\$150

BEATS POWERBEATS

Beats' latest in-ears for workouts are doppelgängers for the much more expensive (and wirefree) Powerbeats Pro, except for the cable between the buds. That wire has benefits beyond the security of making these headphones much harder to lose: It saves battery life and manufacturing cost, which means the corded Powerbeats have 15 hours of juice and sell for \$100 less than their cordless cousins, even though they share the same great sound. They work well with Android phones, but iPhone users will get a more seamless experience thanks to a chip inside made by Apple, which owns the Beats brand.



W O M E N

Photograph / Jennifer Chase

W H O

T R A V E L

P O D C A S T

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L I S T E N O N S P O T I F Y / A P P L E P O D C A S T S

TOP 3

Find Yourself

Head for the hills wearing one of these GPS watches. Each can measure your performance in multiple sports, and their batteries will far outlast your stamina. —Adrienne So



\$550

GARMIN FENIX**6S PRO**

Garmin's Fenix series of wearables are the best all-around outdoor sports watches. When I'm lost in the woods, I can scroll through detailed maps on the 1.2-inch color display, using the built-in compass to orient myself. By selecting different time intervals to ping GPS and Glonass satellites, I can also slow the rate at which the location-finding drains the battery. Not only does the watch track granular data on everything—pace, altitude, blood oxygen levels, and heart rate—the accelerometer that counts my steps can also detect a fall, alerting my emergency contacts if I accidentally stumble off a cliff.

\$430

POLAR GRIT X

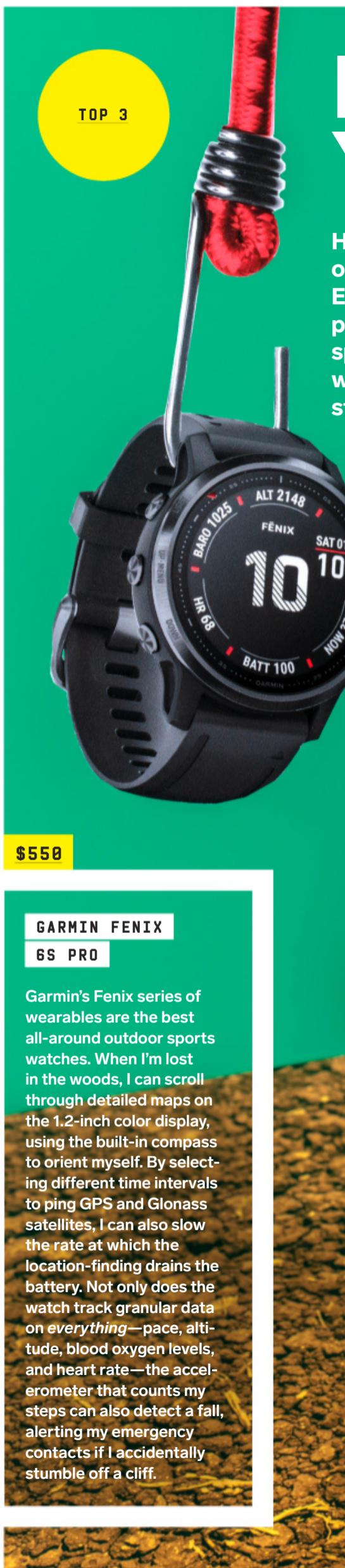
For long days on the trail, Polar's watch buzzes with the occasional reminder to eat or drink; since it's tracking the duration and intensity of your workout, it knows the best times to fuel up. The Hill Splitter feature logs the speed of your ascents and descents in rolling terrain so you can incorporate that data into your training goals. My favorite feature is the big battery; I can leave GPS tracking on for 100 hours, twice as long as the competition.



\$150

FITBIT CHARGE 4

Most devices as small, simple, and affordable as the Charge 4 don't have features like built-in GPS. The inclusion of location tracking here makes Fitbit's slim wearable a great choice for people who like more rigorous outdoor activities but don't need a big, battery-blowing color touchscreen. The new Outdoor Workout feature doesn't just measure heart rate. Sync it to Fitbit's mobile app and it can plot the points on a map where you worked the hardest and show how long you spent in different zones: fat burn, cardio, or peak effort. It's a great feature for casual Fitbitters curious about high-intensity training.



Helping to Stop Leaks in Silicon Valley

Dear Titans of Tech,

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Sincerely,
Glad®



The greatest
innovation ever.
(In trash)

Escape in New York

When circumstances beyond our control put adventure on hold, we just climb the stairs to camp out in the urban jungle. —Kate Knibbs



“Quick, grab the binoculars!” My husband and I stand up from our camping chairs. I put my thermos down next to our other provisions—oranges, granola, two types of sunscreen—and squint through the lenses. “Is that an eagle?”

Not quite. It’s just a robust crow, perched on a condo. It was the first beautiful weekend of the year and we’d wanted to bask in nature, but the pandemic limited our options. We can’t be picky about wildlife encounters, as our campsite for the foreseeable future is the roof of our Brooklyn apartment building.

The building was once a three-story 1930s dairy plant with art deco flourishes, remodeled a couple of decades ago into an eight-unit residence. We feel lucky to live in a historical landmark, even with its old-building quirks, like pinging radiators and fickle water pressure. Last year it sold to a new owner with a rather laissez-faire approach to maintenance. The roof is not like the sumptuous sky decks on nearby high-rises, with professional landscaping and handsome patio furniture. Ours

is bare, with a rubbery gray coating occasionally interrupted by strips of plain black bitumen. A rusty ladder leads to a rusty flagpole. Wires of unknown provenance snake haphazardly along the ledges, and I like to imagine them as the infrastructure that once powered pirate radio. But the neglect works in our favor—nobody cares about it but us. It requires only a little imagination to see it as an urban campground, not exactly off-grid, but removed enough to momentarily unplug.

We’ve built a small garden by filling a series of scavenged pots and buckets with seedlings purchased from our local plant shop. The mint is promisingly tall, and we’re bartering for some zinnias on Craigslist. Plus, the fauna isn’t limited to corvids. A family of carpenter bees swoop around the roof’s perimeter; one curious member frequently hovers near the door, eyeing anyone who comes upstairs. Bumblebees zoom around too, but they’re chiefly concerned with the gangly yellow florets sprouting from last season’s kale. Starlings and sparrows hop along tree branches in our sight

line. Squirrels sometimes chitter to one another as they hug the trunks.

Another species abounds too. The people-watching during a pandemic is captivating. We survey the latest in mask fashion—bandannas are trendy, and it’s rare to see an N95 in the wild. One neighbor loves to take calls on his balcony just as much as he loathes wearing shirts. Young guys pop wheelies on motorbikes. Hasidic children race scooters while their mothers stroll and chat. At 7 each evening, people clap for frontline workers. One night the shirt-hater screamed, “I LOVE HEALTH CARE!” Not the stereotypical sounds of nature, but these outbursts of solidarity are more heartening than a babbling brook. They are the calls of a community eager to make contact. Since most of our encounters with other people are mediated through screens right now, it’s a relief to see and hear strangers out in the world.

To be sure, the roof has had, and facilitated, tough times. Like when I took my sister up there while she was visiting, and we fled after she picked up her wine glass and a cockroach dangled from its base like a wine charm from hell. Or the time a rat died and its corpse melted into the asphalt, turning everyone’s stomachs for weeks. The roof lacks natural shade, and stepping through its door on a sunny afternoon can feel like walking into a giant kiln. There’s no water, and no firepits to be found.

Then again, we don’t have to worry about bears or storms or digging a hole to serve as a toilet. And we’re still carrying out many satisfying rituals: Hiking up the stairs isn’t the same as ascending a mountain, but my calves burn on days when we lug up water jugs for the plants. We’re picnicking and lounging and stargazing. Disconnected from Wi-Fi, we ignore our phones in favor of one another. So what if we have to make s’mores down on the kitchen stovetop? We are privileged to have any outdoor space at all, let alone a slice of sky with a view of Manhattan. Maybe someday I’ll pitch a tent in British Columbia or rent a hut in southern Thailand again. For now, though, I’m finding this improvised approximation of camping to be suited to the moment. Instead of taking me outside of the city, it provides an ideal vantage point to appreciate the neighborhood’s splendor, both natural and human. ■

KATE KNIBBS (@Knibbs) writes about culture for WIRED.

12:29 ↘



InstaGuac



Slyder



ShrimpTail



Mash Photato



Tomato Zoop



Party Faves



eLote



iDip



Crostinemoji



Kso



OOOystar



Mozzarellaflix



Meatball Mobile



Octo+



Potstickr



Wikipizzas



Designed for a world
that runs on apps.

Appetizers that is. With more
leak prevention technology
than ever, the ForceFlexPlus
can handle thousands of apps.
That's why it's the greatest
innovation ever. (In trash)



GAME/NOT A GAME

Videogame developer Naughty Dog was racing to finish the sequel to *The Last of Us*, its blockbuster set in a post-pandemic dystopia. Then it was hit with a series of crises—trolls, hackers, impatient fans, and a real pandemic.

BY DARRYN KING



Courtesy of Naughty Dog/Sony Interactive Entertainment

It's crunch time in the offices of Naughty Dog, the storied videogame developer in Santa Monica, California. On the morning of February 6, more than 300 artists, designers, and programmers are assembled in a maze of workstations, applying thousands of final micro-touches to a game they have been crafting for nearly six years called *The Last of Us Part II*. Neil Druckmann, the game's 41-year-old director, inspects the computer-lined trenches with the swept-back hair, frizzled beard, and beleaguered

look of Jon Snow during a long battle.

Druckmann's adversaries? Time, his own perfectionism, and the reactions of a bunch of strangers off the street.

Since February 2017, Naughty Dog has been inviting scores of gamers to its offices to test out the active construction site that is the unfinished game. These playtesters, as they're called, consent to being filmed as they move through the game; then they fill out questionnaires and meet in groups to discuss what's working and what isn't. Back

in the early stages of playtesting, Naughty Dog was troubleshooting the rough infrastructure of the game: how its world holds up, what people felt drawn to, where they got lost. Now, during this agonizing final stretch of development, Druckmann's team is watching for players' minute responses to the narrative and emotional beats. In the videofeeds piped out of the playtesting room, the dev team logs and annotates every clench of the jaw and widening of the eyes. Druckmann has even taken to spying on the gamers live from his office.

This week, some of the team is focused on a particular sequence that needs attention. The animators are finessing a certain character's performance, while artists adjust the lighting, all in hopes of eliciting different responses from the playtesters on the next go-round. All of it stems from Druckmann's obsession with stretching the narrative dimensions of videogames to offer players more than just fun. "Certain sequences have to be tense. Certain sequences have to feel claustrophobic. Certain sequences have to feel lonely," he says. "I'd just like us to expand the vocabulary."

Back in the early 2000s, gaming pioneer John Carmack told writer David Kushner that "story in a game is like a story in a porn movie. It's expected to be there, but it's not that important." And true enough, knuckle-whitening gameplay and drool-inducing visuals are still typically top priority for the major videogame studios. But for many years Naughty Dog has dedicated its whole pipeline and decisionmaking process to the contrary proposition—that story is everything. Very few games have vindicated that proposition as strongly as Druckmann's hugely successful 2013 opus, *The Last of Us*.

It was a game in the basic guise of a zombie shooter, but with a plot inspired by Alfonso Cuarón's *Children of Men*, a vision of a depopulated planet inspired by the book *The World Without Us*, and a severity of atmosphere inspired by the Coen brothers' *No Country for Old Men*. The story takes place in a world ravaged by a pandemic. A parasitic fungus has made the leap from insects to humans, turning its victims into zombies that sprout fruiting bodies from their heads, an idea Druckmann picked up from a *Planet Earth* segment about a real insect-zombifying parasite. (*Scientific American* commended

the game's scientific plausibility.)

You play as the bone-tired, battle-hardened Joel, a middle-aged smuggler not yet over the death of his daughter, who teams up with Ellie, a 14-year-old orphan whose infection-resistant DNA may be humankind's last hope. Twenty years after the outbreak, the duo sets off on a cross-country odyssey, through urban spaces reclaimed by nature, contending with the roaming infected, plus a ruthless military, vicious anarchists, and cold-blooded cannibals.

But there are tender shoots of beauty amid the rubble: the introspective melancholy of the soundtrack by *Brokeback Mountain* composer Gustavo Santaolalla with its spare, down-tuned guitar; the wonder with which Ellie beholds the remnants of civilization; and, at the center of it, the sense of found family, anchored in the deeply felt motion-capture and vocal performances of the actors who play Joel and Ellie, Troy Baker and Ashley Johnson.

Over its 15 to 20 hours of gameplay, *The Last of Us* conveys the immensity of cinema, the intimacy of a novel, and the sheer storytelling payload of, let's say, one or two seasons of an HBO series. It leads to an explosive climax that taps into the full power of the interactive medium: In a final violent showdown, Joel has no choice but to damn the world in order to save Ellie. It would be a heart-stopping scene if you were to watch it spool out on TV. But experiencing it while playing the character of Joel yourself? The ending generated Red Wedding-like shock waves, inspired passionate debate, and expanded people's ideas of what videogames are capable of.

Which all means, of course, that the sequel has a huge act to follow—and maybe even a target on its back. The more invested fans become, the greater the chance they will eventually turn against the creators. (See *Game of Thrones*, *Star Wars*, *Mass Effect*, et al.) And *Last of Us* fans are seriously invested; after all, they haven't just binge-watched the game's characters, they've inhabited them for hour upon hour. There's a TED talk, as well as numerous YouTube videos and Reddit threads with titles like "*The Last of Us* Changed My Life." An astonishing number of expectant fans are already sporting elaborate *Last of Us Part II* tattoos.

Druckmann and Naughty Dog, meanwhile, are determined to one-up them-

selves. *The Last of Us Part II* is arguably the biggest, most ambitious, most ravenously anticipated game in the notoriously ambitious studio's 36-year history. But for a team that has nudged games closer to the sensibilities of prestige television, the sequel's rollout has itself been subject to some pretty outrageous plot twists.

First came a self-inflicted delay. The sequel was originally due to come out at the end of February, but in fall 2019, the studio pushed the release date back to May. ("The size and scope of this game got the better of us," Druckmann explained in a blog post.) Then came the plague.

At the time of my visit to Naughty Dog in early February, floor stands of Purell hand sanitizer dotted the office; the World Health Organization had just declared a "public health emergency of international concern" over a novel coronavirus that emerged out of Wuhan, China.

In short, the rollout of a videogame set in the aftermath of a fictional pandemic was about to be thrown into disarray by a real one—and also, for good measure, by a group of hackers, an army of trolls, a sea of resolute fans, and the storm of resentments and transformations that have roiled gaming for nearly a decade.

Neil Druckmann was born in Israel in 1978, and he spent countless hours of his childhood on the family computer, learning English partly by playing text-based adventure games like *King's Quest* and *Space Quest* while consulting a Hebrew-English dictionary. Every night, the family would watch the news together: "Local conflicts, terrorism, threats of war and retribution," he says. "It was ubiquitous."

Partly to escape that tense atmosphere, Druckmann's family moved to the US when he was 10. His awe at seeing his new home for the first time, he says, was part of what inspired Ellie's reaction to seeing the ruins of great American cities in *The Last of Us*.

Druckmann, who still retains traces of an accent, was a precocious reader and wannabe animator, but his parents steered him away from pursuing an education in the arts. Instead, he studied criminology at Florida State University, thinking he could be an FBI agent who wrote novels on the side. He took a programming class as an elective, though, and something clicked. "Wait," he recalls thinking, "this is

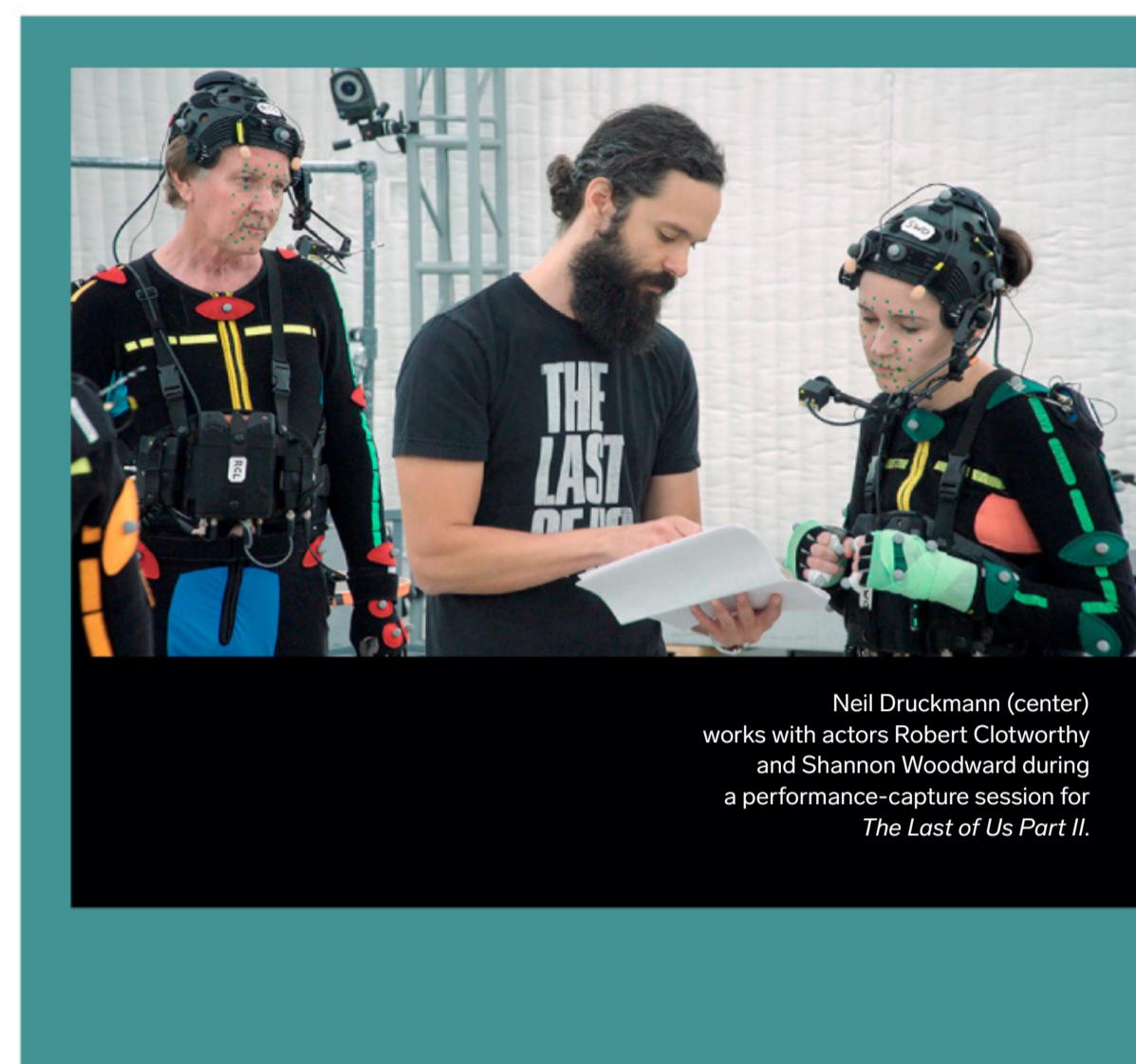
how people make videogames!" A natural coder, he switched his major to computer science and eventually picked up a master's in entertainment technology at Carnegie Mellon.

In 2004, he took a summer internship with Naughty Dog and never left. After a grueling year and a half of programming, he talked his way into the creative departments, working as a writer and designer on the action-adventure title *Uncharted: Drake's Fortune*. He took on an even larger role in the sequel, still straddling writing and design. *Uncharted 2: Among Thieves* boasted epic set pieces that unspooled, in the parlance of the industry, "on the stick"—as the player played—instead of in passive cinematic cut scenes. It was a thrilling exercise in how to intermesh story and interactivity—in what he and his cocreators called "the active cinematic experience."

Inspired, Druckmann began attending writing seminars. He inhaled a copy of Robert McKee's screenwriters' bible, *Story*, which would become a yearly read. By the time he'd gained enough clout in the studio to pitch a new game, he was hooked on a concept: Could you represent the growing bond and shifting dynamics between two contrasting characters through gameplay, and do it in a way that mirrors the connection between the player and the characters? That idea became the main kernel of inspiration for *The Last of Us*.

In an early version of *The Last of Us*, then titled "Mankind," only women were susceptible to the parasitic fungal infection that brings down civilization. In that version, Ellie was the only female believed to be immune. But that concept, Druckmann said in a 2013 speech, was a terrific failure. "The reason it failed is because it was a misogynistic idea," he confessed. "A lot of the female workers at Naughty Dog came up and said, 'I don't like this idea. I understand what you're trying to do—it is ultimately a story about the love of a girl—but the way it's coming off is you're having a bunch of women turn into monsters and you're shooting them in the face.'"

Druckmann reworked the plot. Then he became a father. Having an infant daughter quickly charged him with the awe and terror of caring for a child. It also deepened his growing conviction that videogames had to do better at representing female characters—beginning with his own.



Neil Druckmann (center) works with actors Robert Clotworthy and Shannon Woodward during a performance-capture session for *The Last of Us Part II*.

This "awakening," as Druckmann calls it, further cemented his desire to turn Ellie into the most fully realized, nonsexualized female protagonist in videogames—an ambition that met with no small amount of resistance from other quarters in the gaming community. Early focus groups reacted poorly to Ellie, and later, marketing gurus advised against featuring her on the box art. Druckmann stood his ground.

By any measure, he was vindicated: *The Last of Us* sold 1.3 million units in its first week and went on to reach a total of more than 17 million, making it one of the highest selling PlayStation games ever. Among its many accolades, *The Last of Us* won Game of the Year at the annual awards presented by the Academy of Interactive Arts & Sciences, gaming's take on the Oscars.

So Druckmann and Naughty Dog kept pushing the envelope. In 2014 they released *Left Behind*, an expansion pack for *The Last of Us*—a kind of minigame that takes place, in part, before Joel and Ellie meet. This time, gamers played not as Joel but as a teenaged Ellie, and during the game, Ellie kisses her female best friend. One gaming critic called it "the first example of intimacy in a videogame that's meant anything."

Then in 2018, Ellie came fully out of the closet. At that year's E3 Expo, the game industry's marquee annual event, Naughty Dog unveiled a scene from *The Last of Us Part II*, with Ellie sharing a dance, and a kiss, with a new female character named Dina.

"I remember being in the room when that trailer was first shown," says Keza MacDonald, *The Guardian's* videogames editor, who is queer, "and thinking, you know, a few short years ago I was sitting here with my head in my hands because the latest *Assassin's Creed* had four playable men and no women, because female characters were 'too hard to animate.' And this year Sony is leading its E3 conference with a game starring a gay woman. Maybe everything isn't terrible."

At Naughty Dog, says Druckmann, the goal of deepening narratives in videogames has wedded itself naturally to the studio's commitment to represent diversity in game characters—which in turn has attracted new talent. To help him cowrite *The Last of Us Part II*, in 2016 Druckmann brought in a television and film screenwriter named Halley Gross. "Our goal is absolutely to create the most multifaceted characters you've seen in games," says Gross, who spent 13 months working on the first season of

HBO's *Westworld*. By comparison, she has spent three and a half years writing *The Last of Us Part II*. And she and Druckmann have drawn extensively from the rest of the team, Gross reports; queer staffers have helped in the writing of queer characters, adding dimension and complexity: "I think we're doing right by the LGBTQ+ community, who have often been drawn with a broader brush."

Not long after the release of *Left Behind* in 2014, the Gamergate controversy erupted, turning questions of representation and gender in videogames into some of the most toxic issues in American cultural discourse. Today there are plenty of gamers who proclaim that political correctness has ruined videogames, or to quote the title of a discussion of the issue on a gaming forum, "liberal politics infected Naughty Dog."

But it is these players' loyalty to *The Last of Us* that fills them with such distrust of its creator. "*TLoU* is my favorite game of all time," one fan tweeted at Druckmann "Please try to keep your personal politics out of *Part 2*. Thank you very much."

Compared with the first game, perhaps the simplest thing to say about *The Last of Us Part II* is that it is bigger: It has more characters, more room to explore, more to do. Your allies and opponents are smarter. Even the haptic-triggering signals delivered to the DualShock controller in your hands have been more carefully calibrated. The setting, for much of the time, is Seattle, four years after the events of the first game. There are ferns and firs growing in the streets of Pioneer Square, and a river of floodwater runs alongside the ivy-covered concrete guideway of the monorail. Naughty Dog artists traveled to the city, capturing photorealistic textures, topography, the precise quality of the overcast city's ambient lighting. Seattleites will be able to visit the debris-ridden remains of downtown coffee shops.

Ellie, after being playable for just a couple of riveting sections in the first game, takes center stage this time. Now 19, her appearance is more detailed and more closely resembles Ashley Johnson, with facial performance-capture tech used for the first time in the franchise. The artists worked hard to get her clothes to wrinkle authentically, while one sound designer

Before teaming up with Druckmann to cowrite *The Last of Us Part II*, Halley Gross worked on the first season of HBO's *Westworld*.



"Our hope is that players who might not have related to someone like Ellie will find a part of her that is familiar," Gross says. "You're walking in her shoes, you're empathizing with her."

DARRYN KING (@DarrynKing) wrote about the making of *Gemini Man* in issue 27.10.

invented a system that tracks Ellie's exertion level and plays respiratory audio effects to match. Animators even labored over such blink-and-miss-it details as, well, blinking—the mere opening and closing of eyelids feels more fleshy and organic. "Real life is the bar," says the game's codi-

rector Kurt Margenau. In comparison, he says wryly, "*The Last of Us* was a baby game for babies."

During my visit, everyone at Naughty Dog vigilantly guarded details of the game's plot. What's clear is that *Part II* follows Ellie on a personal quest for vengeance, while a war

rages between two rival militia factions called the Washington Liberation Front and the Seraphites. The game's cycles of violence faintly mirror those in the part of the world where Druckmann was born, along with the factions and divisions in the US today. "This one was much more inspired by real-world events," Druckmann says.

The idea is to complicate the player's feeling of inherent righteousness. "Justice is so much about perspective," Druckmann says; the sequel is built to challenge your sense of "the morality of the character you're inhabiting."

Compared with the usual videogame depictions of meaningless and over-the-top violence, there's a terrible weight to the bloodshed in *The Last of Us Part II*. Go on, take out another anonymous baddie with a rifle or nail bomb or flamethrower or brick—and then feel your satisfaction curdle when his buddies cry out his name in shock and grief. Even the dogs in *The Last of Us Part II*—which sniff out your scent trail and attack when they find you—are some of the most intelligent, realistic dogs in videogames ever. In Naughty Dog's offices, playtesters have been horrified to find themselves committing acts of canine carnage. Yelps and whimpers and whines ring out, not all of them from the dogs. "It makes players feel dirty, and that's part of the point," Druckmann explains.

The game also goes to the trouble of realistically grappling with trauma, according to Gross, who says that she drew on her own experience with post-traumatic stress. "Joel and Ellie are complex people who've done really rough things," she adds. "We have to honor not just that but the trauma in their world."

Ideally, despite these bleak, heavy elements, players will be so caught up in the story they're unable to put the controller down. "We want you to try to empathize with that character, understand what they're doing, and say, 'OK, I'm going to role-play,'" Druckmann says, "I'm going to try to think the way this character thinks."

But Druckmann understands from his hours of watching playtesters that not everyone appreciates that. In fact, he says, some players *hate the game*. And he knows it will be the same for certain fans of *The Last of Us* out in the wild. "Some of them are not going to like this game, and not like where it goes, and not like what it says or

the fate of characters that they love," Druckmann notes. But he believes developers like him must learn to tolerate more discomfort: "I'd rather have people passionately hate it than just be like, 'Yeah, it was OK.'"

It's nearly 7 pm when I leave the studio that day in February. Much of the team is still at work, and dinner is being laid out. "The game is a living, breathing thing that's still evolving and growing and changing," Gross tells me, bringing to mind an interminable videogame boss battle—or a virus. But the game isn't all that's changing. That day, just over 300 miles away, a San Jose resident dies, in what would later be considered the first diagnosed Covid-19 fatality on US soil.

On one level, the faint connective threads between the news and the world of *The Last of Us* are simply eerie. "We did a lot of research about pandemics and outbreaks," Druckmann says, referring back to the days when he and his team were developing the first game. "Now we're witnessing superficial similarities that are surreal. Art imitating life imitating art." (A couple of fake Twitter accounts, created to promote *The Last of Us* in 2013, make for discomfiting reading today: "If you must travel outside," tweeted @SpringsHospital, "we recommend wearing a face mask.")

A few weeks after my visit, even before the government required it, Naughty Dog started shifting its team to working from home. "If we end up missing a production date, so be it," Druckmann declares.

But in the actual event, it isn't the creative process that holds things up: In early April, Naughty Dog announces that the game's release will be postponed indefinitely. In an interview, Druckmann indicates that it was due to concerns about coronavirus-related disruptions in international distribution. Gamers' impatience—the release date had been postponed once already—begins to mutate into indignation. On social media, anger and invective start flowing.

On Monday, April 27, Naughty Dog announces that the game will in fact be released on June 19, news that ought to turn fans' mood around. But the bigger news that day is that hackers have leaked a trove of potential plot spoilers and gameplay footage to YouTube.

The leak opens the floodgates of vitriol from the gaming community even wider. As Druckmann had predicted, there are

plenty of people who don't care for the game's apparent politics or where the story seems to go—even though they lack the full context of the narrative that Naughty Dog's obsessives have been stitching together for six years. Druckmann is bombarded with anti-Semitic slurs, death threats, and messages informing him he has ruined the franchise; one YouTube personality posts a video arguing that *The Last of Us Part II* "could damage gaming for years," which quickly racks up hundreds of thousands of views.

The term "release date" has rarely seemed so doubly apt, suggesting the devs' liberation from what has become a strange extended nightmare. For Druckmann, at least, the *Last of Us* saga continues: In March, HBO announced that it will be adapting the game into a series, with Druckmann writing and executive producing alongside *Chernobyl* creator Craig Mazin.

But in the meantime, the game's creators get by on optimism: Maybe, just maybe, the narrative and empathic power of a game like *The Last of Us Part II* can move even its skeptics. "Our hope is that players who might not have previously related to someone like Ellie will find a part of her that is familiar," Gross says. "You're walking in her shoes, you're empathizing with her struggles and dreams."

Indeed, I'm told of at least one playtester who came away from *Part II* saying, "I think I have to change my beliefs." Druckmann's hours watching all those video feeds of people playing his unfinished game revealed its raw emotional power. "I saw one girl get to this sequence that took us a long time to get to land. And she's bawling. I'm watching her, and I'm starting to cry because she's crying, and I'm like, all these years of work for a couple-of-minutes sequence," he says. "It's all for this—just to be able to get this person to feel this experience."

On May 4, Druckmann posted a video to Naughty Dog's Instagram page announcing that his team had finally finished the game and had handed it off to be pressed and distributed. "No matter what you've seen or heard or read, nothing compares to playing this thing from beginning to end," he says. "It's a videogame. You've got to play it."



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**This is
Nathan
Wolfe.
We should
have
listened
to him.**

The San Francisco virologist worked with a 140-year-old German insurance giant to crack an impossible problem: how to insure businesses against rare but devastating pandemics. They created the perfect product. So why are we in this mess?

by Evan Ratliff

PHOTOGRAPHS BY CHRISTIE HEMM KLOK



“It’s really a 100-year thing,”

Nathan Wolfe said. It was 2006, and Wolfe, then a 36-year-old virologist with an unruly nest of curly hair, was sitting across a table from me at a bustling restaurant in Yaoundé, the capital of Cameroon. An epidemiology professor at UCLA, he had been living in West Africa for six years, establishing a research center to identify and study viruses as they crossed over from wild animals into humans.

That night Wolfe told me he was forming a network of research outposts around the globe, in hot spots where potentially devastating viruses were poised to make the jump: Cameroon, where HIV likely passed from chimpanzees into local hunters; the Democratic Republic of Congo, which had seen human outbreaks of monkeypox; Malaysia, home to a 1998 emergence of the Nipah virus; and China, where SARS-CoV had crossed over, likely from bats, in 2002. Wolfe’s hope was that by understanding what he called the “viral chatter” of such places, it would be possible not only to react more quickly to outbreaks but to forecast their arrival and stop them before they spread. The “100-year thing” he was thinking about was a global pandemic, and how history would judge humanity’s efforts to prepare for it. His biggest fear, he said, was a virus unknown to human immune defenses starting a human-to-human transmission chain that would encircle the globe.

As we knocked back Cameroonian beers and talked between sets of a local band, he admitted his project could fail. “It could be that we look at this and it’s stochastic—you can’t predict it,” he said. “Or, it could be that we are on the edge of a paradigm shift.” The ultimate question, Wolfe added, was “Will people look back and say you did a good job responding to epidemics, but you didn’t do anything to prevent them?” The 100-year notion so captivated me that I used it as the last line of a story I wrote in 2007, in this magazine.

Thirteen years later, as the SARS-CoV-2 virus burned across the globe this March, it appeared that the 100-year judgment had arrived. We’d failed both at preventing the exact danger Wolfe had warned us about and at responding when it emerged. He wasn’t the only pandemic Cassandra, of course. Not even close. Scientists, journalists, and public health experts had sounded the alarm for decades, filling journals, government reports, and popular books with their pleas. There were conferences, commissions, hearings, exercises, consortiums. Every few years another near-miss epidemic emerged that cried out for long-term preparation.

But Wolfe was the Cassandra I’d known, and I couldn’t help wondering what it felt like to be living through the pandemic you predicted. We had corresponded a few times since 2007, and I’d followed his career sporadically as he started a company called Metabiota. As best I could gather, he had transferred

his original idea of a disease surveillance network into a kind of epidemiological data company.

I dug up his email and wrote to him. “It must be a strange sensation,” I said, “to have been terribly right about something you didn’t want to be right about.”

When he called me the next afternoon, the US had just passed 4,000 cases of Covid-19, and Wolfe sounded beleaguered. “Right now I’m a little bit—what’s the right word for it—overwhelmed,” he said. But he seemed decidedly unenthusiastic about discussing his own prescience. “I’m not interested in Monday morning quarterbacking,” he said. “If you are the person who says the sky is falling and it falls, you definitely feel like saying ‘Why didn’t people listen to me?’ But there are a lot of people saying the sky is falling about other things, and it doesn’t.”

Nor was he particularly interested in casting blame—in offering an I-told-you-so from the intrepid virus hunter. “Plenty of people can speak to that,” he said. “It’s like *Good Vibrations*: I don’t want to play that anymore. I have a new record.” Now 49, Wolfe had traded the Cameroonian jungle for the conference rooms of Silicon Valley. When I saw him on Zoom, his shoulder-length locks

were gone, and his quarantine beard was shot through with gray. But he had the same glow of enthusiasm I remembered. His new preoccupation, he told me, was pandemic insurance.

I'll confess this didn't immediately pique my interest. The word *insurance* evokes in me feelings of tedium and loathing. Like many Americans, my personal interface with the industry has, let's just say, been less than positive. But then Wolfe began to explain the unexpected direction his career had taken. After years of thinking about epidemics in terms of the symptomatic and the dead, he'd begun considering their economic ramifications. A global pandemic, and the steps we would take to stop it, would mean business closings, layoffs, and mass unemployment. Preparing to face an outbreak, he'd come to believe, required anticipating those impacts.

This was where insurance came in, specifically a kind of pandemic insurance policy—for businesses, and perhaps even for countries—that would pay out as soon as an epidemic reached a certain threshold. In 2015, Metabiota had partnered with German reinsurance giant Munich Re and American insurance brokerage Marsh to develop and sell a policy specifically to guard large businesses against pandemics—to stanch the financial losses and keep them afloat. They'd launched it in mid-2018, a year and a half before the first Covid-19 cases appeared in China.

My sense of tedium evaporated. As Wolfe and I were talking, a total economic lockdown was in place, with millions of jobs disappearing by the week and lines at food pantries stretching by the hour. And here he was saying that they had come up with a kind of financial vaccine for exactly this scenario, released not long before the worst pandemic in a century. It wouldn't stop the virus, of course, but it could help alleviate some of the misery that flowed from it.

How must those CEOs feel, I wondered aloud, who had the foresight to buy the world's first pandemic business insurance? What a story they would have to tell.

There was just one problem. "By and large we failed," Wolfe said. "Not because we didn't do the models well. We enabled the first business-disruption insurance for pandemics. But nobody bought it."

I was so stunned I called him up a few days later to ask him again. Did he mean literally nobody bought it?

"As far as I know, nobody bought the policy," he said.

It was a life insurance quandary that first got Gunther Kraut thinking about pandemics, nearly a decade ago. A mathematician by training, Kraut was working at Munich Re, one of the world's largest reinsurers. As it sounds, reinsurance is the business of insuring insurers. The local and national insurance companies that you and I buy life or auto coverage from—the Geicos and Allstates of the world—need their own protection against rare but catastrophic events that might create enough claims to bankrupt them. Reinsurance companies provide that backstop on insurance for everything from homes and infrastructure projects to business losses and individual lives. Reinsurance is a staggeringly lucrative endeavor: Munich Re had \$56 billion in revenue and \$3 billion in profit last year. The market is large enough that its perennial competitor, Swiss Re, took in \$49 billion itself.

Kraut, sandy-haired and still slightly boyish-looking at 39, grew up near Munich, where the eponymous company has dominated the economic landscape since its founding in 1880. He talks about the intricacies of underwriting with a friendly patience that implies he has done so countless times before, none of which have dimmed his passion. He gravitated toward math at university, and, he told me, "it's hard to study mathematics in Munich without ever learning about the existence of reinsurance companies." After completing his PhD in risk manage-

ment and insurance at Ludwig-Maximilians University, he took a job as a quantitative analyst in Munich Re's life insurance division in 2007. "Reinsurance is sometimes called the business of a hundred professions," he said. "Because you don't just have mathematicians and lawyers and businessmen. You have former mining engineers. You have former captains who steered ships across the ocean. You have art experts who are specialized in art insurance. It is, if you like, always close to life. Admittedly with a little bit of this negative view on it."

Munich Re—a company built to absorb the risk of others—had a risk problem of its own: namely, the possibility of a global pandemic. Insurance is essentially the business of quantifying risk and then smoothing it out. But for a worldwide outbreak, the math in its life insurance portfolio looked worrying even to Kraut and his colleagues, who spent their careers pondering the darkest risks. In late 2011, Kraut's team decided to try to do something about it.

"Let's take the example of Munich and car insurance," Kraut told me. "That's a very, very stable business." A local company might insure tens of thousands of cars, each with a certain probability of having a small accident. "You can predict very well how much money you will have to pay on the claim settlements, and hence how much premium you will need to collect," he said. But let's say that one year there is a freakishly large hailstorm in Bavaria, damaging half the cars in the portfolio. The resulting claims could be an extinction-level event for an insurance company. Such storms may occur statistically only once every three decades—a one-in-30-year event, in risk parlance—but every car insurance company would have to keep enough cash on hand to pay out on claims on half its cars, just in case. "That's a lot of money you need to put aside for something that happens very rarely," Kraut said.

Now consider an auto insurer in Paris with the same problem: a fleet of cars, a predictable number of accidents, the threat of a one-in-30-year hailstorm event. Herein lies the mathematical advantage of reinsurance. If Munich Re pledges to cover both companies against freakish hailstorms, "what we can assume with a high chance is that there will be hailstorms in Paris, there will be hailstorms in Munich, but most likely they will not happen in the same year," Kraut said.

That means Munich Re can set aside less money to prepare for a rare event. Even better: The more car insurers that Munich Re adds to its portfolio, in more geographical regions, the more it can convert a rare and expensive risk into a predictable and cheaper one for itself. In insurance it's called diversification. "The more that you can spread the risk, the better for making it insurable," Kraut said. "That's why reinsurance companies are global companies."

The math applies to other insurance "perils," as they're known—earthquakes, floods, wildfires. And ordinary deaths, most of the time. But therein lay the problem for Kraut, who was partly responsible for making sure the company's life insurance division didn't shoulder unsustainable risks. Local disease outbreaks were like the hailstorms of life insurance: rare and devastating regional events that could be counted on to happen at different times in different locales. "Now you quickly see the problem with insuring pandemic risk, because a pandemic is *by definition* a global event," Kraut said. Imagine a hailstorm spreading from town to town, across the globe, in a cataclysmic chain: "The whole concept of global diversification doesn't work out anymore." An outbreak on the scale of the 1918 flu—50 million dead worldwide—might be a one-in-500-year risk, an event way out on the tail of a probability curve. But a pandemic at that scale, or even one considerably smaller, could not only overwhelm life insurance companies but Munich Re too.

To tackle Munich Re's exposure, Kraut's team began attempting to quantify and price this incredibly remote, unpredictable risk. If they managed to do that, they would then need to sell part of that risk—to find someone willing to insure the reinsurer. "No one really had tried to do a transaction at a one-in-500-year return period," Kraut said. His boss gave it a 50-50 chance of success.

But over the course of two years, the group gradually built up a list of potential buyers. It turned out that there were a few large institutional investors looking to diversify their own portfolios, and a little bit of pandemic risk was just the thing. Munich Re would provide them with annual payments, year after year. In the rare event of a pandemic, they would have to cover Munich Re's losses. One interested class of investor—if a macabre one—was pension funds, which typically



grapple with something called longevity risk: the chance that people will live longer than expected. "It's not really good terminology to call it a 'risk,'" Kraut said. "It's a good thing, technically! But if people live a lot longer than expected, then a pension fund needs to pay out a lot more pensions than they originally calculated." A deadly pandemic that takes the lives of pensioners, to put it in the most clinical terms, means fewer years of pension payouts, canceling some of the longevity risk. Should no pandemic arise, they would pocket payments from Munich Re. By 2013, Kraut and his team had put together enough investors—starting

with a large Australian pension fund—to take some of the pandemic problem off of Munich Re's books. But he soon encountered an unexpected hitch: The mechanisms written to trigger the deal relied on a series of "pandemic phases" monitored by the World Health Organization. (Phase 1: Virus is circulating in animals. Phase 2: Reports of human infection. Phase 3: Human-to-human transmission. And so on up to Phase 6: Sustained outbreaks in multiple regions.) Sometime in 2013, however, the WHO abandoned this system for a less specific four phases. Kraut suddenly needed some other organization to delineate the stages of epidemics reliably enough to write into an insurance policy. And he needed someone to monitor epidemics closely, to know when they hit agreed upon triggers—illnesses, deaths, spread. "But you can't just hire the WHO," he said.

In studying up on the world of epidemiology, Kraut happened to have picked up a book called *The Viral Storm*. It was written by Nathan Wolfe. Part memoir, part prescription, the book laid out a vision for how to counter the threat that novel viruses represent to humans. Kraut looked up Wolfe and saw that he'd formed a company.

"I thought, oh, maybe these guys actually can do it," he said. He sent an email to info@metabiota.com. "Hello, have you ever heard of a reinsurance company? I might have a good reason to talk to you."

NITA MADHAV,
AN EPIDEMIOLOGIST,
SPENT 10 YEARS
MODELING CATASTROPHES
BEFORE COMING TO
METABIOTA. SHE'S NOW
THE COMPANY'S CEO.

As it happened, Wolfe was already thinking about the business shocks of pandemics when Kraut's email arrived in Metabiota's inbox in 2013. By this time, Wolfe's public profile as an Indiana Jones–like virus hunter had been well established. He'd been featured on CNN and had given the obligatory TED talks. He'd walked away from his tenured position at UCLA, moved to San Francisco, and founded Metabiota. Wolfe leveraged his academic work into the private sector, using the data from his network of research stations to conduct disease surveillance for clients. For years, the company subsisted largely on government contracts, including more than

\$20 million from the Department of Defense and aid agencies involved in managing epidemic outbreaks. Metabiota also partnered with the foreign assistance agency USAID on a project called Predict, helping to build a database cataloging viruses in their animal reservoirs and forecasting which ones might jump to humans. "There was some success," Wolfe told me. "Some money was put into prediction and prevention. Not enough, obviously."

As Wolfe started to appear on stages alongside business leaders, he became convinced that the commercial sector had seriously underestimated epidemic

risk. In 2010 he sat on a panel at Davos called "Prepare for a Pandemic." In advance of the talk, the organizers circulated a survey showing that while 60 percent of CEOs believed the threat of a global outbreak was real, only 20 percent had an emergency plan in place. That same year he'd been invited to a cruise industry conference. He'd tried, without luck, to convince executives that Metabiota could help them avoid the havoc of an epidemic. "I felt like nobody was paying attention to it," he said.

Then Gunther Kraut's email arrived. Kraut and Wolfe met up at a conference in Munich and began riffing. Soon Metabiota was providing disease monitoring for Munich Re's life insurance division.

Kraut, however, had an even more ambitious idea in mind. What if, instead of simply hedging its own life insurance business in the case of a pandemic, Munich Re could use the same concept to insure other businesses against them? Business interruption insurance, the policies that protect companies against income losses from disasters like fires or hurricanes, often explicitly excluded disease. (And when it didn't, insurers could still use the ambiguity to deny claims.) The risk was thought to be too large, too unpredictable to quantify. But Munich Re had already proven it could cover its own life insurance risk in pandemics, and now it had a partner in Metabiota that specialized in seemingly unpredictable outbreaks. What if they could create and sell a business interruption insurance policy that covered epidemics, starting with acutely vulnerable industries like travel and hospitality? They could then pass on the payout risk from those policies to the same types of investors who had bought their life risk. "There is a bit of financial alchemy to the whole thing," Wolfe told me later. "You really are creating something from nothing."

At the same time, Wolfe had been working to operate Metabiota more like a technology company. In 2015, he hired Nita Madhav, an epidemiologist who'd spent 10 years modeling catastrophes at a company called AIR Worldwide, one of a handful of firms the insurance industry relies on to compute extreme risks. (Munich Re, in fact, had worked with AIR epidemiological models in its life insurance calculations.) Madhav's mandate at Metabiota was to build the industry's most comprehensive pandemic model. Her team, which eventually grew to include

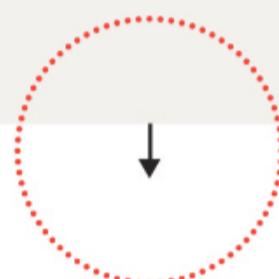
data scientists, epidemiologists, programmers, actuaries, and social scientists, began by painstakingly gathering historical data on thousands of major disease outbreaks dating back to the 1918 flu. Her colleagues had recently created what they called the Epidemic Preparedness Index, an assessment of 188 countries' capacity to respond to outbreaks. Together, the two efforts informed an infectious disease model and software platform. A user could begin with a set of parameters around a hypothetical virus—its geographic origin point, how easily it was transmitted, its virulence—and then run scenarios exploring how the disease spread around the world. The goal was a model that could, for example, help a manufacturer understand how a disease might impact its supply chain or a drug company plan for how a treatment would need to be distributed.

As sophisticated as Metabiota's system was, however, it would need to be even more refined to incorporate into an insurance policy. The model would need to capture something much more difficult to quantify than historical deaths and medical stockpiles: fear. The economic consequences of a scourge, the historical data showed, were as much a result of society's response as they were to the virus itself.

The group started building what became known as the Sentiment Index. Ben Oppenheim, head of the product team and a political scientist, had studied the work of Paul Slovic, a University of Oregon psychology professor who studied how human beings perceive and respond to risk. Inspired by Slovic's data-driven approach, they gathered their own information from around the world on how much various symptoms frightened people. To validate their measures, they also began tracking and studying how media coverage evolved around different types of outbreaks. Scarier diseases tended to generate more news stories.

In 2015 the Zika virus outbreak arrived and crystallized the reality that fear was a critical variable in understanding the economics of outbreaks. A mosquito-borne disease with no vaccine or treatment, Zika almost never killed its victims, but in pregnant women it could lead to a rare and terrifying birth defect called microcephaly. After decades of low-level outbreaks, the disease suddenly surfaced in Brazil and raged northward, causing billions of dollars in tourism losses across South and Central America. Even two years later, Oppenheim, whose wife was then pregnant, canceled a trip to a conference in Bogotá, despite the fact that his own company's research told him the risk of Zika-carrying mosquitoes at the city's altitude was negligible. "I remember thinking, we have to solve this," he said of the question of how to model fear. "Because if a pretty rational person with access to a lot of data is making an emotional decision, imagine this magnified in a pandemic."

The Sentiment Index was built to be, as Oppenheim put it, "a catalog of dread." For any given pathogen, it could spit out a score from 0 to 100 according to how frightening the public would find it. That number could then be used to help calculate the possible financial losses from an epidemic, everything from empty hotels to postponed mining projects. Madhav and her team, along with Wolfe and Oppenheim, also researched the broader economic consequences of dis-



"There is a bit of financial alchemy to the whole thing," Wolfe said. "You really are creating something from nothing."

ease outbreaks, measured in the "cost per death prevented" incurred by societal interventions. "Measures that decreased person-to-person contact, including social distancing, quarantine, and school closures, had the greatest cost per death prevented, most likely because of the amount of economic disruption caused by those measures," they wrote in a 2018 paper.

By then, the Sentiment Index had been tested against Metabiota's database of historical pandemics, and Munich Re began incorporating it into a business interruption policy. Gunther Kraut's group was then operating as a stand-alone unit called Epidemic Risk Solutions, with groups in Singapore, Munich, and London. The promise, for both companies, was enormous. Metabiota had raised \$30 million via venture funding in 2015, partly on the idea that providing the technology behind pandemic coverage could be a growth business. There was, after all, only so much a government agency might pay Metabiota for disease surveillance; the universe of large businesses that could suf-

fer losses from a major pandemic, however, was nearly limitless. Munich Re had a chance to create an entirely new segment of the insurance market, for a risk that existed in literally every part of the globe.

To Wolfe, the product felt like an elegant solution to the inaction he'd seen for years, as whole industries lacked the tools to prepare for the peril that an inevitable pandemic represented, even if they understood the risk. Insurance would provide a mechanism whereby the financial risks that companies faced—shuttered locations, vanishing customers—would be shouldered by investors eager to accept it in exchange for a regular premium.

Munich Re wasn't the only company looking for a bit of financial alchemy. The US insurance firm Marsh had been grappling with the same question for its customers. Like Oppenheim at Metabiota, Christian Ryan had personal reasons to be struck by the financial consequences of the Zika outbreak. "My father was a hotelier down in Brazil," said Ryan, the head of Marsh's hospitality, sports, and gaming division. When the disease began spreading in 2016, his dad lost a significant amount of his business and eventually sold the hotel for a fraction of the price he once could have gotten. "It just showed how fragile hospitality was. Because it's predicated on people continuing to show up and feel safe and feel secure."

Ryan and his colleagues went looking for someone who might have modeled out the risk, and like Munich Re, they ended up on Metabiota's doorstep. Soon Marsh had formed a three-way partnership with Wolfe's company and Munich Re. Marsh would sell the insurance under the name PathogenRX. (Munich Re set up similar sales relationships in other parts of the world.) The policies would be tailored for each company, but most would contain what's called a parametric solution: a preset amount of coverage that could automatically pay out when the epidemic reached certain thresholds, giving companies an infusion of cash without the delays of filing a claim.

The marketing materials for the policy now read like a letter from 2020. To the airline and hospitality industries, they warned that "these outbreaks have had widespread impact on personal and business travel." For sports teams and leagues, they cautioned, "individuals must be able to participate in and attend events without fear for their safety and health. Pandemic outbreaks can disrupt public confidence, and in turn, make or break many companies."

But selling the insurance meant first persuading risk managers and chief risk officers—the figures responsible for insurance coverage at large corporations—that pandemics were a risk worth hedging. Then the risk managers would need to persuade their bosses—the CFOs and CEOs—to pony up for a new expense that wasn't going to help the company's quarterly bottom line.

Oftentimes Munich Re and Marsh would bring someone from Metabiota along to client meetings to drive home the existential risks. Jaclyn Guerrero, Metabiota's associate product director, told me that for a meeting with one major hospitality conglomerate, she used the company's data on average hotel bookings and ancillary income to show the executives what the losses could look like. Her analysis made it clear that the shock from a severe months-long SARS-like pandemic could erase between \$300 million and \$800 million from the company's annual bottom line. The chief risk officer "really believed that this was something worth protecting against," she said. But the company passed on buying the policy. "A lot of times in these conversations," she said, "clients will say, 'OK, we understand why this could potentially be such an impact. But we haven't seen an event like this in 100 years. Why do we need to care about it now?'"

Marsh and Munich Re both knew they were fighting an uphill battle. "Insurance

is sold, not bought," the industry saying goes, and pandemic insurance would be both novel and quite expensive—potentially millions of dollars on top of what the company was paying for insurance. No CFO was eager to be the first among their competitors to take on a significant new cost.

"They all recognized that it was a risk, but I think at the end of the day it was a business decision," Ryan said. "We had a lot of clients say, 'Not now, but let's think about it next year, and I can plan and budget for it.' Well, next year is right now, and unfortunately Covid-19 happened this year."

On December 31, 2019,

Nita Madhav was in Portland, Oregon, attending a cousin's wedding. That summer, after four years leading the infectious disease data science team, she'd taken over as CEO of Metabiota. Now she was enjoying a holiday away from the stress of running a 60-plus-employee company. Her extended family had traveled from around the US and beyond to celebrate the wedding and count down the last moments of 2019 together. But that morning, before the ceremony, Madhav began getting texts from Oppenheim telling her about a cluster of unusual pneumonia-like infections in Wuhan, China. The company's early detection system, which included an algorithm for parsing and highlighting news stories about outbreaks, was flagging Wuhan as a potential hot spot. The team typically looked at hundreds of media reports a week and approached new ones cautiously. At the reception, Madhav messaged with Oppenheim and wondered: If it was respiratory, could the source be more like H7N9, the avian flu? A coronavirus like SARS-CoV?

The next day, she checked in with her staff, who would need to quickly marshal enough data to project where the outbreak could land. "We were just trying to see what we could find out," she said. "We weren't yet in the all-hands-on-deck mode. By the third week in January, we certainly were."

As the human and economic devastation multiplied in tandem across the globe, Metabiota's employees suddenly found themselves living inside their own model's projections. Just two years earlier, the company had run a large set of scenarios

forecasting the consequences of a novel coronavirus spreading around the globe. “I guess part of what I’m struggling with emotionally is that it’s almost like we’ve been attacked by a cliché,” Oppenheim told me later. “No one can predict the exact timing and location and dynamics, but the broad contours are a story that people have walked through specifically before.”

At the same time Metabiota was watching the nightmare that its models had anticipated unfold, Gunther Kraut was in Singapore facing a different problem. Where Munich Re’s epidemic solutions division had been struggling to get traction with potential customers, now, in early January, buyers were banging at the door. “That’s just the nature of human psychology,” he said. “Whenever a catastrophe arrives, people immediately want insurance for that catastrophe.” The virus was still confined to China and Kraut faced a grim calculation: Should the company write business interruption policies that would cover SARS-CoV-2, outside of Asia? “You clearly have the human tragedy,” he said. “On the other hand you are in charge of the business unit.” But there were too many warning signs—too much risk for Munich Re. It would have been like selling fire insurance for a house already in flames. Kraut made the decision not to sell.

In a sense, Munich Re had dodged a bullet: Had the company succeeded at selling pandemic protection to corporate giants starting 19 months before, it would have collected almost no premiums and now be paying out on every single one. Kraut acknowledged as much, but offered that if insurers never pay out, “then you lose the reason of existence.”

By March, Metabiota had closed its offices in downtown San Francisco, and its employees joined the legions of new remote workers. “It is painful to see loss of livelihoods, insecurity, fear,” Oppenheim said, “when potentially we would have had tools to prevent that.”

On the afternoon of April 10, as the worldwide death toll crossed 100,000, the data science and product teams gathered on a Zoom call to discuss a new Covid-19 scenario tool. The goal was to help an international aid agency concerned about the possible trajectories for developing countries. Metabiota’s models are built for long-term understanding rather than real-time analysis, but as clients turned to them for information, they scrambled to adapt. With home and office life now fully merged—“Was Ben

going to join this one?” Madhav asked. “No, I think he’s on childcare,” came the response—everyone turned off their video to save bandwidth for the screenshare. One data scientist kicked off the call by showing a rough version of the new tool, paging through alternately disheartening and terrifying graphs illustrating the best- and worst-case results for 16 countries, depending on how the virus was contained. The former showed hundreds of thousands of additional deaths from late March onward. In the latter, reflecting a total breakdown in containment, the deaths reached into the tens of millions.

Nicole Stephenson, Metabiota’s director of infectious disease modeling, then pulled up a data set the company had obtained, capturing an individual country’s epidemic controls: travel restrictions, school closures, border closures, limits on public gatherings. It was the kind of data they could later feed into their disease-spread model. “We’re trying to figure out a way to rank countries in their



BEN OPPENHEIM, VICE PRESIDENT OF PRODUCT, POLICY, AND PARTNERSHIPS AT METABIOTA, HELPED DEVELOP THE COMPANY’S SENTIMENT INDEX, A “CATALOG OF DREAD.”



proactiveness,” Stephenson reported. The group discussed which parameters to quantify to feed into the system and tossed out ideas on what was missing. They needed data on food security, one suggested, since it could impact the feasibility of national lockdowns. Another had a line on some data about Covid-19’s comorbidity with HIV—a critical concern in some African countries.

“Are we tracking which countries have put into place economic stimulus packages?” Madhav asked. “And which countries are seeking out relief or aid?”

“Some of this is captured in this data set,” Stephenson said. “But it’s very qualitative.”

That would be the next step: figuring how to convert thousands of rows of words into quantifiable measures that the model could use for calculations—and ultimately show the client how bad things could get. “Everybody’s got some fun data to play with over the weekend,” Stephenson said. “I know that’s what I’ll be doing.”

“**Nobody bought** the policy.”

I couldn’t stop thinking about what Wolfe had told me, back when I reconnected with him in March. It wasn’t quite *nobody*, as it turned out. Kraut told me that one company in the health care industry in the US had bought some level of pandemic protection, although the insurer that sold it had later quit selling the policies due to lack of interest. For confidentiality reasons, Kraut wouldn’t say who the end client was or whether it had received payment.

There are some large corporate insurance



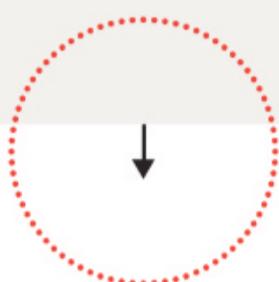
policies that do cover disease-related losses, such as event cancellation coverage; both Munich Re and Swiss Re announced that they potentially faced hundreds of millions of dollars in claims connected to suspension of the Olympics and other events. In April, news surfaced that the Wimbledon tennis tournament was set to collect \$140 million from an insurance policy in which it had demanded a pandemic protection clause 17 years earlier—after the SARS outbreak in 2003. And even as late as February, when the virus was already worldwide news, hedge fund manager Bill Ackman managed to find a taker on a \$27 million investment bet that the virus could crash the stock market. It was essentially an insurance policy for his portfolio. When he cashed it in to the tune of \$2.6 billion in March, after going on TV and warning of the potential devastation the virus could cause, he felt the need to take to Twitter and defend himself against accusations of profiting off human misery.

But the existence of a few prescient exceptions only served to underscore the question of why no one else had heeded the warnings. The failures are massive, almost incomprehensible. (Among them is the fact that, in September 2019, the Trump administration canceled funding for Predict, the USAID disease surveillance program that had been working to identify dangerous viruses—including work with the Wuhan Institute of Virology in China.) But after weeks of asking the question, I realized that at least part of the answer was already there, in that first conversation I'd had with Wolfe in March. After all, I'd written about him more than a decade before. I had heard the warnings directly from him, listened to him describe the hundreds of thousands of unknown mammalian viruses that lurked out in the biosphere. I'd hiked through the jungles where HIV likely made its jump to humans. And then I'd come home, written my story, and largely forgotten about the pandemic he'd predicted.

"I just don't think our brains are particularly well suited to sorting out these kinds of risks, particularly ones that are infrequent," he told me recently. Companies are led by humans who suffer from the same failures of sustained imagination as the rest of us—unable to truly internalize the one-in-100-year disaster until it arrives on our doorsteps. "It will be a defining event for all humans who have lived through this, including my 3- and 5-year-old children," Wolfe said. "But still, everybody is going to go back to their jobs, and people will wonder whether the risk is really that great again." Researchers who study epidemics even have a term for the phenomenon: the cycle of panic and neglect.

But now, as we swing wildly through the panic end of the pendulum—justified panic, as hundreds of thousands die and the international economy collapses—there's no longer a need to explain to airlines or hotel chains or sports franchises how even a small amount of pandemic insurance might help them. Gunther Kraut and his group find themselves deluged with hundreds of requests for the business interruption policies on the *next* outbreak. Now their challenge is volume, taking a policy meant to be customized for each client and converting it into a commodity that can be sold to many of them at once.

"The demand for insurance arises at particular moments, often in response to dramatic crises that demonstrate human



Companies are led by humans who suffer from the same failures of sustained imagination as the rest of us—unable to truly internalize the one-in-100-year disaster until it arrives on our doorsteps.

vulnerability," the Princeton historian Harold James has written. In 1666, after the Great Fire of London destroyed a third of the city, the modern fire insurance business was born. A financial crisis in the 1830s prompted the development of the US life insurance market. In 1906, the San Francisco earthquake became the greatest payout, relative to premiums, in Munich Re's history and reshaped natural disaster preparedness forever. Hurricane Andrew, Hurricane Katrina, 9/11: Each has shifted how our society thinks about risk and the money we set aside to try to prepare for it. Climate change is doing so again.

Without a doubt, insurance will factor into thinking about the economic consequences of pandemics going forward. Already several prominent US restaurants have sued to try to force the issuers of their current business interruption policies to cover coronavirus losses. (Where policies don't specifically include or exclude disease, insurers

have just denied any Covid-related claims from small businesses, leaving them with no relief.) Some in the insurance industry speculate that banks may now make business loans in some industries, like travel and hospitality, contingent on having epidemic insurance. Or governments may simply mandate such coverage. In any case, the demand for disease-based insurance may quickly outstrip even the reinsurers' and other investors' ability to cover the policies.

National governments may end up the ultimate pandemic reinsurers, stepping in to prop up the insurance market, as the US did after 9/11 with the 2002 Terrorism Risk Insurance Act. By late May, there were already multiple proposals in Congress do just that. "I think it's very fair to think 9/11 is to terrorism as Covid-19 is to epidemic risk," Wolfe said.

From a certain angle, it will always appear ghoulish for insurers to capitalize on the risk of misery. Insurance triggers are themselves inherently cold, emotionless calculations—a number of sick or dead, or a level of fear on a Sentiment Index. Both Metabiota and Munich Re have explored the possibility that countries themselves, particularly in the developing world, could be insured against epidemics and pandemics. But one pandemic-insurance-like product on the market, a \$425 million "pandemic bond" set up by the World Bank in consultation with Munich Re and Swiss Re, has been heavily criticized for failing to pay out quickly enough. While the bond did eventually deliver the part that covered coronaviruses in April, the World Bank was accused of making the triggers needlessly complex and then dawdling while bodies were piling up.

Epidemics are inherently chaotic, as Metabiota itself experienced during the 2014 Ebola outbreak in West Africa, which killed 11,000 people in six countries. A 2016 Associated Press investigation detailed accusations that the company's laboratory in Sierra Leone had mishandled testing samples and underplayed the epidemic's potential scope. "We're not a response organization," Wolfe told me recently, by way of explanation. "But the government was our partner and it was an emergency, so we stepped up to respond. Everybody makes mistakes in those kinds of environments, and we were not free of mistakes."

Even if and when pandemic insurance policies become widespread, they aren't a panacea for the kind of economic ruin we are currently living through. One only has to look to the 2008 mortgage crisis to see how financial alchemy can go wrong. There will be small businesses priced out of coverage, insurers who exploit every loophole to avoid claims, and corporate executives who enrich themselves and not their workers when they do receive payments. But if SARS-CoV-2 has shown anything, it's that we need every preventive weapon in the arsenal. Even a marginal amount of pandemic insurance could have meant fewer layoffs, diluting the economic pain. "Right now, taxpayers are going to soak up 100 percent of the risk," Wolfe said of the coronavirus impacts. As of late May, the US economic bailout alone amounted to \$2 trillion and counting. Pandemic insurance would shift at least some of that burden onto investors who'd willingly taken on the risk. "How much risk will the private sector be able to take? I'm an optimist on that. More than it's currently taking. I don't think anybody would say it's not at least 5 to 10 percent," Wolfe said. Five percent of the bailout would amount to \$100 billion lifted off the books of the taxpayers and onto investors who had gambled on the risk.

The other reenacts the "dance of the barrel makers," celebrating the end of a 16th-century plague. Local lore has it that in 1517, the barrel makers took to the streets, dancing to convince the population that the plague had subsided and normal life could resume.

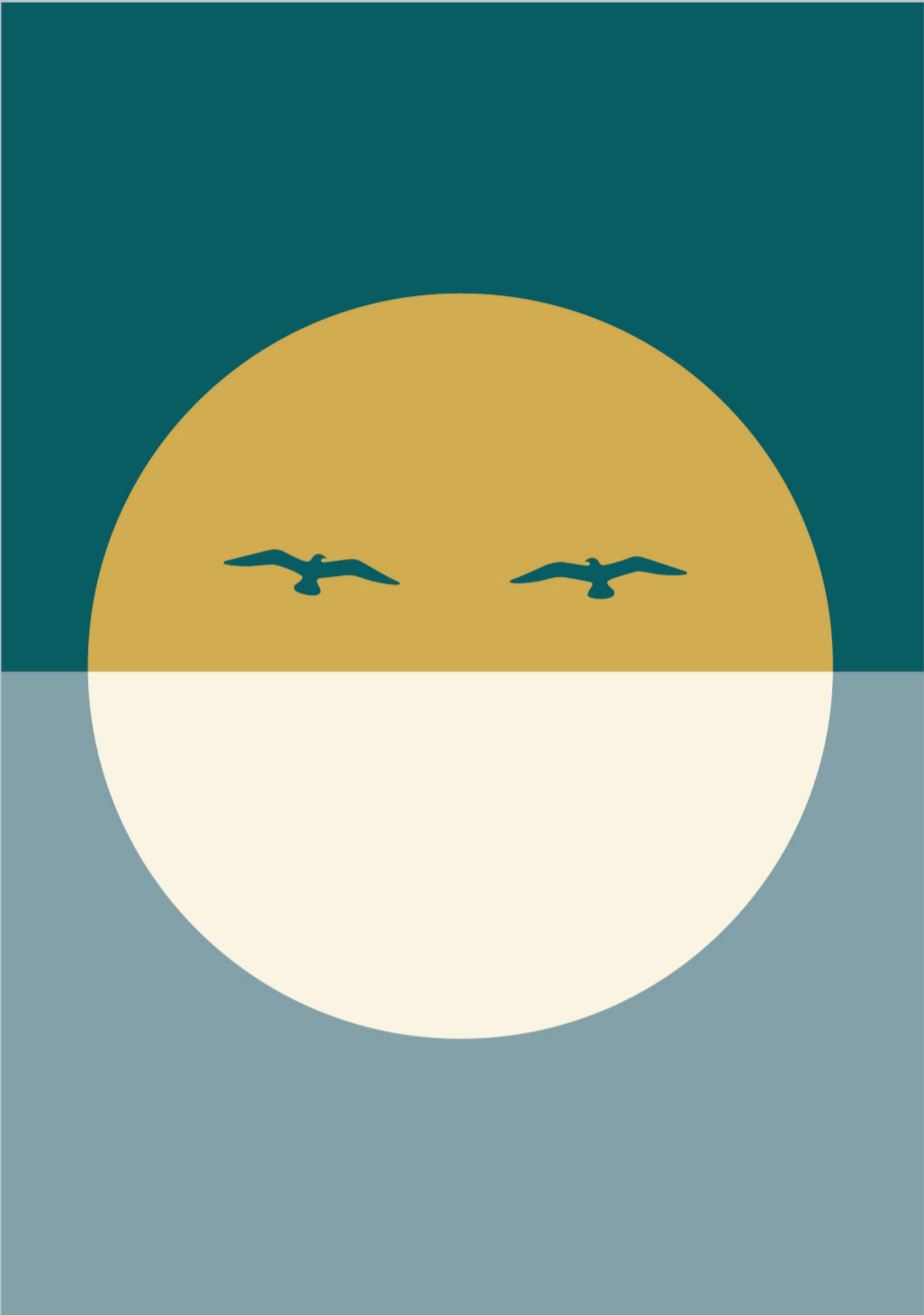
Gunther Kraut often found himself recounting his hometown legend over the years, as he tried to distill the mathematics of pandemic risk into some digestible reality. A one-in-500-year disease event wasn't some abstract concept, he would tell people. It was something that had reshaped our societies in the past and would do so again. And whatever level of truth one ascribed to the glockenspiel's legend, 1517 was just about 500 years ago. The plague would come again, and someone would have to be the barrel makers, bringing everyone back out into the sunlight.

The remoteness of the risk is always the hardest part to get our heads around. Our past moments of calm or our current nightmare, like the last coin flip or turn of the roulette wheel, tell us nothing about when the next one might arrive. One in 500 years isn't a prophecy, just a probability. If anything, as Wolfe pointed out when I first met him over a decade ago, global warming, urbanization, and destruction of species habitats are only accelerating the speed at which the next pandemic may arrive.

"I have a long-term view of this, and this is not the last one," Wolfe said. "It's a bad one." He paused. "It's a bad one. I don't think there's any more 'ifs': This will fundamentally change the future. It is not impossible that over the course of the next 50 years, humanity has an event which is substantially worse than this event, and people at that point look back and say, 'As terrible as Covid-19 was, if we had not had it, the consequences would have been so much more dramatic.'" Even amid the pandemic he had predicted, Wolfe said he still considered himself an optimist. "You want to honor the devastation that this virus is going to have on families, on livelihoods. But in the grand scheme of history, it may also be seen as a very costly inoculum against future events. I believe that the world has no choice but to respond in such a forceful way that will make humanity safer." ■

In the central square in Munich sits a clock tower atop the town hall, completed in 1908. One of the city's most popular tourist attractions, the tower's edifice includes a pair of famous glockenspiels, mechanical-musical dioramas depicting scenes from the region's past. At designated hours, small figurines spin in time with the chiming bells. One portrays the lavish wedding of a Bavarian duke.

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WHAT HAPPENS NEXT

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ILLUSTRATION —
NOMA BAR



THE PASSAGE OF TIME DURING THIS PANDEMIC HAS

often felt immeasurably, unbearably slow. But the transformations we've been living through are, by any historic measure, lightning fast. A crisis can force insights on us that might not have seemed so clear otherwise: insights about ourselves, about our families, and about the businesses and governments that hold sway over us. Insights we're going to need as we face the changes that will inevitably come next. The following five essays reckon with what the pandemic is teaching us—and what's just over the horizon.

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LIVE
WRONG
AND
PROSPER





MANY OF US ARE FAILING TO BUILD THE
SECURE, STABLE HOUSEHOLDS WE WERE
TAUGHT TO DESIRE. NOT ONLY IS THAT OK.

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IT'S THE FUTURE OF FAMILIES.

BY LAURIE PENNY /
ILLUSTRATION SONIA PULIDO





“DO WE KNOW IF SHE HAD FAMILY?” ▪ Self-isolating in my bedroom, I finally watched *Avengers: Endgame*, and I found myself sniffling at the scene where Earth’s defenders gather to bury Black Widow. The character had previously been portrayed in the Marvel superhero franchise as a tragic loner, the only girl in the gang, the spandex-clad supersoldier who never quite manages to get it together with Hulk or Hawkeye, whose infertility makes her a “monster”—the single woman without children who is, by definition, alone. ▪ Until Captain America points out the obvious: Yes, he says, as the music soars. Black Widow did have family. “Us.” ▪ This moment—the moment when the ragtag band of heroes realizes that they are one another’s “real family”—is a pop culture trope that’s still just poignant enough not to feel trite. Especially when you’ve been alone in your bedroom for a week, trapped in a body that frightens you, coughing yourself into a frenzy of frantic self-monitoring, with only your housemates to push lovingly if ineptly made mugs of tea through the door. As it has for millions of others, the Covid-19 pandemic has made me reassess exactly what family means. The idea of the found family is a cultural artifact whose time has thoroughly come—because so many of us are currently in the process of making, and remaking, our own.

IN LATE MARCH, A JOURNALIST friend of a friend called to find out what my specific found family in Los Angeles looked like. She was writing about people who were quarantining together with people they were neither related to nor sleeping with. That was us—my housemate and me, plus two friends who live alone nearby. We were all separated from our relatives by distance and disease; we were all very single. We weren’t quite a traditional household, but we needed some way to refer to one another, so—since almost everything in the world right now feels like it comes from one of those alternative timelines in a late season of a derivative sci-fi TV dystopia—we called ourselves a “pod.”

I had met my housemate, a composer and singer-songwriter, years earlier at a house party in New York, all throbbing UV lights and thudding music. We instantly knew that at some point we’d be important to each other; that point came at the end of 2019, when I needed someone to share the rent on a sublease in Silver Lake with a janky Jack and Jill bathroom and a lemon tree in the flower bed. My other podmates are a sex-positive musician and therapist I know from Twitter and a strange young writer I met in the loo queue at our local coffee shop, where we got to chatting about our favorite radio shows.

The reason the pod came together was more accidental than profound: My housemate and I got bedbugs. Bedbugs are disgusting and expensive and exhausting, and require you to role-play your own private disaster movie, nuke most of your belongings and fumigate the rest. Coffee-shop writer boy was helping us ferry all our clothes to the laundromat; I was staying on my therapist friend’s sofa to escape the tiny biting bastards in my bed. When the announcement came that LA was shutting down, we’d already been in such close quarters that if one of us had been exposed to the virus, we all had. We decided to pool our risk. Divvy up chores, entertainment, car runs. Make sure that, at any one time, everyone had enough snacks to stay sane and nobody was haring off to meet random strangers on Hinge. It made sense. That, at least, is what we told the journalist.

I thought it would be a quick background interview, that we’d show up halfway down a feature in the lifestyle section. A few days later, our picture was on the front page of

the *Los Angeles Times*: “Easing the Isolation With Their Quarantine Buddies,” read the headline. Then, suddenly, we were doing interviews for local television and national radio. It was all getting a bit out of hand. Why, I wondered, was this a story at all?

The story that most of us are living is very different from the story we thought we were supposed to be living. We millennials, as well as several generations before us, were raised to believe that adulthood would begin when we found one perfect person of the opposite sex to settle down with. That’s how it was supposed to work: You wait for someone with whom you can make a real family, and everything before or after is just dicking about. “When we think of the American family, many of us still revert to this ideal,” the conservative commentator David Brooks wrote in a recent essay in *The Atlantic* called “The Nuclear Family Was a Mistake.” “We take it as the norm, even though this wasn’t the way most humans lived during the tens of thousands of years before 1950.”

The nuclear family, as Brooks points out, was a historical aberration. It was only a workable way of organizing society when there were structures in place to make it possible. Structures like affordable housing, supportive local networks of extended family and friends, a generous welfare system, well-paying jobs that enabled at least one parent to occupy themselves largely with childcare—and a culture that largely shut women out of the waged workplace, meaning the role of wife and mother was the most that many of them could aspire to.

All of that, for better and for worse, has changed. Priced out of all of the usual markers of success, from parenthood to home ownership, a whole generation has built lives in the space between the story society wrote for us and what it actually made possible. Some of us live alone. Some of us live with partners, with parents, or both. A great many of us live with roommates (or housemates, as I like to call them, because I have never actually shared a room).

When Covid-19 came, the tune stopped in the great game of musical chairs that was our combined housing and relationship drama. Suddenly, we had to acknowledge that who we live with is who we *are living* with—whether that’s our housemates, our extended family, our aging parents, our boyfriend’s sister, our daughter’s boyfriend, our

married friends, or our recently divorced, high-functioning alcoholic colleague who moved in for a couple of weeks last January and is now the person we talk to most in the world. These are our family, in the original sense of the word, which derives from the Latin for “household.” *Familia* included your blood relatives but also guests, visitors, guards, servants, slaves—anyone who, by choice, circumstance, or coercion, was living under the same roof and to whom you owed some sort of loyalty.

Over the months of the global lockdowns, the concept of the “quarantine house” has crept into the cultural lexicon. Memes circulate asking which Marvel heroes or cartoon characters or Greek gods or famous writers we’d rather be stuck in a small house with, trying to fathom an unknowable future without murdering one another. Yet even as more of us are living in ad hoc households cobbled together in times of crisis, there is still a measure of cultural confusion whenever those households don’t conform to familiar shapes. “Quarantine buddy arrangements are sometimes met with stern disapproval from those who adhere to a traditional definition of family,” wrote the *LA Times* journalist (who, I should note, was a delight to speak to—we still text).

Fewer and fewer of us have reason to adhere to a traditional definition of family. In LA, nearly half the adults are currently living with a nonpartner. About a third of the overall American adult population, and the majority of people between the ages of 18 and 34, live in a shared house. For all of them, the aspirational model of a married couple ensconced in benign stability with their kids, that single story of what love and commitment and security were supposed to mean—that’s not their story. It’s not mine, either.

PART OF ME HAS ALWAYS KNOWN that my story wasn’t going to end like a Disney movie, with wedding bells ringing and the credits rolling on the perfect couple behind their picket fence, happily ever after. But without that specific ever-after, was it possible to be happy? As a twitchy, morbid child growing up in a town outside London, I didn’t think so—until one otherwise ordinary Saturday when I was 13 years old.

My mum and dad were splitting up, and

my favorite place to go to shut out the world was the local indie cinema, where I saw a very strange film. It was in Swedish. It was set in the 1970s. It was about a suburban mother who escapes a failing marriage and moves in, with two kids in tow, to a ramshackle hippie commune full of communists, hedonists, and various flavors of ornery idealist all arguing about whose turn it is to do the washing up. The film was *Tillsammans*, directed by Lukas Moodysson; the title, in translation, means *together*.

Tillsammans turned my world inside out. I was watching my parents’ marriage collapse and trying to make sense of what adult life was supposed to look like. I already had a nagging feeling that what my peers had planned wasn’t going to work out for me. And there it was: 15 weirdos crammed into a huge house. They weren’t living a normal life by the standards of 1970s Stockholm or early-’00s London, but they were together. It looked romantic. It looked free. It looked easy—as these things always do, from the outside, in stories.

Twenty years later, I’ve been living in communities and house-shares for the better part of my adult life. After university, in the early years of the Great Recession, I moved into a filthy flat share in London’s Turnpike Lane, attempting to create some of that *Tillsammans* spirit. Sure enough, there were intense political arguments over the washing-up roster and ethical debates over how and whether to murder the terrier-sized rats that kept rooting around the bins. We soon learned that the fun of sharing space wears away somewhere between the first time you step in your flatmate’s vomit on the way out the door to your minimum-wage job and the umpteenth time you can’t sleep because the people you share a wall with are being loudly and relentlessly 23 years old.

After that, I moved in with a chain-smoking Scottish archaeologist and a couple of insomniac hackers in Mile End. Then into a flat in Hackney with two lesbian poets. Then there were the student occupations of 2010, and the Occupy camps in 2011, where I lived for months on end. (OK, so I’ve been a literal roommate exactly once: There was a commune in Willesden Green where I split a repurposed cupboard and a mattress on the floor with a sweet Australian goth, paid 450 quid a month for the privilege, and considered it a damn good deal.) It never occurred to me to settle

down. For one thing, I couldn't afford to. All in all, between 2008 and 2020, I've lived in 35 places in five countries with, depending on how you count them, over 200 housemates, their partners, their eccentricities and their childhood traumas, attempting to make temporary homes together while we waited for our "real lives" to start.

The last commune I lived in, back in London in 2015, was a dilapidated former storage warehouse where, technically, two or three people were supposed to be living as "caretakers." By the time I moved in, there were seven housemates, all between the ages of 22 and 34. Soon, as more of the downstairs hangar space got built out, there were eight of us, then 10, and usually a couple of extra reprobates crashing on the sofas. We had what so few young people in the capital had: space.

Not much of it, of course, and not fancy. The Victorian plumbing broke down every

no small part because of the photo that accompanied the article, in which my fabulous singer-songwriter housemate draped himself over the rest of us in snazzy boots and a pair of tight shorts that were safe for social distancing but decidedly unsafe for work. "That's the queerest group of people I've ever seen, and I've spent a lot of time looking in mirrors," one redditor wrote. "I don't think anyone with magenta hair is straight," said another. I bristled. I'm as surprised as anyone else by my fondness for vanilla hetero sex, but that doesn't mean I don't want to have colorful hair and live in a puppy pile of queer weirdos.

Queer people have always formed "alternative families"; it can be easy, especially if you live in a nice liberal part of a nice liberal metropolis, to forget how many young queer people are still abandoned by their families, shoved headfirst and hurting into the deep end of an adult life they're not prepared for.

I'M AS SURPRISED AS ANYONE ELSE BY MY FONDNESS FOR VANILLA HETERO SEX, BUT THAT DOESN'T MEAN I DON'T WANT TO HAVE COLORFUL HAIR AND LIVE IN A PUPPY PILE OF QUEER WEIRDOS.

summer, and sharing a porta-potty with nine people really makes you think about the quality of your decisionmaking, as does playing the interminable game of identifying whose crusty cereal bowl/crusty boyfriend this is. There was a romance to it all, though, and there's a romance to it now, five years and 5,000 miles away, in quarantine lockdown with three people I barely knew last year.

"THERE'S NO HETEROSEXUAL explanation for this." Soon after our quarantine pod made local headlines, a Reddit thread found the story—and hundreds of strangers were suddenly wondering which of us were secretly shagging. This was in

But in the years since the financial crash, there have been more and more reasons for all sorts of people, queer or otherwise, to form alternative families.

Wages have plummeted, rents have soared, and many of us have found ourselves living, out of necessity, in a way that would previously have been understood as a "lifestyle choice." Single mothers are doubling up to form households where they can provide mutual aid and support. Young married couples struggling to afford mortgages are installing rent-paying friends in their spare bedrooms and garages. Adults are moving in with their friends' parents and grandparents. So-called co-living is a trend in the same way that tiny houses and cheap dates and dodgy home dyes are trends—because millennials are broke. The

reason so many of us live with a housemate or two or five or six is not because we've collectively decided to tear up our parents' social norms—or not *just* that. It's also an economic necessity.

Then again, so is any family, at any time. The nuclear family, in its brief heyday, was fundamentally an economic strategy, one that made it easier to control the supply of workers and organize childcare and domestic work so that women were doing as much of it as possible for free. This arrangement no longer makes economic or emotional sense—and millennials know it. Almost half of us, after all, grew up with parents who were divorced, or in single-parent households. But the nuclear family remains the only form of family with cultural legitimacy.

Right now, there is a deep longing not simply for other ways of living but for those other ways of living to be acknowledged in culture and supported in society. Yet there's really only one place where that longing truly plays out: in fiction—and especially in genre fiction, which has greater permission to imagine other worlds beyond the everyday, the expected, the orderly and straight.

The trope of the found family has been around for decades. A bunch of misfits, thrown together by circumstance, finds a way to live and grow together. It works because it's wish fulfillment, including for the sort of people who grew up just wanting a group of friends to rely on. And because the dramatic possibilities are endless. So much genre storytelling kicks off by contriving a means by which to bring those disparate people together. They all meet in a tavern, or on a spaceship, or on the run from their robot overlords. They are members of the same army unit, classmates in the same supernatural university, superpowered teenage criminals in the same community service program. They might hate each other at first, but eventually they are enmeshed in one another's lives.

Women writers, in particular, have long been pioneers of the sort of futuristic novel that thinks creatively beyond the nuclear family as the base unit of human existence. Authors from Ursula K. Le Guin and Octavia Butler and Sheri S. Tepper to Marge Piercy, N. K. Jemisin, Lois McMaster Bujold, Joanna Russ, and Lidia Yuknavitch have set themselves to imagining alternatives to standard-issue happiness. So much of the time, that process involves creating new, alien

kinship structures. New pods, new buddy systems—new “surrogates,” as the theorist Sophie Lewis calls them in her book *Full Surrogacy Now*. The surrogate family or family structure, in Lewis’ poetic reclaiming of the term, replaces and improves upon those traditional, limited, patriarchal family forms with new and fluid networks of care.

In Becky Chambers’ *Wayfarers* series, a band of space renegades gallivants around the universe encountering various alien societies. My favorite are the Aandrisks, for whom it is normal to have three families in the course of a lifetime. First, there’s the family you grow up with, the “hatch family,” who are not always your blood relatives. Then, as young people, you form “feather families,” the members of which produce the children but don’t raise them, as they’re busy building their own lives and having the sort of drama that most of us go through in our twenties and thirties. Finally, there’s your “house family,” where you and other mature adults settle down to raise the children you’re finally ready to nurture.

What if living with friends and strangers and parents and siblings wasn’t considered a “failure”? Or what if it were a failure in a way that doesn’t have to be abject? The pop philosopher Jack Halberstam speaks of “the queer art of failure,” which deliberately abandons those brittle models of success that were never made for us anyway. It’s a way of life that “turns on the impossible, the improbable, the unlikely, and the unremarkable. It quietly loses, and in losing it imagines other goals for life, for love, for art, and for being.” There really is no heterosexual explanation for any of it.

A FOUND FAMILY CAN BREAK YOUR
heart just as much as a traditional one can. In October 2016, I turned 30 and threw a party in my London commune. It was a good party. Drinks were drunk, secrets were shared, unwise kisses were exchanged, and I found myself glad that this was what my adult life looked like. Three days later, the nine close friends I had been living with, including former lovers, put into my hands a seven-page, double-sided letter explaining, in excruciatingly detailed, painfully non-violent hippie rhetoric, why I was a shameful waste of human skin and henceforth evicted from the home that was also my

entire social world. It was a blow. I’d lived in situations that had broken down before, but I hadn’t expected to be kicked out on my ear with no warning. I thought these people were my friends—my family.

The heartbreak was a physical weight. No romantic breakup, before or since, has hit me half as hard. I was not OK for a very long time. And almost the worst of it was lacking the language to translate that loss. If I had ended an engagement, or broken up with a long-term live-in partner, it would have been easier to explain the grief. My relatives were sympathetic but also relieved—they cared about me, and they hoped that now I might settle down into something more traditional, something more solid and secure.

I decided that perhaps they were right. Perhaps I had made a mistake by deviating from the story straight women were supposed to tell about their own happiness. Trying to live as if you were in the early days of a better nation was too painful, so I’d try to be normal, instead. I moved in with a dear friend who had just become a romantic partner, in a small flat by ourselves, in my hometown. It really did seem like a good idea at the time. We were both trying terribly hard to be normal, to be, in all senses, straight. To be square. To slice the soft and strange parts of our hearts into the clean lines culture demanded. Maybe, if we doubled down on doing the things we were supposed to do, we might be happy. We might be safe.

That was a silly plan. I soon found myself single again, in a house with my name on the mortgage thanks to a bequest from a relative. I started to furnish like mad, to stave off the gnawing loneliness. I knew that I was lucky. So why did I feel so miserable? Why would I have traded it all in—not for the perfect partner and the marriage and the mortgage, but to be back sharing a beaten-up bathroom and the bills and the chores with nine friends and their quirks and childhood traumas, however temporary, however insecure?

Here’s the lesson I had to learn: “Traditional” nuclear families today are no more stable or secure, no more or less likely to lead to lasting happiness, than “alternative” households. In *The Sirens of Titan*, Kurt Vonnegut spends hundreds of pages coming to the conclusion that the purpose—or at least a purpose—“of human life, no matter who is controlling it, is to love who-



HOW WE’LL AGE

— LOUISE ARONSON,
GERIATRICIAN, UCSF SCHOOL
OF MEDICINE

Elderhood is as varied as childhood and adulthood, and this crisis has affected elders in different ways—depending on age, to some extent, but also on income and ethnicity. Many are confronting their own version of the anxiety and uncertainty we all feel. Others who are nearing the end of life hear that they’re going to spend much of it locked up, and some think, what the hell is the point? Even before the pandemic, we’d done a lot to strip older lives of purpose and meaning. ▪ Nursing homes are getting more attention and sympathy now than ever before, and that’s wonderful. But I worry that it reinforces a narrow, myopic notion of old age. Ninety-three percent of older people do not live in facilities. Think about our leaders: Nancy Pelosi, age 80. Anthony Fauci, 79. Donald Trump, 74. They make efforts to look younger, but the fact is they’re doing what they’re doing as old people. And if they looked like what they were, they would really be transforming society. ▪ We tend to think you’re either a helper or a person who needs help. The fact is, we’re usually both at the same time, throughout life. There are older people who need physical help but their brains are fine, so why aren’t we having them tutor children or immigrants? We need to stop blaming old age for our failures of creativity. ▪ Right now, around 70 percent of nursing homes are run by for-profit owners, and the lobby for that is hugely powerful. The penalties for doing things wrong are tiny; the staff is paid badly. We have a real opportunity right now to pair these glaring flaws with the incredible need for jobs. We’ve got a lot of people who need jobs and a lot of jobs that need people. This is a chance to look into the future in a sensible, compassionate, human-first way.

—AS TOLD TO ANTHONY LYDGATE

Illustration by Noma Bar

ever is around to be loved.” The problem with found families is exactly the same as the problem with every other sort of family. There is no perfect structure, no single set of rules, that can guarantee that people will always be decent to each other, will never have growing up to do, and that nobody will ever get their heart broken ever again.

IN BUFFY THE VAMPIRE SLAYER, a group of high schoolers fight monsters and demons while attempting to live normal lives, before coming to the realization that perhaps normal lives aren’t all they were cracked up to be. In the TV show’s fifth season, the gang has to face down one of the most horrifying monsters of all: conservative relatives, who are unhappy with the lifestyle of a character named Tara because she is a lesbian and also, incidentally, a witch. “We are her blood kin,” screams her father. “Who the hell are you?” It’s Buffy who says the obvious. “We’re family.”

During the Covid-19 lockdowns, millions of people have been forced to confront the ways in which the “traditional family” can be coercive. Conservative estimates suggest that there has been a 20 to 30 percent increase in incidents of domestic violence around the world, as women in particular find themselves trapped with their abusers. Even before the lockdowns, 19 American women a week were murdered by their husbands or intimate acquaintances. The nuclear family, like any, can be a dangerous place.

It’s not that the people you’re bound to by blood, or any other bodily fluids, are superfluous, inevitably abusive, or, per *Buffy*, actively demonic. They’re just not the only important relationships—and it’s taking a global pandemic to make that clear to a wider culture that’s for so long felt threatened by difference. Forced isolation has made us hyperconscious of our needs and expectations for cohabitation, and of the hope for improvement. Perhaps the real threat, now, is not simply the fact that a significant proportion of us might never form traditional families, but the prospect that some of us might prefer not to. That we might stop doing this because we have to and start doing it on purpose.

In lockdown, I’ve found myself calling on all the old social muscles from the

commune times: the pantry mathematics of meal planning, of providing nourishing and interesting food for cash-strapped, scared people with dietary restrictions who just want something yummy for dinner. The difficulty of staying generous when the bathroom doesn’t magically clean itself, and who do you think has been taking the bins out all this time, eh? The bin fairies?

We do fight. My housemate and I spent one memorable week having the sort of arguments that you might expect a neurotic writer and a neurotic musician to have when they’re trapped in a small box together with a lot of work to do, for which one requires a lot of quiet and the other a lot of noise. There were tears. There was angry baking. There were quiet admissions that we’ve both fought, our entire lives, to find a way to live where being different and ambitious and creative and queer didn’t have to mean being alone.

These fights took half the week. We spent the other half finding somewhere new to live together when our lease is up, because frankly this has been exhausting and important emotional work, and neither of us can be bothered to start all over again with someone else. My housemate annoys me more than almost anyone else I know, and if anyone ever hurts him I will hunt them down. When I came down with Covid-like symptoms in May, he was the one who forbade me from working on this essay and insisted I lie the hell down and watch stupid superhero movies instead. And that, I suppose, is what family means.

It means you love whoever is around to love. That doesn’t mean you have to like them all the time. Love takes work. Living together takes work. Sick and tired of waiting around in the antechamber of socially sanctioned adulthood, millennials are setting up home right here. We are not waiting for our “real lives” to start. We may never have the security or stability we were raised to desire, but we can still have commitment and community. For me, this is my real life. These are the households and relationships where I have grown up, learned how to take care of myself and other people, had my heart and brain and favorite mugs broken. These are our real lives, brief and beautiful, stupid and unlikely, and we would live them far better if we were given permission—beyond the wish fulfillment of fiction—to believe in them. ■

WFH TOMORROW

REMOTE COMMUNICATION REMAINS STUCK IN THE UNCANNY VALLEY. TECH COMPANIES ARE RACING TO ADD MORE PRESENCE TO OUR TELEPRESENCE.

In 2020 we all became Alice Nelson, the *Brady Bunch* housekeeper who occupied the center square in the show’s iconic tic-tac-toe board of faces. Except today, the Marcias and Gregs around us are yammering about KPIs, cost-cutting, and sourdough starters—and proving that, yes, those annoying futurists were right. We can do business from home.

The benefits are obvious: no time lost getting to work, more flexibility for workers to care for children and elders, big savings on office leases, and, with fewer cars commuting on roads and fewer business travelers in the skies, way less carbon burned. Proof of concept in the bag, Silicon Valley is now gearing up to make remote conferencing our permanent reality.

Sure, in the long view, the solution to far-flung connecting might be virtual reality, in which we can share space in our corporate matrices from the comfort of home. But the pandemic has given us a taste of the Zoom life, and we are hungry for something better. And faster. It’ll take a while before cumbersome VR headsets slim down for everyday use. That’s why, inside fledgling startups and tech giants like Google and Facebook, designers are concocting products to make telepresence more compelling and are adding features unique to the digital realm. Collaborative documents, whiteboards, AR, AI.

Getting to compelling won’t be an easy task. “As soon as people can realistically see each other in person, the amount of video chat usage is going to decline dramatically, because it’s a shitty version of being together,” says Jason Citron, CEO of Discord, a chat service originally designed for gamers. The drawbacks are plain: lack of eye contact, frozen screens, inability to read cues or jump into a conversation. So what are they doing about it?



SEE ME. FEEL ME

Jeremy Bailenson, a VR expert at Stanford University, says that we're now in a remote-conferencing uncanny valley. Eye contact alone exploits a nonverbal vocabulary as extensive as the Oxford English Dictionary. But with our cameras situated above the screen, current systems can't transmit those signals. This is particularly true in group meetings.

Remote eye contact is possible. Companies like Cisco have for years sold deluxe telepresence systems with a high-resolution camera on top of multiple large screens. The high-density image, low latency, and eye-to-eye lock create the sensation of an actual physical presence with your remote conversational partner. Alas, these room-size supersystems can cost six figures.

So Big Tech is trying other means to jack up verisimilitude at a more attainable price. Google has ramped up its Meet app with noise cancellation and low-light enhancement to make your lock-down punim less bleak. Facebook's Messenger Rooms allow ad hoc meetings, spicing up their images with photo filters, 360-degree backgrounds, and special effects like bunny ears. As for eye con-

tact, "there are low-tech ways of approaching this, which involve things like redrawing the pixels that are painting your eyes to artificially adjust them slightly upward, to make it seem like you're looking at me," says Javier Soltero, the general manager and vice president of Google's G Suite. But Google isn't committing to this, and Soltero also worries about fictionalizing people's images.

REPLACE THE FACE

Some companies want to ditch the videotream and replace our faces with evocative avatars, ones with expressive cues. Apple has already popularized smart "animoji," which present you as an animal, or even poop, lip-syncing your words with appropriate facial expressions. Facebook just upped its game in giving people tools to look like (idealized) versions of their actual appearance. "What do we really need for that to work?" asks Philip Rosedale, who founded *Second Life* and now has a project called High Fidelity. "There has to be some tension, it has to have danger." In other words, via expressions, the avatar has to feel human enough that there is something at stake.

BY **STEVEN LEVY**
ILLUSTRATION **SONIA PULIDO**

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THE CONFERENCE CONUNDRUM

Large gatherings—the ones we used to travel to—pose perhaps the biggest challenge. I've been "attending" a number of remote conferences of late, with mixed results. Some, like TED's first fully virtual conference, stream the talks and then use a standard conferencing system to let small groups talk with speakers après presentation. (The shift from lean-back to lean-in was jarring, like exiting a Finnish sauna in wintertime.)

A startup called Shindig tries to replicate the vitality of a panel discussion or the intimacy of a fireside chat. Audience members can privately video chat among themselves. High Fidelity uses a different approach: 3D audio, a kind of stereoscopic distribution of sound that simulates how voices are carried in real life, both in small groups and massive crowds. "You could have a stadium concert and you could hear 10,000 people roar in the distance," says High Fidelity's Rosedale.

BECOME PART OF THE MACHINE

The conference lobby scrum, where you reconnect or try to make new friends or business contacts, is the hardest to replicate. Everything in that melee is dictated by a profusion of body signals. Are people leaning in intensely, speaking sotto voce? Or taking desultory sips of wine and shifting their feet? A new social grammar is required for remote gatherings.

A company called Wave is taking its cue on virtual interaction from multiplayer games like *Fortnite* or *World of Warcraft*, whose millions of players have already jury-rigged a way to socialize, when they aren't killing each other. Wave immerses avatars in a gamelike conference world, where there's no need to prowl the corridors looking for the person you want to talk to. Just click on the person's name from the list of attendees and you are teleported to their virtual location. Online Town, a San Bruno, California, startup, lets crude avatars mingle in conference halls, at parks, and on beaches. It uses a clever trick to get around the awkwardness of butting in on a group chat. As you approach a cluster of avatars in conversation, you hear their actual voices more clearly, allowing you to judge when it's OK to nudge your way in.

"We're just trying to provide the minimum amount of interface needed for us to want to be around each other this way," says Cyrus Tabrizi, a cofounder of Online Town. "As long as something makes you feel good about being around the other people here, that's a win."

What's missing, of course, is the frisson of being in a hotel bar or dining room with fellow flesh-and-blood attendees and the full benefit of our evolutionary perceptions. Replicating the kismet of chance encounters and meaningful glances is tech's next challenge. Will future attendees of the Sun Valley Conference close mega-mergers with a teddy bear shaking hands with a pile of feces?

A dealmaker usually likes to look a potential partner in the eye. Painted pixels, better cameras, or VR may soon get close enough to do the trick. But until then, a penetrating look from 6 feet away will beat webcams.



TRUST FALLS

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WHY HAVE SOME ASIAN COUNTRIES CONTROLLED THEIR OUTBREAKS SO WELL?

→
NOT BECAUSE THEY POSSESS BETTER TECHNOLOGY OR MORE OBEDIENT CULTURES, BUT BECAUSE AUTHORITIES THERE HAVE EARNED THEIR CITIZENS' FAITH.

BY GIDEON LEWIS-KRAUS / ILLUSTRATION GUILLEM CASASÚS



ON JANUARY 20, BOTH THE United States and South Korea confirmed their first cases of Covid-19; Taiwan reported its first case the next day, and Singapore followed two days later. Epidemic parity began and ended there. By the end of March, those three Asian countries had largely contained at least the first wave of their outbreaks—and, not only that, had done so at relatively minimal cost to their citizens' routine way of life. The same could scarcely be said of the US. The story behind this divergence was obvious: The governments of South Korea, Taiwan, and Singapore were prepared to test, to trace, and to isolate, and ours was not. Such a vast discrepancy in basic preparedness was, however, almost incomprehensible to many American observers—it seemed impossible to imagine that it could be that simple. The astounding national variance had to be explained by some hidden variable. ▀ The two obvious candidates were culture and technology. On the cultural account, the comparative success of the South Koreans, Taiwanese, and Singaporeans was understood to be an artifact of national—or even supranational—character, some signature constellation of attributes.

As *The Wall Street Journal* paraphrased one expert's view, "In South Korea, as in Japan and Taiwan, the lingering cultural imprint of Confucianism gives a paternalistic state a freer hand to intrude in people's lives during an emergency." Such an appeal to "culture" provided no actionable lessons for the US, but it did provide a ready-made excuse. Nobody was going to propose that the people of Kirkland, Washington, or New Rochelle, New York, be instructed to read the Analects; these Asian countries were successful because they drew on a venerable tradition of filial piety and noble self-abnegation in the service of collective well-being.

A slightly less Orientalist cultural explanation of these successes traded heavily on the notion of social trust. "Social trust is higher in South Korea than in many other countries," according to *The New York Times*, "particularly Western democracies beset by polarization and populist backlash." Social trust, in this generalized sense, is an ill-defined concept that encapsulates a variety of otherwise distinct phenomena: trust in the government as a whole, trust in the relevant authorities in particular, and ultimately trust in one's neighbors. It was, in any case, something that made people more prone to listen to their leaders, wear masks in public, and stand 6 feet apart rather than where they pleased.

Such social solidarity couldn't be counted on in the West. American and European leaders have instead been prone to draw inspiration from these Asian nations' use of technological wizardry. Though South Korea, Taiwan, and Singapore each followed their own distinct approach to pandemic response, their practices were often lumped together as "digital," as if such a category were self-evidently meaningful. The interventions appeared in roughly three varieties: the recourse to geofencing to enforce quarantine; the use of location and purchase-history information to identify pathogen trails; and the development of contact-tracing techniques, reliant on GPS or Bluetooth data, to pinpoint infectious encoun-

ters and notify the exposed.

If cultural stories about deep reservoirs of social trust didn't seem to offer much hope for the worsening American situation, these technological approaches promised, in contrast, that unruly civilian behavior could be rendered irrelevant. Human noncompliance, ineptitude, and weakness could be managed with external controls. Never mind that we can't trust our neighbors to stay home when there's suspicion of infection: In Taiwan, if someone's phone transgresses their invisible geofence, the police are summoned. Similarly, while human contact tracers must trust their subjects to be honest about where they've been and whom they've seen—even if that includes a brief but magical interim at a love hotel—digital contact tracing obviates the need for that sort of candor. No trust *per se* is necessary when we're given complete confidence in a fail-safe mechanism.

It doesn't take much insight to recognize that there has been something incoherent in the tendency to reduce the successes of these Asian countries to a function of both trust and technology. If they enjoyed such preponderant social trust, why would they also need to rely on automated enforcement mechanisms? One way to resolve this tension was to suggest that their eagerness to submit to digital interventions was in fact just another example of culturally inflected obedience. There had to be some deep cultural reason for their willingness to accept the heavy hand of technological oversight—measures we Americans would never tolerate. This view was so common it could be taken for granted. A *New York Times* article from mid-April struck a contrast between Asian technologies and the high-touch, labor-intensive contact-tracing schemes that had been drawn up for the commonwealth of Massachusetts: "Contact tracing has helped Asian countries like South Korea and Singapore contain the spread of the virus, but their systems rely on digital surveillance, using patients' digital footprints to alert potential contacts, an intrusion that many Americans would not accept."

The past 20 years have given Americans good reason to be skittish about national crises as pretexts for expanding the surveillance state. If Asian citizens

were content to be tracked, regardless of the privacy compromises, by centralized agencies, that was fine for them, but Americans were wont to believe that the government enjoyed quite enough power, and to suspect that any credulity would likely be abused. Tracking technology could work, but only if its proportional application could be cryptographically guaranteed—if, that is, the original technology was underwritten by further technology. We in the hard-headed West would borrow techniques from Singapore and other countries and improve upon them: not to track people, but to track the virus itself.

ON APRIL 10, APPLE AND GOOGLE announced an unprecedented collaboration in the service of such a possibility. This may have been a pragmatic necessity—81 percent of Americans own personal tracking devices called smartphones, almost all of them running iOS or Android—but it also made cultural sense. These companies are, after all, two of our most popular institutions, and if their credibility had recently operated at a deficit with the American public, this was their chance to cancel those debts.

The Apple-Google partnership took up the strategy of Bluetooth contact tracing. Imagine how this works with Alice and Bob, the preferred hypothetical pawns of the world's cryptographers, both of whom have chosen to opt into the system. Alice's phone broadcasts randomized identifiers—they are numerical but can be imagined as pseudonyms—to any other device within a radius of, say, 6 feet, for longer than a specified time. If Alice develops Covid-19 symptoms and she tests positive for the disease, she reports this to her phone, and her phone uploads to some server the list of pseudonyms ("Mr Potato-head," "Alphonso Wetwhistle," "David Carradine420") it has recently used, none of which can ever be traced to Alice's device or her person. Bob's phone periodically downloads a list of infected pseudonyms and checks its own Bluetooth-encounter logs to see if any of them come up as recent proximity matches. If Bob's phone finds that it was in fact recently within 6 feet of a "David Carradine420," he would be instructed to self-isolate. If Bob then

developed his own symptoms and tested positive, he would then notify his own app, which would then send out its own untraceable list of pseudonyms, and so on. Nobody—not even health care providers—knows who has been infected, who has been exposed, or where these encounters have taken place, but everyone who might have lingered in dangerous proximity is automatically warned to take expanded precaution. The basic protocol is anonymous and decentralized.

There has been some understandable confusion over what Apple and Google purport to do. They are not, in fact, collaborating on an app but an underlying protocol—a tool kit that public health departments might use to build out their

Alice's phone is not, after all, measuring her actual distance to Bob, but rather using received Bluetooth signal strength as a proxy. But all sorts of factors complicate the measurements for Bluetooth signals: Was Alice's phone in her pocket or her bag? Was it right side up or upside down? Was it an iPhone or a Samsung, and if it was a Samsung, which model was it? Even if researchers can determine a foolproof way to make received signal strength reliable, there's a lot of latitude for mistakes. Alice might be 6 inches away from Bob but on the other side of a glass partition. Alice might be 15 feet from Bob but singing at the top of her lungs. False positives and false negatives are likely to swamp the system and undermine its uptake.

hours that there's no profit in continued isolation—especially if there's pressure from Bob's boss. Almost all of the incentives for an asymptomatic person are aligned to encourage defection.

In other words, these systems are extremely unlikely to work very well on their own; their viability requires extensive public health oversight. For one thing, the country would need widespread access to easy and free testing to mitigate the false positives and false negatives that apps are sure to generate. For another, we would probably need accredited health care providers to trigger the notification process, so as to spare ourselves the trolling that would invariably accompany any anonymized system of self-reporting. We would probably also want some sort of authority in the loop to make us pay attention. We get so many automated alerts on our phones that we're likely to ignore sudden instructions to self-quarantine as so much vibrational noise; even if we're inclined to take them seriously, surely recipients would want further instruction. People directed to quarantine would also want some sort of official document to present to their employers to authorize their absences.

There are also crucial epidemiological reasons for our phones to collect more than anonymized, bare-bones encounter information. Public health experts can better anticipate viral spread if they have access to granular data about where transmissions are occurring; if lockdowns are going to be lifted, we need to know the differences in transmission rates between schools, restaurants, and public parks.

The important question for any of these technological initiatives is thus not *whether* the data is gathered under the aegis of some centralized supervisory body but *how*, precisely, such a centralized system is implemented, and by *whom*.

Take, for example, the experience of Singapore, the first country to develop a major Bluetooth contact-tracing strategy. TraceTogether, as they called it, was in place by the middle of March, and it was the inspiration for similar projects in Europe and the US. The software was developed under the direction of the Ministry of Health, and it is neither automated nor entirely anonymous, and its use is voluntary. As a member of the Singa-

"IT'S ALL RATIONAL CHOICE," SAYS AUDREY TANG. "THERE'S NO MAGIC ABOUT IT. IF YOU KNOW THERE'S NO SOCIAL AND FINANCIAL BURDEN, YOU DO THE RIGHT THING."

own varying approaches. App developers need the cooperation of the underlying operating system to make any tracing system work. But their focus on a protocol rather than an actual application suggests that neither company wants explicit ownership of the eventual app's administration.

Ownership gets complicated. Despite the pervasive fantasy that technology can offer an end run around human unreliability, it should be clear that this system does not in fact eliminate the need for trust; it simply redistributes it away from a centralized intermediary and toward the edges. Alice and Bob need, in the first instance, to trust that the contact identification is in fact accurate—that the two of them were indeed within transmission distance. This is not straightforward.

Many of these technical problems can be addressed with various kludges, but the most pressing issues cannot be solved by throwing more technology at them. Even if our faith in the code is warranted, our trust in others might not be. As cryptographer Ross Anderson put it in a blog post, "The performance art people will tie a phone to a dog and let it run around the park; the Russians will use the app to run service-denial attacks and spread panic; and little Johnny will self-report symptoms to get the whole school sent home." And even if for some reason Alice trusts the integrity of the self-reporting system, on what basis should she expect compliance from Bob? If Bob gets a notification that he might have been exposed and should quarantine for 14 days, he might very well decide after 72 asymptomatic

porean team told me, “We toyed around with many different schemes, and one of them was very similar to the decentralized mechanisms we’re seeing around. And the health officials said, ‘Look, we cannot be flying blind with this. We need the information about how it all works, how people respond, what the impact is.’” Without a human involved in the process, offering direction, those notified about exposure might run to the ER or a doctor’s office rather than going home to quarantine. Or they might make a grocery run before isolating themselves, endangering others. “If you approach this as an exercise in cryptography, you are missing the point—this is primarily an exercise in public health, about creating and coordinating an operational response to Covid that works.” Singapore had already marshaled teams of hundreds of trained manual contact tracers, and the app was only ever seen as one additional tool—a tool that serves their epidemiological management rather than purports to supplant it.

There is an obvious tension here. Epidemiologists are in widespread agreement that such digital mechanisms as Bluetooth contact tracing only really add value if they are deployed by credible actors atop a robust public health response that handles testing, outreach, and resource distribution. But the Google-Apple protocol is built to prioritize a different, and probably incompatible, end: to circumvent the pitfalls of centralized surveillance that have preoccupied Americans since at least 9/11. This makes these companies the effective gatekeepers between sovereign governments and the citizens they’re scrambling

to serve. (They are hardly transparent gatekeepers, either; Google’s spokesperson directed me twice to a vague blog post about its operations and refused further comment.) Public health officials in France and the UK are developing apps and would prefer that they be able to collect more data or store it on central servers; Google and Apple won’t allow it. Either they play by Google and Apple’s rules or they face OS-level constraints that will thwart their reliability and efficacy.

Even this tension, however, might ultimately be beside the point. In South Korea, Taiwan, and Singapore, where various and sundry technological interventions have been used to further the more traditional, human measures already in place, they’ve been of only marginal value. Taiwan has rarely even used the advanced surveillance technologies at its disposal; Singapore’s TraceTogether system has proven most useful in confirming information that manual contact tracers had already secured. This raises an obvious question: If these sorts of tools require a robust institutional response to make them accurate and useful, why do we really need them at all? Have we in the US actually been suffering from a deficit of advanced technology, or might we be suffering from an utter lack of confidence in our institutions and our neighbors?

THE ATTEMPT TO BYPASS THE ENIGMA

of “social trust” in favor of precision engineering thus comes full circle: Issues of institutional and interpersonal credibil-

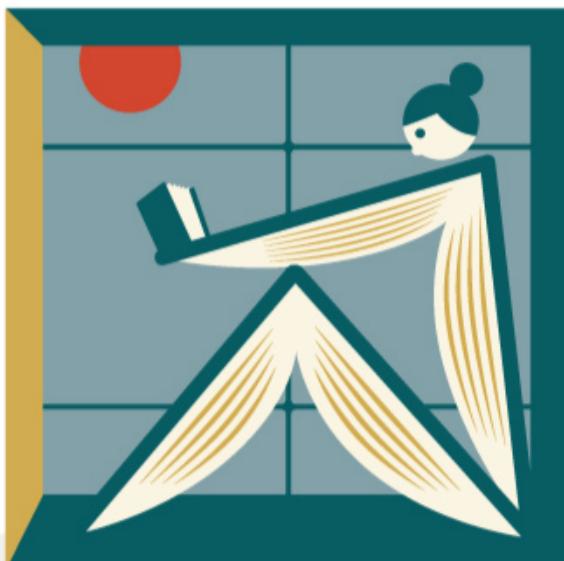
ity can’t be avoided. The notion that social trust exists in some generalized state does not hold up to any real scrutiny, especially when it’s perceived as a function of cultural stereotype. As the German scholar Katharin Tai, who studies Chinese internet policy at MIT, noted on Twitter, “I keep hearing that Europe cannot learn #Covid19 strategies from Asia bc Asians are ‘obedient’ & not as ‘critical’ — South Koreans ousted their last president with mass protests, Taiwanese students occupied parliament to protest a trade deal & HK has been protesting for months.” In an interview, she compared the perceptions of various national responses. “Now Germany is held up as this shining example instead of South Korea or Taiwan, the underlying idea being that if these places are democracies they’re somehow not the same—whereas Germany and Merkel seem more like ‘us.’ Why is that, if not due to some fundamental idea that Asia is different?”

Yet there is clearly *something* going on in these societies. The people have mobilized in ways we clearly haven’t, and they’ve had a much easier time incorporating modest technological tools with neither the fanfare nor the apprehensiveness with which these mechanisms have been greeted in Europe or the US.

Over the past few decades, political scientists have come to articulate a concept of trust that is not a fixed property of a given culture or society. Margaret Levi, the director of the Center for Advanced Study in the Behavioral Sciences at Stanford, has proposed that we wean ourselves from talking about “trust” as a primary concept and instead talk about “trustworthiness.” As

HOW WE’LL CREATE

— JOY HARJO — US POET LAUREATE



When all the usual places of inspiration and entertainment are closed to us, and we can’t even attend a funeral or sit beside a loved one in need, our outlook turns inward. To know what to look for when we turn inward, we turn to poetry and art. During the pandemic, these are doing what they’ve always done: finding us doorways to fresh knowledge of ourselves as human beings and as cocreators on this planet. ▀ Art teaches us to live a life that has meaning, by accepting the responsibility of becoming aware. Inside our little beehives, we are now growing more atten-

tive. We’re paying attention to food sources, for example. We’re asking, who’s bringing my food to me? How is it prepared? We should also ask, when we go back out do we continue as we were, or are there things we need to let go? Art answers: Leave behind that which isn’t nourishing. Not only have we been in a culture that’s marked by a predominance of processed foods, there’s also a predominance of processed ideas, colonized ideas, that follow a particular template toward a particular end, namely fame and money. ▀ We’re at a crucial and incredible moment of reckoning, and of opportunity. The pandemic challenges us to recognize the immense experiment that planet Earth is, and that human beings are part of the same community—all peoples, past and future ancestors, animal human beings, tree human beings. We have been thrown into the center of knowing. Our great challenge will be in sustaining what art helps us become. —AS TOLD TO ZAK JASON

Henry Farrell puts it in his book *The Political Economy of Trust*, drawing on the work of Levi and the late Russell Hardin, “trust pertains to relationships with *specific others over specific matters*” (italics in original)—that is, trust is not some ambient property of a system but a way to describe and evaluate the expectations that condition and color our relationships, expectations determined by mutual understanding and candid negotiation. The upshot of this view is that “trust” is not an explanation for behavioral phenomena but is itself a behavioral phenomenon that needs to be explained.

What, in other words, has largely been dismissed as either an effect of draconian surveillance or an expression of sheep-like obedience—or both—is that these Asian governments have earned their citizens’ trust with a record of public investment and accountability. In the case of the response to the new coronavirus, some of this trust was predicated on the government’s rapid and competent rollout of preventative measures. South Korea immediately introduced simple, pervasive Covid-19 testing, and Taiwan was putting health officials with diagnostic equipment onto incoming flights from Wuhan as early as January. Some of it has to do with the basic confidence inspired by a strong social safety net: People can “trust” that seeking treatment won’t bankrupt them—both countries have extremely reliable national health care systems—and that they can stay home from work without finding themselves unable to pay for their daily needs. In Taiwan, people quarantining at home are given a stipend of \$33 per day. If they don’t have space to quarantine, they are directed to hotels; refusal to comply is punished with fines that run to tens of thousands of dollars. It’s not that the government measures have worked because people are naturally cooperative and responsible; people are cooperative and responsible because the government measures have worked.

The competence extends to communication. South Korea allayed fears of runaway surveillance with frank explanations of exactly who has access to what personal

data, on what terms, and for how long; when a few citizens were publicly exposed as potential carriers via inadvertently identifiable records, the country was quick to alter the way the data was published. The Taiwanese authorities made nationwide mask-inventory data available in real time, and volunteer developers immediately published simple apps to dampen fears of scarcity and publicize the location of distribution kiosks. When a young boy called into the national pandemic help hotline—a call center with an extremely high immediate-pickup rate—to complain that, anticipating ridicule, he was afraid to wear a pink mask, the next day’s pandemic task force press conference saw every public health representative in a pink mask.

As Audrey Tang, Taiwan’s digital minister and a veteran of the 2014 Sunflower Movement, said to me, a lot of it boils down to norms—which themselves have been conditioned by material experience. “People expect that anyone who has those symptoms will wear a mask, go to a clinic, and report whatever they have done in the past 14 days—and they will do this not because there’s anything top-down but because we have a single-payer system and it’s the logical thing to do. Coordination might look like compliance, this stuff about Confucian thought; I’ve read the Analects and understand that it’s a useful metaphor, but this looks far more Taoist to me,” she joked. “It’s all rational choice, there’s no magic about it—if you know there’s no social and financial burden, you do the right thing.”

None of this has anything to do with ahistorical “cultural values” or “social cohesion” or demographic homogeneity; it simply reflects basic commitments to transparency in governance, open communication, and, perhaps most of all, trust in the reliable provision of services. These are concrete measures with historical causes. That history includes Asia’s fraught and perilous experience of two previous viral outbreaks, SARS and MERS. Tang told me that everyone of her generation and older has been marked by their memories of the barricading of the Taipei Municipal Hoping Hospital during the 2003 SARS outbreak. Hundreds of patients and health care providers were summarily locked inside, and at least one nurse tried to throw herself out of a window to escape. It was a rushed and

clumsy response that left a legacy of anxiety, one that the current administration was keen not to repeat.

The bad news is that there is no shortcut to effective pandemic management. The good news is that social trust—the kind that undergirds both an institutional response and a technological one—can be cultivated, as long as responsible authorities keep their promises and refuse to default on their most basic obligations. Even small acts of ministerial competence can go a long way in a crisis. Taiwan banned the export of N95 and surgical masks on January 24 and nationalized mask distribution two weeks later, which established an atmosphere of mettle and faith.

Americans, of course, need far more than access to masks, though that would be a good start. A functional government, universal health care, and a much stronger social safety net—not to mention consistent, meaningful communication from on high—would help us relinquish the enduring fantasy that we will be saved by a Silicon Valley moon shot or that our low levels of social trust are congenital.

Over the past few months we’ve seen some fleeting, guarded optimism that this moment might be used as an opportunity for national reconciliation—a time to re-create a sense of fellowship and solidarity lost to decades of increasingly rancorous polarization. Crises like these can be occasions to see ourselves as part of what Margaret Levi and the political scientist John Ahlquist call an “expanded community of fate,” “those with whom we perceive our interests as bound and with whom we are willing to act in solidarity at some personal sacrifice.” The spontaneous appearance or expansion of radical mutual-aid groups—grassroots efforts of concerned citizens to help ease one another’s difficulties—might thus be taken as an auspicious sign. But mutual-aid groups are at best a stopgap measure. All too often we imagine that Washington doesn’t work because we as citizens are irremediably polarized, when the truth is almost certainly the opposite. We cannot thus hope that mere crisis solidarity will once again render America functional; we must instead remind our leaders that our precarious solidarity hangs in the balance of their competence. They should feel welcome to start with something small. ■





NEWS

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I STARTED A COVID-THEMED NEWSPAPER FOR THE CHILDREN IN MY NEIGHBORHOOD. IT TURNED INTO A GLOBAL OUTLET FOR PANDEMIC KID JOURNALISM, FEATURING EARNEST ADVICE COLUMNS, INTENSIVE BIRD-WATCHING REPORTS, AND NO-PARENTS-ALLOWED TIPS FOR ACQUIRING CANDY.

BY CHRIS COLIN / ILLUSTRATION SONIA PULIDO



Minecraft and burping contests all day, and only in bed that night do you realize she was processing some awful thing someone mentioned about the Holocaust.

On the afternoon of March 16, as my son and daughter ate lunch, I dashed off an email to a handful of friends and neighbors with school-age children. Might their kids consider jotting down some impressions? A journalist with a slew of postponed assignments, I was now directing the impulse elsewhere. The internet was overflowing with news of the global variety: prospects for a vaccine, testing shortages, government ineptitude. I wanted to know what was happening locally—on kids' blocks, in their homes, in their heads.

I was starting the country's first local coronavirus newspaper by and for children, my email announced, to myself as much as them. It was early enough in the pandemic that such assertions were likely true; if you wanted to start the first coronavirus hedgehog club, the claim was yours to make. Kids would name the paper, and they could write about their experiences however they saw fit. My editorial policy would be *yes*.

In less desperate times, one of those parents might've asked whether I'd ever done this before, whether I even knew how to make a website. (No and no.) But sudden homeschooling is the mother of acquiescence, and everyone promised to pass along my invitation.

Our neighborhood, Bernal Heights, is a quirky little zone. Situated just south of the Mission, its working class and bohemian roots remain, though gentrification walloped us good; our main drag features both old-school nail salons and fancy artisanal shops. We're squarely within city limits, but a small-town vibe runs through the place: The manager of the local grocery sits in a dunk tank at our annual fiesta, and kids wander freely, from the playground to the library to the enormous grassy hill rising up over the southeast side of San Francisco. And now those kids were locked indoors, wondering what they were missing outside, forming impressions about life inside. I figured I'd receive at least half a dozen haiku about Purell.

I awoke the next day to a torrent. My call for submissions had made the rounds, and then other rounds. Here was a local 8-year-old's description of lockdown from a cat's perspective, and a 6-year-old's proposal for

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THE DAY AFTER SAN FRANCISCO CLOSED

its schools, I noticed right away two children in my house. They were *my* children, I observed—not off getting educated but here in my living room, eating cereal, occasionally looking up at me. Texts from friends suggested similar situations all around town. Once in a while a stray bit of clarity drifts in, and on that morning, March 16, four days into what was officially but still only distantly a national emergency, I saw that 56 million children across the country were about to lose their minds. ■ I'm not talking about the intense boredom and unease their new isolation would unleash. Anyone half paying attention had seen that problem coming. What concerned me were the 7,000 *other* things going on inside our children, the complex internal rearrangements we wouldn't begin to comprehend, let alone address, for years. Hell, we have no idea what's happening in ourselves these days. ■ But adults have whiskey and teletherapy for managing our feelings. Most kids can't manage a can of chicken soup. What's more, they're emotional ciphers. As a parent, you do your best to get out in front of any trauma they're experiencing, but you have limited access to their inner worlds. Even in the absence of a global pandemic, a sideways glimpse is often the best you can hope for. Your kid talks about

a social-distance-enforcing Hula-Hoop. A teenage data journalist created a map of Bernal's struggling restaurants, complete with status and new hours. A 9-year-old wrote about going on a grocery run with his dad and seeing masks on so many faces. His piano lessons kept getting canceled, and he was afraid some grandparents might die. "I don't know what the coming weeks will be like," he wrote.

A handful of non-Bernal kids sent in submissions, too, so immediately a robust Foreign Correspondents section was born. An 11-year-old wrote about being trapped with her family in Tahoe. She reported that her daily routine was getting dreary ("the same boring eight boring hours of the same old thing"), but at least there were breaks for going outside and making snowmen. On Google Hangouts, all her friends said the same thing: "I want 2 go back 2 school."

The contributors suggested names for the paper, which I then put to a vote. In a dis-

of diversion in these strange times, but it wasn't just that. A world was beginning to take shape in my inbox.

HOW WILL HISTORIANS MAKE SENSE of this time? How will they unpack even a single day? When they look back on March 16, they may note that it had been just over 10 weeks since Chinese health authorities shuttered the Huanan Seafood Wholesale Market, a purported source of the outbreak; that Britain had yet to institute a shelter-in-place policy; that the Tokyo Olympics were still on the table; that fewer than 90 people had died in the United States.

Or they might assess the day on a more local scale: Shuffling around the house was strange and new. Americans streamed 156 billion minutes of fear-numbing entertainment that week, more than twice the figure from a year earlier. US alcohol sales rose 55

I WAS STARTING THE COUNTRY'S FIRST LOCAL CORONAVIRUS NEWS-PAPER BY AND FOR CHILDREN. MY EDITORIAL POLICY WOULD BE YES.

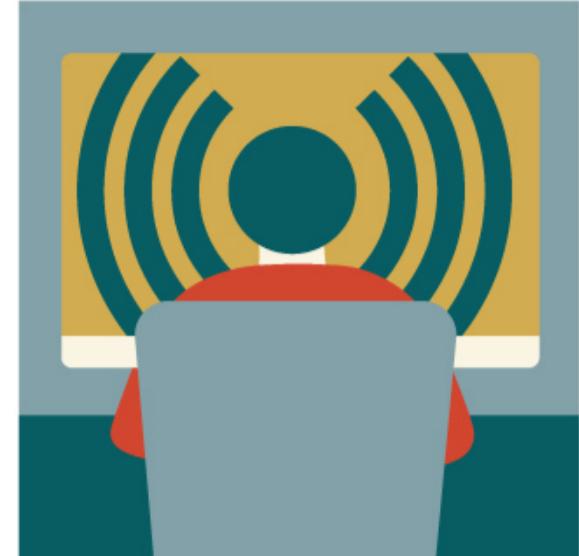
illusioning blow to my 7-year-old, *Bernal Butts* was narrowly defeated by *Six Feet of Separation*. I worked with the kids on their pieces, marshaled my nonexistent layout skills, and frantically Googled cheap publishing software, ultimately settling on a godless app presumably designed in the 1940s. You could flip through our digital newspaper like it was the real thing, even if the pagination feature sometimes spit out a few extra page 6's.

All the while new submissions rolled in. They were earnest and sharp, sweet and raw, and often wildly unrelated to the pandemic at hand. Neither of the two reviews of *The Good Place* quite touched on the virus, nor did an 8-year-old's refreshing critique of the *Terminator* film franchise ("most of the actors are British people, and I like that"). The pieces were human, in other words, and within three days I had more than enough material for our first 29-page issue. Clearly the kids had found a dollop

percent. We baked banana bread by the pallet, and "flattening the curve" was an interesting new idea.

Or they could consider the day via Ava, age 10. "It all started when my mom was gonna pick us up from school," Ava wrote. She was waiting in the cafeteria when, without warning, the sprinklers overhead switched on. Instead of spraying water, they sprayed milk. That's when she realized she'd left her lunchbox on the other side of the cafeteria. She was soaking wet by the time she retrieved it, and then she woke up.

Historically I have not reflected much on the dreams of local 10-year-olds; I've endeavored to avoid hearing my own children's. But now I find myself with entirely different feelings on the matter. Precisely as children's worlds are being turned upside down, parents are being reminded how utterly impossible it is to extract meaningful intel from them. What does all of this feel like? (Shrug.) Are you scared? (Shrug.) Is our



HOW WE'LL LEARN

— JANICE K. JACKSON

— CHIEF EXECUTIVE OFFICER,
CHICAGO PUBLIC SCHOOLS

If you had asked me three months ago, "Janice, how long would it take you to put together a remote learning program?" I would say, "Give me two to three years." Turns out, we did it in a couple of weeks. Right away, we focused on meeting students' basic human needs, like providing meals. We also distributed more than 124,000 laptops and tablets. ■ A life-altering event like this brings equity into sharper focus. Unfortunately, the kids who were most vulnerable before the closures—low-income students and students of color—have been put at a greater disadvantage. That's something we should keep top of mind: How do we use this as an opportunity to solve inequities that existed prior to the pandemic? ■ In the past, people might have considered providing students with technology as a nice-to-have. Now it's clear that a lack of internet access is a barrier to education, and as a city we're currently looking at ways to respond to that need. I hope there's a greater investment in public education after this. People would be outraged if a school didn't have adequate textbooks. They should be outraged from this point forward if every child doesn't have an internet-connected device. ■ Students and educators are finding such creative ways to lift each other up. Every day, I see something online that gives me joy, like teachers driving in "car parades" through their students' neighborhoods. One school posted a video of a kid presenting his science fair project. At first I thought, "Poor baby." But now he has an audience of thousands. I hope we don't lose that in our post-Covid world. —AS TOLD TO PIA CERES

Illustration by Noma Bar

failure to imagine the long-term economic, psychological, and societal impact of this, like, messing you up *a lot* or just some? (We don't say that one out loud.) At the moment we most want it otherwise, we are living through peak *how-was-your-day-fine*.

But their days are not fine. These are people for whom satisfying even the most basic human urges—can you reach the faucet, please?—requires negotiation with nearby adults. Now they can't even touch a door-knob without a parent anxiously monitoring the operation. Older kids, meanwhile, will watch their graduations and proms and other coming-of-age rituals migrate online. They might do so with rueful chuckles, but the balance will eventually come due, as it will for all these kids. They may be asymptomatic at first. The incubation period may last months or even decades. Something is in there, though, rippling through their psyches unseen.

Yet writing has a way of cracking through and coaxing out whatever's stuck inside. From the earliest submissions it was clear that kids are fully convulsed by the pandemic, though not like we are. While their parents fret over vast existential questions, the young journalists generally focus on the minutiae of their new realities—changes in the breakfast routine, new screen time allotments. Little in the way of sentimentality creeps in. Amid the reflections on missing school and friends are quarantine horoscopes, elaborate recipes, comics about crime-fighting super fish, classified tips on acquiring candy, and impressive nature writing. (Bring it on, other neighborhoods' appreciation of the American kestrel!) An 11-year-old girl in India at first despairs at

the emptiness all around her: "The tailor who mends clothes and sits under the tree has gone, the ironing man has left for his village and I do not have any friend to play with me." But she begins to find solace at home, first by cooking potato wedges ("fried and not baked"), then by "training my dog, Besty, to jump over brooms and ropes. She is doing a pretty good job of jumping over the brooms."

As the submissions kept coming—now from New York, now from Spain, Arizona, Florida—I devised a philosophy of youth publishing on the fly. Parental involvement would be tolerated only with the youngest participants. (My own children, 7 and 11, have contributed two articles altogether. *Six Feet of Separation* is the Chinese restaurant they live above and never frequent.) I would turn a blind eye to an ungodly number of grammatical errors, not because they're cute (a little goes a long way) but because the paper is a reflection of their sensibilities, not mine. My take-all-comers policy would be ironclad, though gradually I began nudging writers to dig deeper in their second drafts: *Tell me more about the California slender salamander. What's it like, not going to mosque for Ramadan?*

Within the space of just three issues you could track an evolution. Kids allowed themselves to get vulnerable. A 17-year-old who initially wrote about fun activities for homebound kids ("clean shoes with an old toothbrush and baking soda") was soon tackling a peer's worrisome sense of listlessness in a new advice column ("Unmotivated But Otherwise Fine, I believe in you"). A high school senior composed an essay about dropping out of school last year in order to work, then reenrolling so her mom could

see her in a cap and gown—only to be sent home again. "I'm gonna be in the real world soon with a missing part of me," she wrote.

After a couple of issues were out, a radio station in Minneapolis invited me to talk about the paper. At one point I mentioned a short piece I'd loved from the first issue, a 7-year-old's review of the evening's dinner. He'd awarded it three out of five stars:

It had some really good meat sauce. A little too much pasta and too much parsley. It was chunky good. And the pasta was a little too flat. Oh and nobody asked me if I actually wanted cheese or parsley. Mom said it's part of the recipe.

I mentioned that the review had been funny, and heard in the radio host's voice something like relief.

"So this is not a newspaper for heavy, serious, depressing stories," she said, or something to that effect.

"No, it *is*," I said. "It's for those *and* it's for funny reviews of the evening's dinner."

The correct response to a pandemic, I wished to convey, is neither seriousness nor humor. There *is* no correct response. If the paper can reflect the fullness of that fact—that fart jokes and profound sadness can live side by side—I will consider it a triumph, five out of five stars. *Six Feet of Separation* isn't meant to mimic *The New York Times* or, for that matter, any aspect of the adult world. The adult world is failing these kids. It's failing to let them hug loved ones, to get normal educations, to keep them safe, to assure them a stable future. By God, paint a dinosaur holding a cat as it flies over Oakland. Describe the best quarantine pranks. Write a poem slightly critical of zebras.

HOW WE'LL LISTEN

ETHAN DIAMOND, CEO OF THE ONLINE MUSIC PLATFORM BANDCAMP



The pandemic has caused a lot of fans to reevaluate how they support their favorite musicians. We had a campaign to draw attention to artists who lost their income from touring revenue. In 24 hours, we raised \$4.3 million. The next one we did raised \$7.1 million. ▪ For the vast majority of artists, streaming services essentially generate spare change. Our business is modeled on a revenue share, where we only make money if the artist makes a lot more money. We've seen a big uptick in sign-ups from artists, labels, and fans, and in the amount of

money flowing through the site—vinyl, digital sales, CDs, T-shirts, everything. We've just launched a vinyl pressing service, where fan orders finance the pressing of the records, so there's no up-front cost to an artist. Artists who offer physical goods on Bandcamp make a lot more than the ones who don't. ▪ Why would anybody buy music anymore when you can pay a monthly fee and get all the music in the world? The fact that we're selling 77,000 records a day is proof that people want to have direct relationships with artists. Streaming is a lot like radio, and fans lose connections and context—you're not looking at the liner notes or holding the physical object in your hand. For a certain type of music fan, something is lost that they're looking to get back. Even after the pandemic, I expect we'll still see a lot more direct support of artists, which is great for music overall.

—AS TOLD TO KATE KNIBBS

SIX FEET OF SEPARATION

A YOUTH NEWSPAPER FOR BERNAL HEIGHTS AND BEYOND



Self portrait, Fiona Charne, 5

“WE’RE ALL IN THIS TOGETHER”—so went the hopeful cry of solidarity in the early days of the outbreak, generally from the kinds of people with the free time and emotional bandwidth to issue heartfelt platitudes. In truth, of course, the pandemic has hit the poor and marginalized harder than others. Young journalists aren’t exempt from this divide.

Paying for a publishing platform, finding a friendly neighbor to figure out Word-Press, having a whole network of helpful parents and the free time to email children every day—these are middle-class comforts. Which, you know, great. All kids deserve encouragement. But at a certain point it became clear to me that *Six Feet of Separation* wouldn't live up to its potential unless it sought out and raised the voices of kids otherwise going unheard.

This summer, with a grant from AT&T, I'm beginning a partnership with 826 National, the largest youth writing network in the country. It will allow *Six Feet of Separation* to reach into communities that are too often ignored, even at grown-up levels. Although born of quarantine living, the paper will evolve as the national landscape does: Long after the pandemic's medical phase is over—knock wood—there will be economic, social, and psychic impacts to process for years. My ultimate hope is that all manner of loosely connected satellite papers will spin off in neighborhoods around the country, each with its own voice and flavor.

Seeing your peppermint brownie recipe in a janky online newspaper will not redistribute the world's wealth and power. But it's also not nothing. With the publication of the brownie recipe comes a blast of confidence. Soon you're emboldened to interview the mail carrier. The mail carrier conversation is stressful but eye-opening, and next someone mentions a neighbor

who delivers for Instacart. Now you've got the hang of it, and you start directing your questions inward. What's *my* story? How is all of this affecting *me*? What do I want, and who's standing in the way? Once the journalism section of the cerebrum starts lighting up—curiosity, skepticism toward authority, a dedication to community and democracy and truth and mystery—you reach a point where it's easier to keep plowing forward than stop.

That's my theory, anyway. This is all new to me—I don't know what I'm doing, but it beats scanning gloomy CDC predictions. Early on I realized that having a grabbable daily sliver of optimism would be invaluable in this crisis. I think that explains why the publication has benefited from a striking amount of goodwill. Dan Rather said it "gives hope"; the *San Francisco Chronicle* called it "a stellar reflection of humanity." These words are lovely, of course, but I sense they say less about *Six Feet of Separation* than they do about ourselves, and our hunger for something hopeful. I get it. I'm hungry too.

In 1665, the bubonic plague swept through London, forcing King Charles II to relocate his court to Oxford. There he quickly found himself lacking a solid news source; courtiers, it seemed, didn't want to touch the pamphlets being published in the capital. That November, the first issue of the *Oxford Gazette* was born, a proto-newspaper that would eventually

COMICS



By River, 9, Larkspur, CA

A pretend baby's pacifier makes the front page (left): Tod falls for a classic fast-food prank.

become *The London Gazette*, the oldest surviving English-language paper in the world. The election of the new lord bishop of Oxford, debates in the House of Commons, assorted Dutch naval news—these, apparently, were the events that needed to be recorded. Only on the last page, almost as an afterthought, would readers find mention of the plague that was upending the country: “The Account of the Weekly Bill at London runs thus, Total 253. Plague 70.”

The news we all feverishly devour these days—will it be the news our children value when they look back at this time? How will this time even register? Will it be the first of many insane crises in their lives—*oh yeah, that thing with the masks*. Will they feel we did right by them?

"This is a picture of the Katura tree in front of my house," a 6-year-old named Rosetta from Washington state wrote in our second issue. Her mother had sent a slightly blurry photo Rosetta had taken, of a Katura tree growing in her yard, although adults call it a katsura. "I took it this Sunday morning when I was thinking of the outside because we are going to go on a bike ride and I was feeling happy. My favorite thing about this image is the Katura tree. The tips have really beautiful blossoms of red flowers. They make me feel good."

In seven years Rosetta will be a teenager. Seven more and she'll choose her major, and a few more after that she and her generation will take the reins from our tired hands. But they're here now, biking around, looking at trees, making snowmen, dreaming of milk sprinklers, trying to make sense of the world we've given them. 

CHRIS COLIN (@chriscolin3000) wrote about Marc Benioff, the founder of Salesforce, in issue 28.01. He's a contributing writer to California Sunday, and his work has appeared in The New York Times, Outside, and Pop-Up Magazine.

WITH LABS SHUT DOWN AND UNIVERSITIES CLOSED, HOMEBOUND SCIENTISTS WERE LOOKING FOR WAYS TO **HELP BATTLE THE PANDEMIC**. I PUT OUT A CALL ON TWITTER, AND THE COVID-19 DISPERSED VOLUNTEER RESEARCH NETWORK WAS BORN.

0 7 4

BY **MAIMUNA S. MAJUMDER** /
ILLUSTRATION **GUILLEM CASASÚS**

HEADS IN THE CLOUD

 **AS THE PANDEMIC WEARS ON, I'VE BEGUN TO** forget what the inside of my office looks like. The last time I saw it was the second week of March, when my colleagues and I were told to work from home. Most of us had an easy enough time making the transition: At the Computational Health Informatics Program, an initiative jointly run by Boston Children's Hospital and Harvard Medical School, we spend much of our time in front of screens anyway. We had been studying Covid-19 since late January, modeling its spread in hopes



of understanding how it might evolve in the weeks and months ahead. Now we'd swap our desk chairs for couches. I switched off my office mood lamp and fairy lights, grabbed my laptop, and quickly familiarized myself with the VPNs I would need to gain remote access to our institutional computing services.

Others in my field weren't so lucky. As I settled in at home, I saw tweet after tweet from scientists all over the world whose professional lives had ground to a halt. Laboratories were shutting down. Clinicians could no longer see their patients. The post-doctoral job market had suddenly dried up, and many recent graduates were concerned about the gaps the pandemic would leave in their CVs. Even among those who still had work to do, there was a feeling of listlessness: Everyone wanted to contribute

from France who could speak to the pandemic's legal and political implications.

Surprised by the deluge, I enlisted my friend Angel Desai, an infectious disease physician, and my husband, Imran Malek, a recent law school graduate with a decade of experience in software engineering, to form an ad hoc oversight committee. And just like that, the Covid-19 Dispersed Volunteer Research Network was born.

We decided to formally launch our effort with a weekend hackathon. Other groups had organized similar events to develop diagnostic tests and help with the shortage of medical equipment, so why not do the same for research? From the beginning, we knew we'd have to shake up the usual way of doing things. In a traditional lab environment, the structure tends to be hierarchical: A principal investigator sets the

were adhering to lockdown orders? What might internet search query data reveal about the public's interest in coronavirus treatment scams?

The participants sorted themselves into groups, settled on eight different projects, and got to work. They kept at it for 54 hours; shockingly, no one quit. Many of their studies will soon be published in peer-reviewed scientific journals. One team, made up of epidemiologists and computer programmers, decided to perform a meta-analysis of clinical and epidemiological parameters associated with Covid-19, then develop an interactive online interface to visualize their results. A tool like this can help public health decisionmakers predict where the disease will go next, and it makes the same knowledge accessible to the general public.

This kind of cross-institutional, almost cross-cultural, work is very much at odds with academia's usual way of doing things. Prior to the pandemic, it was rare that any of us ventured outside the bubble of our own universities and hospitals. Over the decades, this siloed approach to research has shaped the way science gets done—and who gets to do it. The system tends to favor the career advancement of those who belong to a select few institutions over all others, irrespective of the depth of their skills or training. A growing body of literature suggests that underrepresented minorities are less likely to attend prestigious universities, even when they are equally qualified to do so. As a result, scientific research suffers from a lack of diversity—despite the fact that deeply diverse teams appear to produce better solutions to problems.

Academia divides researchers in other ways too. Most of us are used to working mostly, if not exclusively, with others in our fields. But as Tenley Brownwright, a post-doctoral scholar at Penn State and member of the volunteer network, puts it, "very few topics exist in a vacuum." Brownwright is a spatial epidemiologist, which means that she primarily studies how health varies with geography, but she regularly works with theoretical biologists and clinicians. "It's very easy to get stuck in our niche as researchers," she says.

But the pandemic is a problem that crosses disciplines. It requires devising plans to reopen the economy while being

BY FORCING RESEARCHERS OUT FROM BEHIND THE WALLS OF THEIR HOME INSTITUTIONS AND INTO FULLY VIRTUAL WORKSPACES, THE PANDEMIC HAS ENABLED THE KIND OF COLLABORATION THAT SCIENCE NEEDS MOST.

something to the fight against Covid-19, but some worried they didn't have the ability to do so on their own.

On March 18, five days after the Trump administration declared a national emergency, I decided it was time to harness all this pent-up brainpower. I put out a call on Twitter for qualified volunteers who wanted to use their extra time to tackle a myriad of research questions at the intersection of computing and Covid-19 epidemiology.

Right away, expressions of interest flooded my inbox: I heard from a veterinary clinician in India with expertise in zoonotic diseases, a category that includes Covid-19; an engineer in Canada who'd recently completed her master's degree in artificial intelligence and could help with deep learning; a health law and policy specialist

agenda and divvies up tasks for the group. Our hope was to proceed more democratically. We didn't want to scare off people who were donating their spare evenings and weekends, an immensely precious commodity at a time when everyone's lives had been upended. And we suspected that a group as diverse as ours, encompassing a wealth of disciplines, 20 different native languages, and 25 self-identified ethnicities, would work best with minimal limits on its ingenuity.

More than 30 volunteers across dozens of different institutions signed up for the event. We started by hosting an all-hands meeting on Zoom, where the oversight committee laid out some of the unanswered questions we'd encountered in our own research: Could we use smartphone mobility data to gauge whether people

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mindful of public health, or developing strategies to distribute antiviral drugs and vaccines while making sure they're affordable. By forcing public health researchers out from behind the walls of their home institutions and into fully virtual work-spaces, the pandemic has in many ways enabled the kind of collaboration that science needs most.

Since our first hackathon, the volunteer network has grown to nearly 100 people, with 23 active research projects. One team is analyzing text extracted from hundreds of thousands of news articles to better characterize the quality of the US media's pandemic coverage. Another is sifting through millions of tweets to understand how public sentiment toward face masks has shifted since early April, when the CDC recommended that everyone wear them. Without question, the diversity of the network, across disciplines and institutions but demographically too, has been a tremendous boon to the formulation and investigation of problems that really matter.

The research hasn't been without its challenges. Chief among them is work-life balance—a goal that, as millions of us are now discovering, becomes uniquely elusive when one's home becomes one's full-time office. People's pets and children often chime in with indecipherable key-smashes on Slack, or clamor in the background of Zoom meetings; none of us think it's strange anymore to email a colleague at 1 o'clock in the morning. Among the volunteers, we enforce regular breaks during work sprints to encourage some semblance of normalcy. Unless you're careful, Brownwright says, "time is unstructured and feels endless."

Since March, a sense of camaraderie—even friendship—has materialized among the researchers. Whenever there's a juicy announcement on the coronavirus front, they react on Slack with a sea of Kermit-sipping-tea GIFs. They shower each other in a set of custom emoji, the most popular of which is a French cartoon chicken called Piu Piu. They swoon over an image of Anthony Fauci, the director of

the National Institute of Allergy and Infectious Diseases, in his youth. ("Foxy Fauci," my husband calls it.)

Yet the connections go further. "I've witnessed a deeper sense of caring emerging from the pandemic's shadow," says Benjamin Wong, an epidemiologist at the Centre for Global Health Research in Toronto and one of the first volunteers to commit his time to the network. "Conversations about our struggles are now openly shared when, months earlier, they may have been left unsaid." Grappling with mortality is a professional hazard for many in public health. But the frankness with which we're discussing it today—maybe because some of us have lost loved ones to Covid-19, including the frontline workers we call our friends and colleagues—points the way toward a much needed shift in culture.

These conversations have prompted some of the researchers in the network to begin studying the collective trauma associated with Covid-19, which will likely have population-wide mental health repercussions that long outlive the pandemic itself. They're using natural language processing to examine deidentified text from online therapy sessions, aiming to better understand both the short- and long-term effects of the crisis on anxiety and depression. Work like this requires the expertise of psychologists, epidemiologists, and computer scientists—all of which the network has.

Many of us will be returning to our offices someday in the future, and when that day arrives, we ought to take the things we've learned with us. The very *possibility* of remote work should be offered as a reasonable alternative to those who might otherwise be asked to uproot their lives for a one- or two-year position—a common occurrence in the postdoctoral phase of an academic career. "In quantitative disciplines like epidemiology, much of our work can be done from home," Brownwright says. "I hope going forward we can keep this level of support and flexibility in place, so postdocs and labs are able to choose the situation that best fits them."

So much is possible when we break down the walls and rigid work styles that have traditionally mired academic science. Here's hoping for a post-pandemic future that puts them to their rightful end. ■



HOW WE'LL MOVE

JANETTE SADIK-KHAN

NEW YORK CITY TRANSPORTATION COMMISSIONER FROM 2007 TO 2013; PRINCIPAL AT BLOOMBERG ASSOCIATES



Just a few short months ago, we thought the future of cities would be autonomous vehicles and big data and escooter

ers and e-hail companies. Then the bottom dropped out and traffic fell 50 percent across the US. Our streets haven't been this quiet since cars first emerged, and they may not be this quiet again in our lifetimes. I think the global transportation response to this has really less to do with new tech and more to do with revealing the streets that we've always needed. ■ In Oakland, Denver, Minneapolis—all these cities are using this opportunity to make the kinds of changes that they wanted to see a decade ago, when taking space from cars was viewed as an assault on the status quo. Brussels and Berlin have extensive new bike lanes. Milan is converting car lanes into bike lanes and expanding its sidewalks. Vilnius and Tampa are taking away parking lanes and even entire streets in the city center for restaurants or cafés. ■ It's so eerie to see these empty streets, but they're really a blank slate. People are looking at this moment to bring new life to cities without bringing back the old congestion and the traffic and the pollution that threatened them before. If we can make it easier for people to get around without having to own a car and paying to operate, maintain, and park it, that's money that can be used for health care, for education, for housing. This is a moment for cities to be as big and bold as the crisis we're addressing.

—AS TOLD TO ARIAN MARSHALL

Illustration by Noma Bar

AT 37, MY CHILDHOOD FRIEND BRIAN WALLACH WAS
DIAGNOSED WITH ALS. HE STARTED TAPPING A LIFETIME OF
CONNECTIONS—FROM OUR EPISCOPAL BOYS SCHOOL, FROM COLLEGE,
FROM THE OBAMA ADMINISTRATION—TO GIVE HOPE AND HELP
TO FELLOW SUFFERERS WHILE GRAPPLING WITH HIS OWN MORTALITY.

PHOTOGRAPHS BY KEVIN SERNA





A
LIF~~E~~
JUST
OUT OF
REACH

BY

BRIAN BARRETT

BRIAN WALLACH'S LEFT HAND CRAMPED

and he dropped his pen. Ten minutes later, it happened again. Annoying. He'd spent months preparing for this case. He'd joined the US Attorney's office, a dream job, almost three years earlier. He was in the midst of prosecuting the surviving member of a group that had smuggled guns into Chicago from Indiana. The trial was a few weeks away. And now these cramps. He chalked it up to stress and moved on.

That was April 2017. On July 31, Brian and his wife, Sandra Abrevaya, had their second daughter, jaundiced but otherwise healthy, so all three stayed in the hospital a week. That's when Brian started coughing, barking, unable to finish a sentence. Sandra told him to see a doctor, so he did. He ticked off every symptom he could think of: the cough, the cramp, and also a muscle twitch in his left arm.

That physician sent Brian to a neurologist the next day. The neurologist talked through Brian's symptoms, looked at his tongue—it was subtly undulating, something Brian hadn't noticed. The doctor then told him the news: He likely had amyotrophic lateral sclerosis. ALS. Lou Gehrig's disease. If he was right, the doctor said, Brian had approximately six months to live.

That was the same day Sandra and their daughter had come home from the hospital. Brian barely knew what ALS was. It seemed impossible that it would have found him, much less imposed so strict a deadline.

Brian's first call on the drive home was not to Sandra but to Nick Morris, a neurologist at the University of Maryland and a friend from college. Before he could tell Sandra the news, he needed someone to help him process it. Nick obliged, explaining that there's no one definitive test for ALS—in fact, a conclusive diagnosis often requires a months-long process of elimination.

Sandra called in the middle of that conversation, and Brian switched over. She caught something in his voice. No, everything wasn't OK, he told her. No, he couldn't say it over the phone. Yes, he was on his way home.

Sandra paced while the girls napped. When he arrived she ran out to the car and jumped into the passenger seat. Nick was still on speakerphone. "I need you to get off the phone because I don't know what's going on," Sandra said to them both. And then Brian told her.

"That's not that bad, right?"

"No," Brian replied. "It is."

I'll spare you some suspense. The neurologist was right about ALS, albeit for incomplete reasons, but he was wrong about the timetable. Three years later Brian is still alive.

ALS is a cruel disease. Motor neurons in the brain and spinal cord gradually degrade and then die, robbing the sufferer of control over their muscles. Eventually patients cannot move or speak or eat or breathe. There is no cure and, except in a minority of inherited cases, no known cause. Once symptoms appear—in an arm or a leg or a hand—the typical survival rate is three to five years. It is fatal in virtually all cases.

Brian was one of roughly 5,000 people in the US to receive an ALS diagnosis in 2017. He's one of more than 16,000 patients living with the disease in the country today. Each has faced some version of Brian's moment in the car: mortality in sharp relief. A loved one at home who doesn't yet know. A decision about how to spend whatever time they have left.

Brian and I have known each other for three decades. Our lives have played out as variations on the same theme: good schools, bad work-life balance, two kids, settled down hundreds of miles from where we grew up. He and Sandra told me this story when I visited them last spring. We were sitting in a bedroom addition of their suburban Chicago home, built with a ramp for the inevitable day that Brian's disease will confine him to a wheelchair.

Even now I keep coming back to Brian driving himself home from that doctor's visit. I try to envision how I might have felt in those first moments alone, after the life I'd built started a slow dissolve. I can't. But for the past 18 months I've watched Brian devote whatever time he has left to fighting a disease that will inevitably take his life. To creating tools for others to fight it. To funneling a lifetime of experience and connections and determination into a singular cause while he still can.

I don't know what I would have done after leaving that neurologist's office. I don't think anyone could. But I do know that even the most optimistic boundaries of my imagination can't match what Brian has already achieved.

As I rode the Metra train from downtown Chicago to the suburban Kenilworth stop to meet Brian in the spring of 2019, I tried to think of the last time we'd seen each other. The first was easy: fourth-grade orientation at St. Albans School in Washington, DC, where we'd been classmates until college. I had orbited a group of friends that included Brian; we were close enough to ride the same

WALLACH AND HIS WIFE,
SANDRA ABREVAYA,
PHOTOGRAPHED IN KENILWORTH,
ILLINOIS, ON MAY 1, 2020.



party bus to prom but not to stay in regular touch since.

Most of my memories of Brian from those days are broad and fuzzy, an impressionist canvas of penny words like *smart* and *competitive*, kinetoscope footage of five or six teenage morons blustering in the A/V room after school. One image stands out more sharply: our senior spring, Brian edging milliseconds closer to the school record in the 400-meter run, a race that requires maximum effort for longer than your body is designed to give it. I had forgotten if he'd managed to break it.

Scrolling through Facebook I found our last encounter, down to the day. There's a group shot, a baker's dozen of us wearing matching camouflage T-shirts with 10.12.07 printed on them. We're at a bar in DC, celebrating the return of our friend Sam from two tours with the Marines in Iraq. In the photo, Brian and I are standing next to each other, his arm slung over my shoulder. I remember being glad for the excuse to see old friends. It somehow hadn't occurred to me then that Sam might not have come back alive. Mortality was an abstraction, just out of view.

As I headed down Brian's tree-lined street near the train station, I ran into him outside, walking with Sandra and his 16-year-old hound mix, Hunter. He looked taller and grayer than in that photo. He also moved at a gingerly pace; Brian later described it as "the gait of an 80- or 90-year-old man." I'd talked to him on the phone ahead of my visit, so I knew his voice had picked up some gravel. In person I could see that speech also took effort, the muscles of his mouth and tongue in quiet rebellion.

Brian and Sandra moved from the city to Kenilworth in the fall of 2018. They live just a few doors down from Sandra's parents, in a house gut-renovated with Brian's ALS in mind. In addition to that bedroom, they expanded each doorframe, hallway, and passage to accommodate a wheelchair. They built a garage big enough for the van that Brian will need to ride in, and wired the house so he can control lights and such from a tablet. The bathrooms have motion-sensor sinks, because Brian will be unable to turn knobs. Every aspect of the house anticipates immobility.

We sat across from each other. Brian filled in the gaps of the life I'd caught glimpses of on social media over the past decade, with occasional interruptions from Hunter. Yale undergrad, Georgetown law. A summer as an associate at powerhouse law firm Skadden Arps, before heading to New Hampshire to work for the 2008 Obama campaign. When the general election came around, he became political director for the state.

That's where he met Sandra, who had left her job as Illinois senator Dick Durbin's press secretary to work in communications for the Obama campaign. As happens in political foxholes, they started dating. After stints in the private and public sectors, they reunited at the White House, where he served as senior vetting counsel and she as associate communications director. And then back to Chicago, where Brian reentered corporate practice before taking the assistant US attorney gig. Sandra now works as

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**WHY DO PATIENTS FEEL SO DISEMPOWERED,”
BRIAN KEPT ASKING HIMSELF.
“WHY DO THEY FEEL LIKE
THEY HAVE TO LIVE IN THE
SHADOWS?”**

president of Thrive Chicago, a youth-focused nonprofit.

The trajectory of Brian and Sandra's life, in other words, seemed charmed, limitless. "I had a life that I loved," Brian told me. "And that disappeared."

But not all at once. Brian spent the months after that first neurology exam undergoing multiple blood draws, MRIs, and a spinal tap. Then there was the electromyography, or EMG, where a needle, inserted into various muscles, spots abnormalities in how your nerves conduct electricity and how your muscles respond. The unspoken hope throughout: that this was something—anything—other than ALS. Something they could fix.

By November, Brian had found his way to the office of Jeffrey Rothstein, a prominent ALS specialist at Johns Hopkins in Baltimore. "Nobody's going to say this right now, because you're still doing testing," Sandra recalls Rothstein saying. "But I've seen thousands of cases of ALS, and you have ALS."

The battery of tests would continue until the following March. But Rothstein's words further convinced Brian to commit to a regimen of the only two drugs approved by the US Food and Drug Administration specifically for ALS: riluzole, greenlit in 1995 and available as both a pill and an oral suspension; and edaravone, better known by its brand name, Radicava, which had just gone on the market. Neither is believed to add more than an extra year of life expectancy.

That winter was a long one. Brian was still working cases, and he was sleeping poorly. They had an infant. The Chicago chill set in. "It was a very hard time," Sandra says. "And we had a lot of fear. Is this a healthy situation for him to stay at this job, as much as he loves it?" Sandra also worried that, once they went public, Brian's disease would shape the contours of every conversation. That it would take away whatever was left of normal.

In early December, Brian flew out to the International Symposium on ALS in Boston with his mother and Sandra's parents. He and Sandra had told only a few close friends and family about the diagnosis. Some of them had urged both to think about becoming an advo-

cate for others with ALS. Brian is relatively young and well-spoken. He has resources and a network of people willing to help. He checks a lot of boxes. And while at first the thought of extending himself even further seemed unlikely, he gradually started to warm to the idea.

And so he reached out ahead of the symposium to a Cambridge, Massachusetts-based group called the ALS Therapy Development Institute. ALS TDI operates under a unique structure: Rather than raising money to distribute to outside researchers, it funds its own lab with revenues of over \$13 million a year. "They came up through the ranks as kind of these rebels," Brian says. "They had an ecosystem that could exist independently of others."

Their reputation for a patient-centric approach appealed to Brian, who had come to believe in the power of community organization during his Obama years.

He met with Carol Hamilton, ALS TDI's senior director of development, and Rob Goldstein, its vice president of ALS community engagement at the time. Hamilton met Brian and his mother in the lobby of the hotel where the conference was being held. "I remember having to walk away," Hamilton says. "He reminded me of so many people I went to college with, so brilliant and lovely. And he had just had a baby and is bravely standing there where he's going to hear horrific stuff about this disease."

After the conference Brian and Sandra started telling more people; keeping the diagnosis to themselves felt like living in alternate reality. Brian has always been social, the connective tissue between friend groups even in high school. By now he had committed to throwing himself into not only his own treatment but the fight against ALS more broadly. "We initially assumed that we would find an organization out there that we loved and we would tie ourselves to it," Brian says. "But every time I met with a group I came away thinking: This group does an amazing thing, but they're not the only group out there. So what is it that they're missing, that these other groups are missing, that we could help with?"

That February, Brian returned to Boston in search of an answer. He toured the ALS TDI lab, then commandeered a conference room in the early afternoon with Hamilton and Goldstein. They stayed well past sundown, talking through the history of ALS advocacy, its politics, what had already been done, and what new ideas might work.

By now Brian had seen firsthand some of the gaps in the framework of ALS treatment and support. There was the sense of isolation, that going public would upend his and Sandra's world. And more practically there was the information vacuum, especially around clinical trials. "Almost every time I went to go see a doctor—the best in the world—we would have to bring information about trials with us to discuss with them," Brian says. Most ALS drug trials set various limits on who can participate, based on age, symptom duration, and so on. They can require expensive, exhausting travel for uncertain gains.

Brian had recently gone to see Senda Ajroud-Driss, a neuromuscular medicine specialist at Northwestern

University. "It's amazing that you come here with your family and that you come armed with so many things to ask me about," he recalls her telling him. "And I think about other patients I've seen who are 20 years older than you, have no family, no resources, and I think about what they will be able to do in this fight and what you can do."

It's easy to get lost. It's easy to give up. "The questions I kept asking were, why do patients feel so disempowered in this fight?" Brian says. "Why do they feel like they have to live in the shadows? Why do they feel like they can't come out and actually be public about this? Why do they feel like they don't have the support to do what they want to do, to talk about their life as it was and as it is?"

Ahead of his meeting with Hamilton and Goldstein, an idea had stuck in his head: With whatever time he had left, he wanted to work to ensure that future ALS patients didn't have to feel so alone. "There was no question that everyone should have the same chance that I had to ask questions of doctors, to seek the care that we were seeking," Brian says. "Democratizing that power was a basic thing that we had to do."

That night, Hamilton couldn't sleep. The next morning, on the drive to work, she called Brian to keep picking at the threads of what a new ALS foundation might look like, how it might advance the cause rather than duplicate existing efforts. "It was exciting but at the same time a really scary conversation for me," Hamilton says. "I know how to raise funds for ALS, and I want to reach outside of the ALS community, but it's scary to give up control. I don't know how to do that, but this guy might be able to."

By spring 2018, Brian had the broad outlines of his final act: a foundation to be called I Am ALS. It would raise awareness of the disease. It would centralize scattered resources for patients, which in turn could more easily connect them with clinical trials urgently in need of suitable subjects. And it would bring only new donors into the ALS fight or reengage lapsed donors, rather than cannibalizing a small pool of existing ones. He spent the next few months on planes, meeting with ALS organizations and patients to ensure that their efforts weren't redundant. "We don't want to build this thing for the sake of building it," Brian says.

That summer Brian had lunch with Michael Slaby, who had been chief technology officer for Obama's 2008 campaign. Slaby pointed to Livestrong for inspiration; his wife is a cancer survivor, and he had seen how patients sometimes feel marginalized. "Most people end up not asking the right questions, not necessarily knowing how to talk about second opinions and drug trials, and miss opportunities as a result," Slaby says.

Brian enlisted his brother Peter, then a consultant at Bain, to help fit his and Sandra's ideas into the confines of a donor-friendly pitch deck. That fall, as I Am ALS continued to jell, he called on Slaby again, this time with a job offer: join the organization's leadership team.

The work went quickly. It had to. They tapped Obama campaign vets like Jeremy Bird, whose company Do Big



BRIAN CARRIES A MOBILE PHARMACY WITH HIM WHEREVER HE GOES.

Things helped build the foundation's branding and website, while 2008 Ohio political director Michael O'Neil and 2012 reelection communications director Brent Colburn joined a kitchen cabinet of advisers that met every couple of weeks to help shape its message.

The band had gotten back together. But in the midst of the relentless progression of Brian's disease, of his immutable diagnosis, what mattered most was this group's particular skills. "You go from zero to 100 miles per hour on a political campaign almost like nothing else," Slaby says. "And everybody who was helping in those first days, first months, was super comfortable with that: not scared by the lights, not stressed by the pace, not concerned about operating without a net."

The year 2018 was a whirlwind for the couple: Brian and Sandra, holding meetings, preparing to launch a new organization. Brian and Sandra, crisscrossing the country for diagnosis, for treatment, for fundraising. Brian and Sandra, raising two young daughters. Brian and Sandra, racing a clock they can't see.

And so, back in Kenilworth, I try to ask Brian the question that has dogged me since our first phone call. It comes out with softer edges than it had in my mind.

"You've got a choice," I begin. "I've got this much time left. I don't know how much, but I know what the averages are. A lot of people end up saying, 'I'm going to spend time with my family.' And you still clearly do spend time with your kids. But you travel a lot, and you're putting so much energy behind this. How do you balance those?"

When I listen back to the recording, I catch myself choking up. I also hear myself not asking the question hovering just underneath this one, about mortality and family and fear and time. Brian manages to answer both.

"There's nothing in our lives that says we're supposed to be here forever," he says. He reminds me that his father had died unexpectedly when he was in college. "We expect we're going to get certain things in life, but we're never actually promised them. And I was given a chance to know that there will be an end coming at some point in time. I had the option to either be pissed off as I went toward that end or to say I'm going to enjoy this and embrace every minute that I can. There may come a point down the road that I get upset, but if I'm angry now I miss whatever time I have left."

On January 22, 2019, Brian and Sandra launched I Am ALS.

I'd met with Brian and Sandra on a Sunday. Early Tuesday morning, I joined Brian at the Metro Infusion Center for his Radicava treatment. I got there a few minutes late; he was already seated near the end of a row of oversized recliners, drugs trickling in through a port in his chest. The chair next to him was free.

Radicava treatment starts with infusions on 14 consecutive days. From there, patients get infusions on a regular cycle: 10 out of 14 days on, then 14 days off, repeat indefinitely. Brian spends much of his time on planes, but he plans those trips around Radicava doses.

His care is overseen by a few doctors, including Rothstein at Johns Hopkins and a local team at Northwestern in Chicago, but primarily by Merit Cudkowicz at Massachusetts General Hospital. (It's an elaborate setup, one that requires even more travel and constant communication.) As I sat with him in the neighboring infusion chair, I noticed a black carry-on-sized backpack that Brian had brought with him.

After he finished—it takes about an hour—he unzipped it for me. Inside, a mobile pharmacy. Nuedexta, to help control the fits of laughing or crying, known as the pseudobulbar affect, which can accompany neurological conditions like ALS. Baclofen, for muscle stiffness. Basis, Nexium, vitamin D, Acetyl-L-carnitine, TUDCA, Ibudilast. This pharmacopoeia goes wherever Brian does. It may or may not be helping. "What you end up doing is taking your best guess at which facets of the disease you're combating through which medications," Brian says.

Despite that uncertainty, every ALS patient, researcher, and advocate I spoke with pointed to the

drug pipeline as a source of optimism. Even just a few years ago “there was nothing really groundbreaking or revolutionary,” says Maura Musciacco, senior director of neurology and ophthalmology at the data analytics company GlobalData. But today she sees “quite a lot more exciting things happening,” including seven ALS drugs in Phase III (large, often randomized studies) and another 27 in Phase II (smaller-scale trials testing mainly for efficacy and side effects) as of August 2019.

The viral Ice Bucket Challenge in 2014 deserves some credit; of the \$115 million raised, at least \$90 million went directly to research expenditures, according to an accounting maintained by the ALS Association. But while the Ice Bucket Challenge dramatically increased awareness for ALS, the primary catalyst for that research boom dates back to 2011, when scientists first pinpointed a genetic mutation that links an inherited form of ALS and a condition called frontotemporal dementia. FTD is three to four times more common than ALS in the US, meaning certain types of ALS research suddenly had implications for a much broader group of patients.

Between 2013 and 2019, the NIH increased its investment in ALS research from \$39 million to \$105 million. “The quality of that science has seen a huge jump in the last five years,” Rothstein says.

That doesn’t mean a silver bullet is in the offing. ALS is a strikingly heterogeneous disease. About 5 to 10 percent of cases are inherited, with a dozen or more potential gene mutations triggering the progression. The remaining 90 to 95 percent of cases have no single confirmed cause. Effective treatment would likely need to be tailored for each type of patient. Still, the recent increase in investment has enabled more novel approaches.

Stanley Appel has led the ALS Research and Clinical Center at Houston Methodist Neurological Institute since 1982; using ALS Association and other outside funding he ran a trial of an immunotherapy treatment that he hopes will ultimately slow ALS progression. “When we first started seeing this my colleagues said, ‘Stan, you’re

outside the box,’” Appel told me last summer. “And I said, ‘Well guys, look very carefully. The box is empty.’”

Part of Brian’s work has been helping to fill that box. Tensions between the ALS community and the FDA have historically run hot, in part due to the agency’s failure to provide definitive guidance to pharmaceutical companies on how best to develop therapies. Without that clarity, advocates have argued, drug companies are hamstrung in getting treatments to patients fast and effectively. Last July, Brian hand-delivered two petitions to the FDA: one from I Am ALS urging action on releasing the guidance and another created by a group of patients calling for the agency to approve pending treatments more quickly. Between them, the petitions totaled 20,000 signatures. The FDA released the guidance in late September.

I Am ALS doesn’t deserve all the credit for this; the ALS Association has hounded the FDA for years on the same topic. But Brian does know how to open doors in DC. On a trip to the city last spring, he met with friends who had friends in the FDA’s legislative affairs office, who set him up with the commissioner’s office, who introduced him to the people working on ALS drugs. “I was talking to every aspect of my network to see who could help us connect with people,” Brian says. With that access he not only presented the petitions but also brokered a meeting between FDA officials and BrainStorm Cell Therapeutics, a New York company whose stem-cell-based ALS treatment has shown promise. By February, BrainStorm says the FDA had agreed to explore ways to expedite the review process for the Phase III trial of the company’s NurOwn therapy. (An FDA spokesperson declined to comment on the meeting with BrainStorm but said the agency is committed to expediting drug development for serious conditions like ALS.) “Brian Wallach has done in just one year what other organizations take a decade to do,” says BrainStorm CEO Chaim Lebovits. “He understands the system. He’s not bitter. He’s fighting.”

Brian had done so much so quickly. But I Am ALS still felt amorphous, its goals broad enough to lose definition at the edges. It wanted to be more than good. It wanted to be different. I couldn’t see yet how it was.

Walking with Brian to an Equinox gym—he still works out with a personal trainer—I asked him about the 400-meter record in high school. He hadn’t broken it after all. But it turned out I had also forgotten the backstory. Brian had been a baseball player until a shoulder injury sidelined him the winter of sophomore year. By spring he had reinvented himself as a sprinter.

“**THERE’S NOTHING IN OUR LIVES THAT SAYS WE’RE SUPPOSED TO BE HERE FOREVER,” BRIAN SAYS. “I’M GOING TO EMBRACE EVERY MINUTE THAT I CAN.**”

The truth is that Brian is both exceptional and a type. The recent past has produced no shortage of competent, resourceful, driven people who, when faced with an ALS diagnosis, dedicate whatever time and energy they have left to combating the disease. Jay Fishman was the CEO of the insurance company Travelers until his

ALS diagnosis in 2014; he quickly helped raise \$20 million to fund Answer ALS, an organization—headed by Jeffrey Rothstein—that applies big data to the search for underlying causes. After former NFL safety Steve Gleason was diagnosed in 2011, he and his wife founded Team Gleason, which focuses in part on the development and promotion of assistive technologies for ALS patients. And there's former college baseball star Pete Frates, who helped the ALS Ice Bucket Challenge go viral. (Frates died in December 2019, Fishman in 2016.)

ALS foundations in the US number in the dozens, not even counting the many local chapters of the ALS Association, the nation's largest ALS advocacy group. At first blush, this seems promising: The more people engaged in the fight, the better. But many advocates view new entrants in the field with a certain wariness. Unless you're also broadening the donor pool, the same money just gets spread less efficiently. Each group also has its own priorities, be it early-stage research or palliative care.

No one understands this dynamic more deeply than Avi Kremer. Diagnosed with ALS in 2004, Kremer launched the ALS nonprofit Prize4Life in 2006, which dangled two separate million-dollar payouts for promising ALS research. In November 2018 he dissolved the organization, opting to team up with the ALS Association.

"The fragmentation in the ALS landscape hinders the quest to find a cure, because when different patient organizations compete, efficiencies are not optimized," Kremer wrote in a letter to Prize4Life constituents at the time. In that, an implicit lesson: The very existence of I Am ALS could dilute the movement Brian and Sandra were trying to cohere.

I spoke with Kremer over Skype in August; he lives in Israel and is gaunt and immobile due to the progression of his disease. Unable to speak, he communicates with an eye-gaze device, painstakingly spelling out words by shifting his focus over a digital keyboard. The muscles in his neck flutter sporadically; his head lolls from side to side. A short reply can take him 10 minutes to compose.

"I realized that it's not efficient to have a CEO, VP of development, VP of marketing, office manager etc if you are not a big player," he wrote. "It's a waste of precious donors \$\$." Kremer told all of this to Brian, too, back in 2018.

It's a question I kept returning to also, especially in those early months of I Am ALS. But Brian has never been a vanity-project person, especially at such a cost: time away from his family, hours on planes and conference calls that could be spent doing literally anything else.

As it happens, he's more aware than anyone that he's part of a pattern. He also feels equipped to break it. "There have been a number of incredibly charismatic patients who have come into the fight before," he told me. "When their disease takes a turn, the operation slows down by necessity. And so at the start of our story, a critical idea behind it was, can we build something that's about a community and about a larger idea,

how you rewrite a narrative of what it means to be an ALS patient? And if we can, that's really transformative."

Stand-alone ALS groups have formed an ever-broadening archipelago, within sight of each other but too often out of earshot. I Am ALS doesn't want to be another island. It wants to build the bridges. "Currently I'm a skeptic," Kremer typed from his kitchen. "But if someone can do it, it's a patient like Brian."

Brian and I are approaching 40. Mortality is no longer so abstract. Our high school classmate Alex Maasry died three years ago. Brain cancer. Jay Bloomer was the kind of guy who put a room instantly at ease; he'd gone to college with my wife, Rachel, and married her best friend. He was diagnosed with lymphoma in April 2019; he died in October. "You realize, when you have a moment like this, that success means so many things, and that we sometimes put a very arbitrary limit on them," Brian told me in March. "When my time comes, whenever that is, I want people to be able to look back and say, what that guy did, it wasn't just for him. It was for others."

In late September, the day after the FDA released its revised guidance, I met Brian in Washington, DC. I Am ALS had also just announced its new CEO, Danielle Carnival, a neuroscience PhD who had spent seven years at the White House, including five years at the Office of Science and Technology Policy. (I Am ALS had seven full-time employees as of May—not counting Brian and Sandra—and hopes to add two more. It's built to continue long after Brian can no longer contribute.)

That flurry of activity coincided with the reason Brian and I had traveled to our hometown: a meeting he convened of more than a dozen of the largest ALS foundations and funders in the US. They had gathered as a step toward more cohesion, or at least coordination of efforts. In unity comes strength, like Aesop's bundle of sticks.

The airy conference room had ample seating for a couple dozen attendees, with tables arranged in groups and a breakfast bar against the wall. Merit Cudkowicz and Jeffrey Rothstein were there. Representatives from Team Gleason and ALS TDI played icebreaker games encouraged by two professional facilitators—"Find one thing that everyone at your table has in common"—with NIH administrators and ALS patients. Brian sat next to Amelie Gubitz, the program director in the Neurodegeneration Cluster at the National Institutes of Health.

Brian's disease had progressed since I'd seen him last; his cadence was more halting and it took more effort to talk. I realized that I'd frozen him in my mind in March, but that's not how ALS works. It's a train that doesn't slow down, makes no stops. I had talked to enough experts to know that. I hadn't wanted to believe it.

I stepped out after the introductions, at Brian's request. Getting the group's OK to have a journalist there at all had required negotiations on his part. The

ALS community wants attention but is also wary of it, especially when it comes to its own conflicts and sensitivities. When the moderators asked for questions about how the day would run, the first was why some groups had been included and others had not.

At the end of the day, I checked back in with Brian. He was happy with how the meeting had gone; no catalytic breakthrough but plenty of common ground. He seemed tired but energized, body and mind running on contradictory tracks. I gave him a hug near the elevators—too hard, he flinched—and headed back to my life.

This wasn't the first gathering of the ALS clans. It won't be the last. But it was uniquely Brian: professional, organized, community-driven. He believes in the power of connections. It's what helped him build I Am ALS so quickly: Michael Slaby and the White House vets, his business-minded brother, the college buddy on the other end of that first phone call. Tracking the rise of I Am ALS feels a little like watching the end of *It's a Wonderful Life*, loved ones lining up to pile what they can on the table.

I'm aware that I'm one of them, and that this story is my contribution. I worried, for too long, that this fact also meant there may not be enough actual story there. That I was blinkered by personal investment.

But then, look: There's Brian last April testifying before Congress—a mostly empty chamber but a heartfelt speech in support of more funding for ALS research. There's Brian standing up the first ALS caucus in Congress in June. And there's the 2020 US budget, which doubles the Department of Defense's ALS research funding to \$20 million.

And over here: a single tweet from Barack Obama in May 2019 netting some 1.8 million views for an I Am ALS video. The Chan Zuckerberg Initiative announcing \$453,000 in I Am ALS funding in September. A segment on the *Today* show in October. An I Am ALS takeover of Times Square last December, a dozen billboards spotlighting a disease that has spent decades in the shadows. A CNN appearance in February 2020. An op-ed in *The Daily Beast* written by Brian in May.

IAmALS did that. Brian and Sandra did that. A community of friends and coworkers and patients and researchers and associations did that. Brian is a type, but he's exceptional. "It's hard because there is no happy ending," he told me back in March. "We want to believe that we can find a way to make things better. That's a phenomenal part of the human condition."

Brian doesn't get on planes anymore. In October he fell when he got out of a Lyft in Boston, hitting the back of his head. Thirteen staples later, he and Sandra agreed to curb his travel for a while. Whenever he did leave Chicago, a family member or ALS staffer would accompany him. Then the coronavirus pandemic hit, effectively grounding everyone. It's hard to fundraise during a global crisis. But I Am ALS has not downshifted. "The question that we faced was, do we take our foot off the gas in any way, shape, or form?" Brian said the last time I spoke with him. The answer was no. The timetable for the navigation program remains unchanged. They continue to staff up. And I Am ALS worked with members of Congress to introduce two bills the same day in late May, both aimed at removing barriers between patients and potential treatments.

There's another photo I found, this one in our senior yearbook, page 93. It's our fifth-grade class picture. I'm standing in the back, awkward in huge glasses. Brian's sitting in the front row, legs crisscrossed, face serene. I like this one because we're not quite fully formed. The long arc of our lives had not yet been fixed. And then I remember that there is no arc. Nothing's fixed. There's just a box, and what you fill it with. ■

BRIAN BARRETT (@brbarrett) is WIRED's digital director. This is his first feature for the magazine.

COLOPHON

Foresight that helped get this issue out:

Sighing off interviews with "Buy toilet paper" starting in January; growing up neurotically counting to 20 every time I washed my hands (being the child of an infectious disease specialist does this to you); leaving *Middlemarch* unread on my nightstand for three years; stocking up on preroll packs in March; the existence of Roll20 for D&D enthusiasts; started reading Knausgård just before this all began; buying spices in bulk two years ago; the large stash of booze my roommates and I slowly accumulated through hosting parties; our bidets, installed over a year ago; *Demolition Man*—bring on the touchless sex; moving out of the big city; buying 2 pounds of yeast in January; holding onto the sewing kit my aunt gave me in college; cultivating a rich inner life; couples therapy; I never share my food and always share my feelings; buying a set of dumbbells for home before the gyms shut down; holding onto the Wild Draw 4 card for one more turn; my cast-iron skillet, which supports my two quarantine hobbies of cooking and bragging about cooking on Instagram; shaving my miniature poodle days ahead of the shelter-in-place order; being an introvert.

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IN SIX WORDS, IMAGINE AN APOCALYPSE WITH A HAPPY ENDING:

THE ALIENS WERE ALLERGIC TO CATS.

@romer6
via Twitter

THE DOGS ARE THE MASTERS NOW.
@AZZOUR VIA INSTAGRAM
DEADLY VIRUS MUTATES INTO X-MEN GENE.
@REDEYEDED SAN VIA TWITTER
AT ONCE, MY AMAZON DEPENDENCY DISAPPEARED.
@MAXACARR VIA INSTAGRAM
BABY'S VOICE ROSE FROM THE CAVE.
CHAKIB MATAOUI SOULEYMAN VIA FACEBOOK

THE COLONY ON THE MOON FLOURISHED.
@EMOCO VIA TWITTER
IN SILENCE, HE SLEPT WELL. FINALLY.
@PATCHOO314 VIA INSTAGRAM
SO SALT WATER, HUH? WHO KNEW.
@ANDRESLOHIZO VIA INSTAGRAM
DINOSAURS RETURN—THIS TIME AS PETS.
@DEB_SHALINI VIA TWITTER
SUN SETS. NO ONE POSTS IT.
@JESIKAHMORGANA VIA INSTAGRAM

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