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**Sorry to burst
your filter bubble,**
**but tech didn't break democracy,
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How LEGO® Education is Helping Students Build Confidence in Learning

YOUTH ACROSS THE GLOBE ARE BENEFITING FROM A HANDS-ON, COLLABORATIVE APPROACH TO STEAM LEARNING

THE TRADITIONAL MODEL of learning is changing. Today, educators are favoring more engaging, interactive, and hands-on ways of teaching in order to achieve both academic and life-skill milestones they set for their students. One way is to encourage learning through play in the classroom, which has been found to help cultivate social, emotional, physical and creative skills.

This is where LEGO® Education comes in, the educational division of the LEGO Group. The company empowers educators to leverage hands-on solutions and develop curricula tailored to the needs of all of their students.

Here, we examine two stories of how LEGO Education solutions are helping students, worlds apart.

NEW YORK CITY'S DISTRICT 75

District 75 is home to 61 schools, which serve more than 24,000 students. It is the largest district in the country comprised of students with emotional, physical, and

cognitive disabilities. But the students are not alone: They have teachers, principals, and other educators who are dedicated to helping them achieve their personal and educational goals. Take, for instance, Sean Arnold, a teacher and former District 75 Science Coach; Leslie Schecht, Director of STEM, NYCDOE/Citywide Programs; and Denis Kogan, current assistant principal at a school in Staten Island. All of these educators have developed teaching strategies that use LEGO Education solutions to foster learning through play in the school environment. The challenge in District 75 is to meet the needs of so many different types of learners, with varying abilities. [Note: Forty percent of District 75's students have been diagnosed with autism.] "I look at my students and believe that with the right opportunities, they can achieve and succeed far beyond anyone's expectations," says Schecht. "LEGO allows people to take intellectual risks," says Kogan. "When it comes to LEGO solutions, there is no right or wrong way to use them." Tools like WeDo 2.0 have proven helpful in assisting students to think about using concrete elements (bricks) in different ways. And the students have been so receptive to this type of learning that Schecht approached the folks at



FIRST® LEGO® League Jr. and asked them to work with her to create a curriculum and competition for District 75 students. Now, during the district's own annual competition, kids in District 75 take on the same challenges as other *FIRST® LEGO® League Jr.* competitors, but with modifications to meet their learning styles. The *FIRST® LEGO® League Jr.* program in District 75 has grown tremendously since its inception.

KOREA INTERNATIONAL SCHOOL

Across the globe, in Korea, Michael Bycraft is working just like the educators in District 75 to bring STEAM programs to his students in order to nourish and expand their creative and cognitive abilities. At the Korea International School, Bycraft has developed different curricula at the middle school level, using LEGO Education solutions like LEGO® MINDSTORMS® Education EV3 for classes such as Rover Robotics, which helps kids understand sensors and how to get robots to navigate mazes. Bycraft is trying to teach his students to be steadfast in the face of failure. LEGO is the perfect medium to teach this lesson. "It takes three seconds for the students to take it [LEGO bricks] apart and rebuild them, getting results and seeing the progression," says Bycraft. "It's



how you build confidence." Case in point: Bycraft tells the story of how he had two very quiet and reserved students in his class. When he tasked them with Robot Sumo, a game in which you have to create a robot out of two large and one medium motors as well as sensors that can push the other robot out of the sumo ring, the students were in their element. They made the winning robot and even asked to take it to other classes to compete.

"Confidence is the key to success and that's what LEGO Education solutions provide students of all levels and learning abilities—while also fostering life skills like communication and collaboration."

As part of a new philosophy of teaching, a hands-on approach is key in order to help students all over the world build their confidence in learning, ultimately setting them up for future success.

To learn more, visit LEGOeducation.com



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With LEGO® Education, students develop 21st-century skills such as problem-solving and communication through hands-on STEAM projects. Collaborating with others, students build confidence in their ability to learn and think critically, setting them up for lifelong success.

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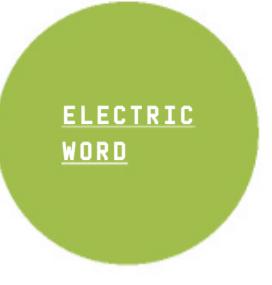
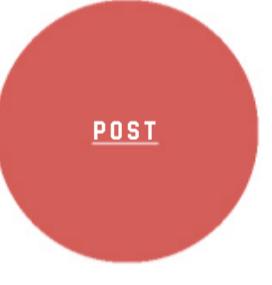
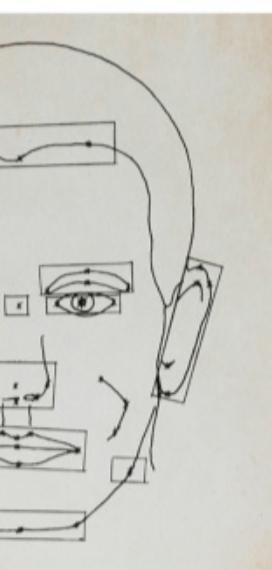
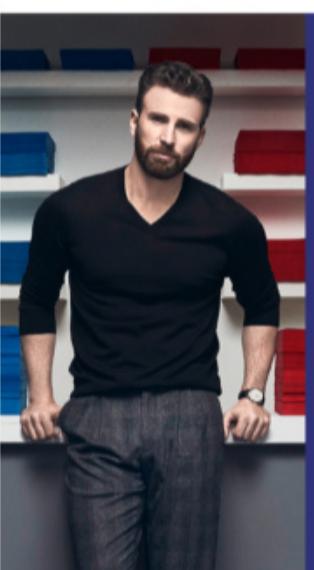


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TOTALLY WIRED

DIARIES OF
AN UNBRIDLED
DIGITOPIAN



In these hypertechnological days, so many thought cycles get expended on the quest for peacefulness, for silence. But silence isn't always a salve. Lately I've been acutely indebted to a trio that keeps away the clamor of quiet: my earbuds, the podcast app, and the sleep timer.

Everyone traverses dark times. And in those times, the darkest come at night. Yes, friend, even Ripley suffers in the night and feels dread in sonic absence. This particular period of unrest has me waking up intermittently, the silence granting entry to terrifying thoughts. Not the habits of a chronic optimist, but as mentioned: dark times.

Blessings, then, to my tech trio. Thanks to them, I don't need to contemplate the tough questions. When I wake up and the thoughts start to invade, I tuck my earbuds in place and—being careful not to wake up my love—grab my phone on the nightstand and hit Play on a pod. Sure, I'm aware there are calming apps for just this thing, but calming doesn't calm me. The perfect companion in these moments is a pundit, a storyteller, a host who enlists my attention but not enough of it to overly excite the neurotransmitters.

The other night, I was reaching for the earbuds when a question came to me: Who was the prophet who had such a clear and precise understanding of the human condition to invent a ghostly and maternal gadget that would fill the open space in our heads for, say, 10 or 20 minutes, then power down when we were safely back to sleep?

In the morning the question still itched. So after a few keys were stroked, I sent an email to the company librarian. It turns out that my corporate overlords have an angel in their midst. Her name is Deirdre.

What dear Deirdre dug up was this: Some day in 1949—perhaps after *Lucky Lady* completed the first nonstop circumnavigation of the planet and before the end of the Berlin airlift—one Otto O. Prophet (yes. Yes.) of the Telechron clock company was sitting in front of a patent application at his desk and penned what I now can only hear in stanza: “My invention relates to time switches / one of its objects is to provide a manual on, automatic off switching mechanism / My invention is particularly useful where the switching mechanism may be turned on manually / to be turned off automatically at an adjustable time thereafter should that become desirable.”

Desirable. Oh kindred Otto O. Prophet. (I imagine the Ancestry.com tree branches that stretch from you to your humble Ripley D. Light.) There are times when such a thing does become desirable. When a touch of tech, a tiny electronic switch, is just the thing that quiets the mind, keeps us from going crazy in the dark. Sometimes it’s the unsilencing of our tools, the cacophony itself, that grants us the rest we need.

RIPLEY D. LIGHT
@RIPLEYDLIGHT

WE ASKED CONTRIBUTORS:

DID YOU HAVE TO BROKER ANY PEACE WHILE WORKING ON THIS ISSUE?

“I tried to get a former intermediary for the CIA to talk to me for this story, but he wouldn’t budge, not even 50 years after the events described. Not even after asking really nicely!”

—Contributor Shaun Raviv (page 56)

“I wanted to think about softness—in particular, the premium put on the extreme, post-cashmere softness of new textiles like beechwood modal. Not only did that mean mentioning brand names with miracle fabrics (startups with too much capital and too many promises), it also meant confronting the consumerism that falls under ‘self-care.’ I can hate expensive softness and the soft, cheap part of me that craves it. And then I wanted to give myself a break and say we are all mortal and need the comforts of beechwood modal these days. That all had to be reconciled while writing about T-shirts.” —Contributor Virginia Heffernan (page 11)

“Before a shoot, we tell subjects they look their best when their clothes are ironed. When one subject arrived on set in a wrinkled T-shirt, Photoshop proved itself for the 8 millionth time as the ultimate peacemaker.”

—Photo editor Lauren Joseph

“Tools of diplomacy wielded in the fact-checking department this issue included Nexis, Pacer, a 47-email-long thread with a publicist, and a three-hour phone call litigating two questions on facial recognition.”

—Senior associate editor Zak Jason

“I had to broker peas for my 6-month-old.” —Senior editor Anthony Lydgate





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UNCONFINED

In December, Brendan I. Koerner wrote about a rising star in the blockchain world whose unraveling culminated in his mysterious death. Angela Watercutter examined the magnetic attraction that the Jedi Rey and her “no-nonsense wardrobe” hold for women cosplayers. And in our January issue, Andy Greenberg followed a group of animal rights activists facing felony charges, who hope to present their jury with VR footage from inside a pig farm.



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Readers share their grief, costume struggles, and ire:

RE: THE STRANGE LIFE AND MYSTERIOUS DEATH OF JEROLD HAAS

Thank you for writing this. Jerold and I were online friends and fell out of touch over the years. Another friend sent me a link to your article today, which is how I first heard the news. A very sad story, but you did it justice. —Marshall Bowers (@maxdeviant), via Twitter

Started the article and couldn't put it down. Saw parts of myself and a friend who killed himself in 2006. Really disappointed that the property owner has refused his mother permission to see where her son died, and that the sheriff won't return his property to his mother. —Glenn / Skate / DP1 (@gcanderson57), via Twitter

RE: EVERYBODY LOVES REY, A STAR WARS STORY

This cosplay isn't that simple. In the Rey cosplay community, there's a constant struggle to get the colors of her Jakku costume right. We literally call it “50 Shades of Rey.” Rey cosplays are a labor of love. So much dyeing and sewing and nitpicking and leather-work and frustration. But it's also hella worth it, cause we love this character.

So don't you dare downplay the time, effort, and dedication that me and my fellow Scavenger Siblings put into this.

—Sydney Brown, via Facebook

RE: TO BE AN ANIMAL

This is heavy stuff. Using VR to shed light on factory farming—one of the major moral evils of our time—is really putting that technology to good use. —Mikko (@mhj), via Twitter

I live in Iowa and can confirm that hog confinements are cruel. One of the benefits of them is for the collection of manure to sell to farmers

for fertilizer. I'm not a vegetarian; we've raised cattle to slaughter, and we use pig manure in our fields. I can acknowledge that there is too much cruelty in many areas of food production. —Dede Engel, via Facebook

Chance of success: virtually zero. They may get to go on trial, but the VR defense is unlikely to fly. —Glenn Harcourt, via Facebook

For those hardcore vegans who believe only they show compassion to animals: They've never seen a rancher carrying a calf through the snow.

—Meat Talk (@Reby_Meat), via Twitter



RE: THE STRANGE LIFE AND MYSTERIOUS DEATH OF JEROLD HAAS

“The line between genius and madness is razor thin. What a sad story.”

—TÖÐÐ (@toddadam), via Twitter

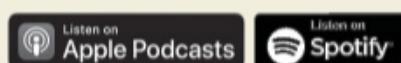
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M I N D G R E E N A D E S

SINISTER SOFTNESS

The human senses never cease detecting things the brain finds a way to dread.

BY VIRGINIA HEFFERNAN

Heebie-jeebies is both the informal *and* the default technical term for a dysphoric response to an innocent-seeming stimulus. Styrofoam, celery, wicker: Something in these materials represents a sensorial crisis for certain human bodies. The primordial heebie-jeebies—revulsion perceived variously in the spine, the molars, the bristling of hairs on the back of the neck—are conjured best with images that beam the feeling straight to the flesh. “Fingernails on chalkboard” is the cliché (feel it now?), but there are other choices: “Fleece makes my skin crawl,” someone reported on a message board. “It makes my skin feel dirty and ticklish.” For me the words “hot, dry towels” reliably cause the very root of my tongue to ... thicken and shudder. ■ Softness, though →

equally subjective, at least gets that lovely old word, *soft*, from the Old English for calm and agreeable. If heebie-jeebies are screeches and creaks, soft things are a major chord, resonant with well-being, reassurance, forgiveness, and even—what the hay—love. But we humans aren't easily lulled into the confidence that we're cared for. The human senses never cease detecting things the brain finds a way to dread. The skin on our fingertips is among the most sensitive in the animal kingdom, after only crocodile faces (might hypersensitivity figure into crocodile-caliber aggression?). Their mechanoreceptors respond to lacunae and threats as small as 13 nanometers in amplitude. (For comparison: A sheet of paper is about 100,000 nm thick.) At this degree of sensitivity, fingertips

are not entirely just “the world’s best cup of coffee”; they’re empirical. Polymer chemists use the Kawabata Evaluation System, a set of extremely precise instruments developed at Kyoto University that measure the subtlest properties of textiles—the ones associated with what the Wilson College of Textiles at NC State calls “comfort perception.” By manipulating fabrics and exerting exceedingly low force on them, Kawabata instruments gather data sets including stretch, rigidity, compression, and surface friction on human skin. Of these, compression (thickness and loftiness) and friction (roughness) are believed to be what comprise the aesthetic of soft.

But even Kawabata can’t understand what produces the anti-aesthetic of

perception. And when the fingertips merely shear, and yet perceive, a dip so shallow, the brain is brought up short, with no way to index the experience.

Think of it: A strand of DNA is about 2 nm in diameter. What if, one day, a set of fingertips only six times more sensitive than our own could perceive DNA strands? Uncanny in the extreme. It would be like seeing ultraviolet and infrared; we’d need a new sensory lexicon to make sense of “invisible light” or the “texture of DNA.”

And indeed that’s the danger for technologists of softness, the same one VR programmers confront: They might miss the mark of pleasurable and plunge into the uncanny valley. This is what many believe happened with polyester fleece, which was

What if, one day, a set of fingertips only six times more sensitive than our own could perceive DNA strands? Uncanny in the extreme. It would be like seeing ultraviolet and infrared.

can find discontinuities the mind may not be able to brook. Minuscule potholes in the surface of magazine paper, for example, can for some clash disagreeably with its apparent glossiness.

To create and assemble soft surfaces designed to touch skin intimately—specifically, to make clothing—requires at least awareness of heebie-jeebies. For a decade, groovy companies like MeUndies (b. 2011), Tracksmith (2014), Allbirds (2014), and Bleusalt (2017), all of which promote at least some of their garments as sustainable, have faced a key challenge. They’ve been creating synthetic-blend textiles that are soft like cashmere but not uncanny, as Minky, mohair, fleece, or chenille can be.

Tracksmith, which is based in Massachusetts, the ancestral home of American textiles, calls its Merino blend “stunningly soft.” Allbirds has managed to create “soft and cozy” wool shoes. Malibu-based Bleusalt claims its beachwear is composed of “the softest fibers on earth.” These boasts

heebie-jeebies. That’s a shortcoming, as anything that calls itself the softest thing on earth shouldn’t strike even one central nervous system as horrid. As I study Kawabata’s components, heebie-jeebies seem related to fabric’s “shear”—the capacity of a material to impose stress when it runs *along* skin, thus scraping or chafing it, rather than when it comes *at* skin, which leads to pokes or punctures.

But here’s my grander working theory: Those creepy sensations arise when fingertips, in sync with other finely tuned sensory systems, experience nanoscopically confounding surfaces like cardboard or paper towels as mentally unassimilable. They’re neither friend nor foe. They flood the circuits. A human brain that balks at even naming a particular supersensory experience can’t be expected to integrate it; the result is almost cellular bewilderment, and the mind expels the encounter as the body would poison it can’t metabolize. Thirteen nanometers is far, far beneath nameable

initially coveted for its softness. Many, including me, find that other “soft” stuff like silk, corduroy, velvet, and mohair hit us as *too* soft, so ostentatiously soft that they edge into the heebies. Maybe subjective softness is attainable, but universal softness is not.

OK but: How does Bleusalt do it? I swear I’m not shilling; I’ve just never met a person who didn’t love the company’s fabric, modal, which uses fiber made of beechwood cellulose. The process of pulping beech trees and pushing the mush through tiny holes to make thread was first invented in Japan in 1951 and later refined in Austria. Beechwood modal is unutterably soft, and that’s empirical. On Kawabata, Bleusalt’s beechwood modal shows up as twice as soft as cotton.

And thus all roads in textiles lead to cotton. One of Kawabata’s benchmarks of softness is cotton, yes; but to mention the fiber is also to invoke a cautionary tale about protectionism, destructive land use,

and above all labor exploitation and centuries of human bondage. The biggest and most profitable nonfood crop in the world, cotton sucks the planet dry. Some 2,700 liters of water are required to make a single cotton T-shirt, and cotton cultivation further exhausts soil, while agrochemicals irrevocably damage ecosystems in Pakistan and Australia.

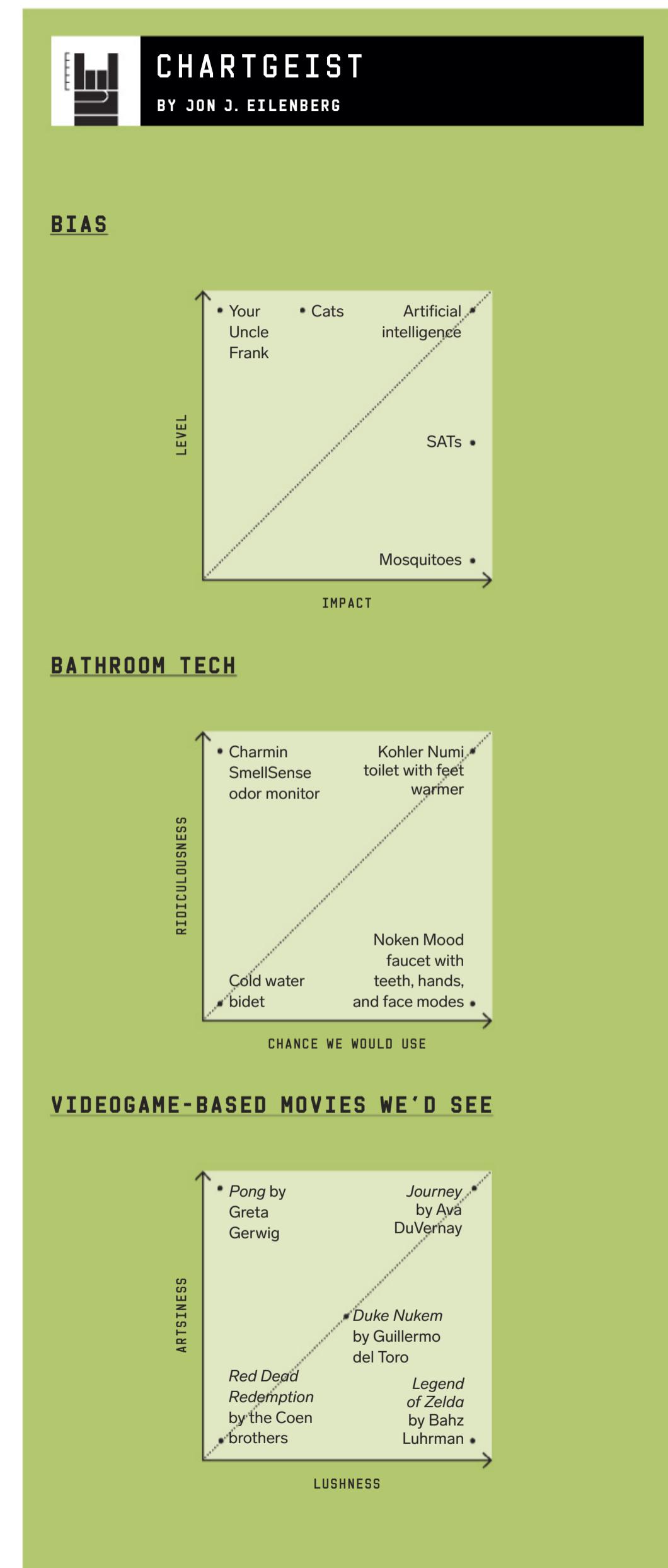
What's destructive to the planet has also destroyed humans. In *Wonderland: How Play Made the Modern World*, Steven Johnson discusses calico, the whimsical printed cotton fabric that the English went gaga over in the 17th and 18th centuries. Johnson hears "cotton's big bang" in the calico craze, which reverberates "from the ancient geological forces that deposited that crescent of black soil, to the appetite for cotton stirred up by the shopkeepers of London, to the brutal exploitation of the plantation system engineered to satisfy that new demand."

"Thinking about pulling a cotton ball apart makes me sick to my stomach and gives me anxiety," says a subreddit. But the author here isn't nauseated by cotton's history. Instead, MissAlexx is troubled by heebie-jeebies.

Could this sensation contain an apprehension of cotton's rapacity? I'm not going to say there's something extrasensory or paranormal in experiences like MissAlexx's. But I won't not say it either. As I can confirm when I think of hot, dry towels, heebie-jeebies can feel like an intimation of something plainly evil. Something bad is happening below the surface. Perhaps some of us can perceive in cotton fibers what Johnson does: the world of suffering its cultivation has visited on earth and its inhabitants.

Or maybe that is far too trippy for a discussion of fabric. Especially because the best ones, especially my beloved beechwood modal, let the mind relax—and offer solace. The solace they give comes without commands or obligations, without tightness or constriction. Instead, soft cloth, especially the kind that's also soft on the planet, reminds us with its blissful, textural harmonies that comfort zones are not always for cowards. ■

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



H I N D G R E N A D E S

THE ASMR CURE

Come for the tingly auditory triggers,
stay for the existential coping mechanism.

BY LAURENCE SCOTT

Last summer the candymaker Reese posted a feature-length video on YouTube called *Reese the Movie*. In a Reese-orange room, five popular YouTubers sit around a Reese-orange table and whisper into their headsets about the pleasures of peanut butter cups. They compare notes on the best way to open a Reese packet. (Cue amplified sounds of packets whooshing across the table and fingernails clicking on wrappers.) The candies topple free with the clunk of wooden blocks. The breathless council dismantles them, scooping into the cups with apple corers and smooshing them under spatulas, releasing soft, sliding squeaks like trampled snow. They slice them like bread, each chop cartoonishly loud. After 80 minutes, our protagonists come at last to the intended destiny of these fluted UFOs: They eat them. The end. ■ What we're watching, or rather having, according to the video's tagline, is "an ASMR experience." I find it hard to gauge how well-known ASMR is. In savvier digital circles, and among my 18-year-old students, it usually elicits a familiar chuckle. But when I bring it up to my thirtysomething peers, they tend to look at me blankly. So here is the requisite unboxing of the acronym: autonomous sensory meridian response. ASMR is an umbrella under which many millions of people huddle to make and listen to amplified sounds of mundane events—bars of soap being scraped, a whisk hitting the side of a bowl, tissue paper crackling, instruction manuals read out in one prolonged whisper. Fans return to their favorite ➔

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"ASMRtists," like the Reese whisperers, for the intensely pleasurable tingles or chills these sounds produce. Move over, *Seinfeld*; ASMR is truly "the show about nothing."

For a long time, commercials have known the satisfying effects of exaggerated sounds—the loud scrape as a beer cap is twisted off, the hiss of pouring soda, the splintering crunch of tortilla chips. In this sense, *Reese the Movie* is nothing new. But the past year has seen a self-conscious turning up of the volume: Bacardi, KFC, McDonald's, and Michelob have all embraced ASMR too. One practical reason for the sudden surge in mainstream force is that ASMR provides an acceptable reworking of the old adage that sex sells. This is carnality that bypasses the

In the midst of this cacophony, ASMR has set up its quiet stalls. It gives us an inverse image of the digital culture of the past 20 years, converting the internet's worst stressors (repetition, amplification) into soothers. Rather than pack the moment with push notifications and text alerts, ASMR encourages us to dive into one sound at a time. It transports you to a *Honey, I Shrunk the Kids* kind of sound world, but one emptied of the terrors of magnification. (No giant ants stomping through the undergrowth.) Instead you listen, elf-like, to the oceanic heaves and swells of a napkin being pleated. Social media is roundly criticized for its elevation of meaningless things to prominence ("Do I really need to see a picture of her morning

the widespread cultural crisis in expertise. Many ASMR videos, besides offering tingly auditory triggers, mine the relaxation of feeling in safe hands. Some stars of this genre are accidental—a manager of a London suit shop taking us through a fitting, a Welsh stone carver explaining his craft while tapping away with his chisel. Others are deliberate: You can devote 18 minutes to a disembodied voice explaining the denominations of Australian currency as a white-gloved hand holding a thin pointer roams over a plush magenta tablecloth. More interesting, though, and more bizarre, is a figure like Dr. Tinglebottom of Tinglebottom Industries, who stands in scrubs and sketches nonsense drawings, his Sharpie squeaking away. ("This is your cranial encasement," Dr. T says in a classic ASMR voice, replete with dragging gasps and moist pauses. "This is your nasal module, of course.")

The outpouring of instructional videos, some legitimate and others role play, suggests a craving for professionalism, for demonstrations of training and knowledge. At a time when so many experts (climate scientists, epidemiologists, round-earthers) are being ignored, these ASMRtists are enjoying the rapt attention of millions. Their popularity upholds the idea that we *do* find experts comforting, despite what populist politicians might want us to believe. Crucially, though, these are experts whom no one is asking us to suspect, to fear for their hidden elitist agendas. ASMR soothes the crisis of authority by turning expertise into a surface affect, a kind of existential brow-stroking. We desire expertise so much that we can be satisfied even with its trappings.

To some, a retreat into this sonic landscape can seem like the proverbial ostrich blissfully out to the soft shuffle of sand around its ears. But this feels like too easy a pose to strike. ASMR's distillation of expertise into its purest, most abstract form confirms our innate attraction to competence. It keeps us alert, however eccentrically, to the many joys of a rational, informed approach to life. Indeed, ASMR's mission, if it has one, is precisely to cultivate this aliveness to the world, to help us care more deeply, one tingle at a time. ■

Perhaps every age feels strung between extremes, and the strategies that help people cope are one way of defining the times.

genitals. (A recent study by researchers at the University of Sheffield concluded that "sexual arousal is not a reliable outcome of watching ASMR videos.") At a time when we're rightly reconsidering the public limits of expressing private desire, these videos permit sanitized declarations of sensuality. With ASMR, we're all ears. Erogenous zones are outsourced to a crème brûlée's glassy, tappable roof, or to the plump domes of bubble wrap.

Yet there is something far deeper at work in the mainstreaming of ASMR: It brings balance to the manic features of our crowded digital economy. We talk about the polarizing of political views, but for a while now we have also witnessed a polarizing of internet culture into two opposite kinds of extremity. On one side is the deafening roar of social media. Twitter booms with self-justifying echoes. Newsfeeds blare one headline after another. Influencers and star vloggers compete under the constant pressure to be memorable. This virtual one-upmanship has its physical perils: A Russian motoblogger died in a crash while reportedly driving his motorbike with his feet; a Chinese vlogger died while eating poisonous insects for his fans; a Spanish YouTuber died while filming a stunt jump from a chimney. We are the numb scrollers on the other side—strung out, edgy, sleepless, and unable to stop.

coffee?"), but ASMR unabashedly embraces the trivial. In *Reese the Movie*, a YouTuber called Gibi ASMR explains, "When I peel open my Reese, I choose where I begin like it's the most important decision in the world." Her 2.38 million subscribers seem to share this sense of importance.

"Ours is indeed an age of extremity," the writer Susan Sontag once observed. "For we live under continual threat of two equally fearful, but seemingly opposed, destinies: unremitting banality and inconceivable terror." Sontag wrote this in 1965, when Cold War tensions and the specter of nuclear annihilation lived alongside what she saw as the uncultured tedium of postwar suburban American life. Sontag argued that science fiction films were one of her era's coping strategies: Their thrills helped distract from life's banality while also habituating people, via alien invasions and attacks, to the idea of existential danger. Perhaps every age feels strung between extremes, and the strategies that help people cope are one way of defining the times. While the '60s had sci-fi, we have ASMR, with its alchemical way of turning "unremitting banality" into something sumptuous and potentially therapeutic.

ASMR not only consoles us with its calming reinterpretations of digital restlessness. It also counters our era's anxieties about

LAURENCE SCOTT is a lecturer in writing at New York University in London and the author, most recently, of *Picnic Comma Lightning: The Experience of Reality in the Twenty-First Century*.

A photograph of a woman with long dark hair, wearing a large straw hat and a colorful, patterned shawl or poncho. She is smiling and looking off to the side. The background is a soft-focus landscape of green hills and mountains.

M E X I C O

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IMMERSIVE
TRIPS
JUST FOR
WOMEN

WE'RE GOING TO MEXICO
and you can come with us

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WOMEN
WHO
TRAVEL

CONDÉ NAST TRAVELER

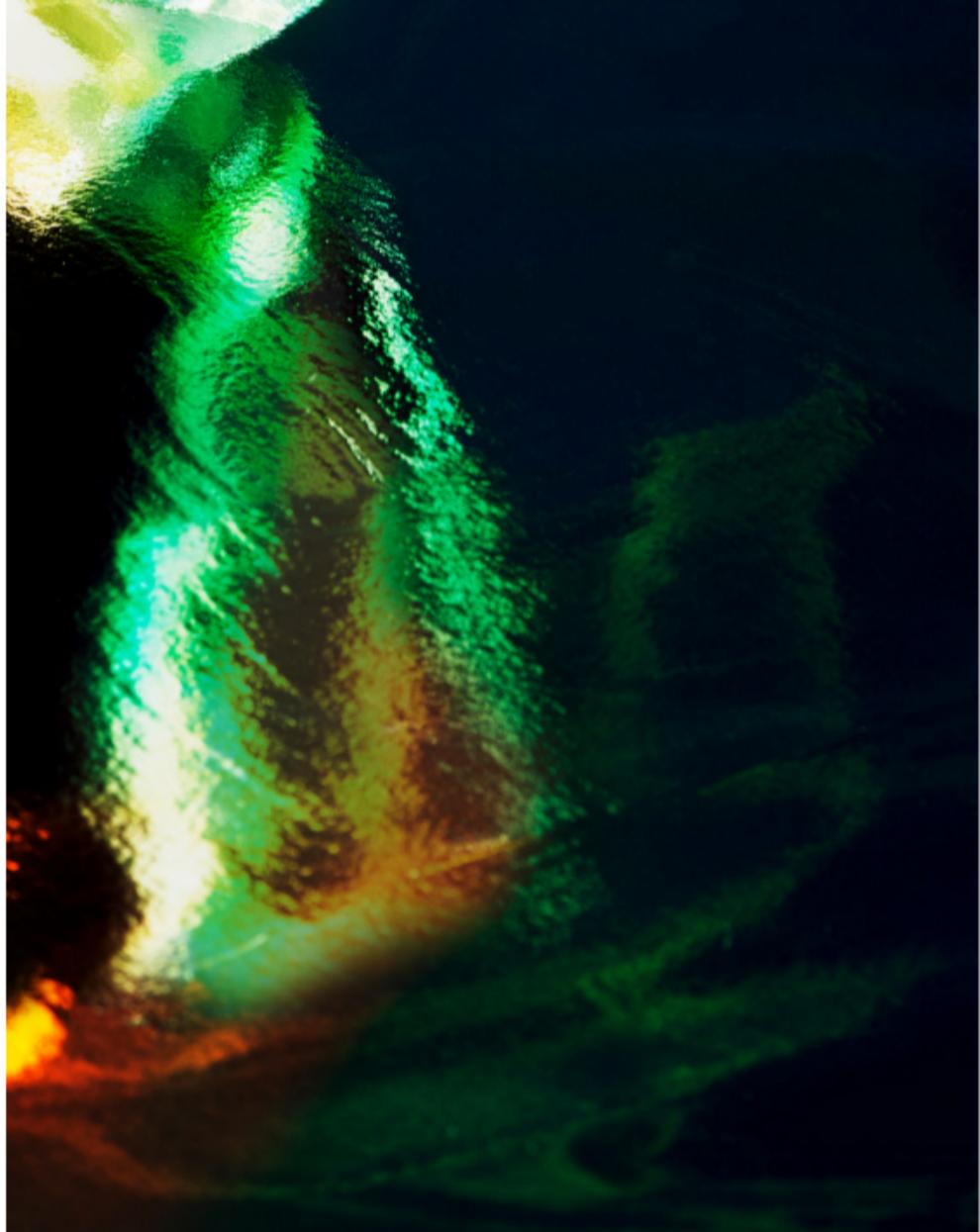


LIFE ON THE EDGE

If you worry about the privacy of smart home devices, there's an AI for you.

BY CLIVE THOMPSON

Alexa, are you eavesdropping on me? ■ I passively aggressively ask my Amazon Echo this question every so often. Because as useful as AI has become, it's also very creepy. It's usually cloud-based, so it's often sending snippets of audio—or pictures from devices like “smart” doorbells—out to the internet. And this, of course, produces privacy nightmares, as when Amazon or Google subcontractors sit around listening to our audio snippets or hackers remotely spy on our kids. ■ The problem here is structural. It's baked into the way today's consumer AI is built and deployed. Big Tech firms all operate under the assumption that for AI to most effectively recognize faces and voices and the like, it requires deep-learning neural nets, which need hefty computational might. These neural nets are data-hungry, we're told, and need to continually improve their abilities by feasting on fresh inputs. So it's got to happen in the cloud, right? ■ Nope. These propositions may have been true in the early 2010s, when sophisticated consumer neural nets first emerged. Back then, you really did need the might of Google's world-devouring servers if



you wanted to auto-recognize kittens. But Moore's law being Moore's law, AI hardware and software have improved dramatically in recent years. Now there's a new breed of neural net that can run entirely on cheap, low-power microprocessors. It can do all the AI tricks we need, yet never send a picture or your voice into the cloud.

It's called edge AI, and in the next little while—if we're lucky—it could give us convenience without bludgeoning our privacy.

Consider one edge AI firm, Picovoice. It produces software that can recognize

nize “on” and “off” and maybe “dim.” When it comes to gadgets that share my house, I'd actually prefer they be less smart.

What's more, edge AI is speedy. There are no pauses in performance, no milliseconds lost while the device sends your voice request to play Smash Mouth's “All Star” halfway across the continent to Amazon's servers, or to the NSA's sucking maw of thoughtcrime data, or wherever the hell it winds up. Edge processing is “ripping fast,” says Todd Mozer, CEO of Sensory, a firm that makes visual- and audio-recognition soft-

I don't need light switches that tell dad jokes. When it comes to gadgets that share my house, I'd prefer they be less smart.

voice commands, yet it runs on teensy microprocessors that cost at most a few bucks apiece. The hardware is so cheap that voice AI could end up in household items like washing machines or dishwashers. (Picovoice says it is already working with major home appliance companies to develop voice-controlled gadgets.)

How is such teensy AI viable? With clever engineering. Traditional neural nets do their calculations using numbers that are many digits long; Picovoice uses very short numbers, or even binary 1s and 0s, so the AI can run on much slower chips. The trade-off is a less ambitious bot: A voice recognition AI for a coffee maker only needs to recognize about 200 words, all related to the task of brewing java.

You can't banter with it as you would with Alexa. But who cares? “It's a coffee maker. You're not going to have a meaningful conversation with your coffee maker,” says Picovoice founder Alireza Kenarsari-Anhari.

This is a philosophically interesting point, and it suggests another problem with today's AI: Companies creating voice assistants constantly try to make them behave like C-3PO, able to understand nearly anything you say. That's hard and genuinely requires the heft of the cloud.

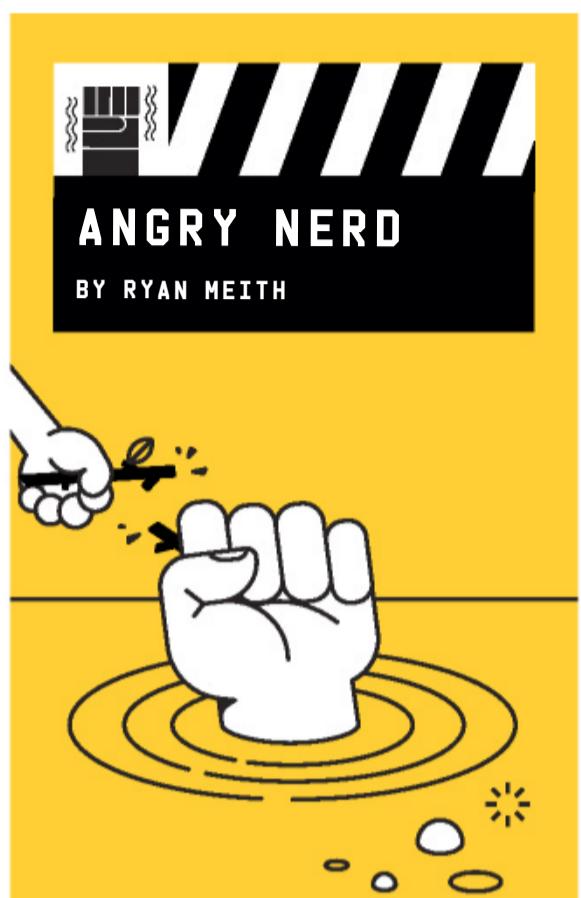
But everyday appliances don't need to pass the Turing test. I don't need light switches that tell dad jokes or achieve self-awareness. They just need to recog-

ware for edge devices. When I interviewed Mozer on Skype, he demo'd some neural-net code he'd created for a microwave, and whatever command he uttered—“Heat up my popcorn for two minutes and 36 seconds”—was recognized instantly.

This makes edge AI more energy-efficient too. No trips to the cloud means less carbon burned to power internet packet routing. Indeed, the Seattle company XNOR.ai even made an image-recognition neural net so lightweight, it can be fueled by a small solar cell. (To really fry your noodle, it made one powered by the teensy voltage generated by a plant.) What's good for the environment is, as XNOR.ai cofounder Ali Farhadi notes, also good for privacy: “I don't want to put a device that sends pictures of my children's bedroom to the cloud, no matter what the security. They seem to be getting hacked every other day.”

Of course, old-school AI isn't vanishing. New, ooh-ahh innovations in machine intelligence will likely need cloud power. And some people probably do want to chitchat with their toothbrush, so sure, they can feed their mouth-cleaning data to the Eye of Sauron. Could be fun. But for everyone else, the choice will be clear: Less smarts for more privacy. I bet they'll go for it. ■

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YOUTUBE CAN'T HELP YOU

Some call me cheap; I say I'm DIY-enabled. Occasionally I pay for it, like the time my motorcycle nearly combusted after I “fixed” the headlight. Maybe I should have consulted YouTube. Or not. Recently, the voice chat on my Xbox crapped out, so I searched for helpful tutorials. What I found? Videos of charmless children all the way down. The top results redefined uselessness. Make sure the jack on my Apple EarPods is plugged in. Turn the Xbox on and off. Have your parents buy you a PlayStation 4. (Listen, punk, I was playing *Fortnite* when it was still called *Unreal Tournament*.) One kid even recommended this: “OK, hold the volume button up for three seconds, then the volume button down for three seconds, then hold the middle for 30 seconds.” Barely comprehensible, and no better than '90s-era voodoo advice to fix Nintendo 64 cartridges by blowing on them. My last threads of hope frayed and unraveled as video upon video of baby-faced charlatans instructed me to “warm up” my microphone. Nobody warms up Apple products these days! Where were my fellow mature gamers? The adults who speak my language? Have they been algorithmically de prioritized on this increasingly infantilized platform? Or scared off it entirely? Finally, I turned on my Xbox and did as I was told, pressing the EarPods' volume up for three seconds, then down for three seconds, then holding the middle—whatever that means—for 30 seconds. Yeah, didn't work. Thirty-six seconds of my life I'm never getting back. The console didn't even catch fire.

THE HEAT IS ON

Automated solar arrays could help incinerate global warming.

BY LAURA MALLONEE

Plenty of days, temperatures in California's Mojave Desert climb above 120 degrees Fahrenheit. A measly figure. These 400 silvered glass panels, tucked into the western edge of that hot, hot desert, are there to generate heat 15 times that amount. And, ideally, to help cool the planet too.

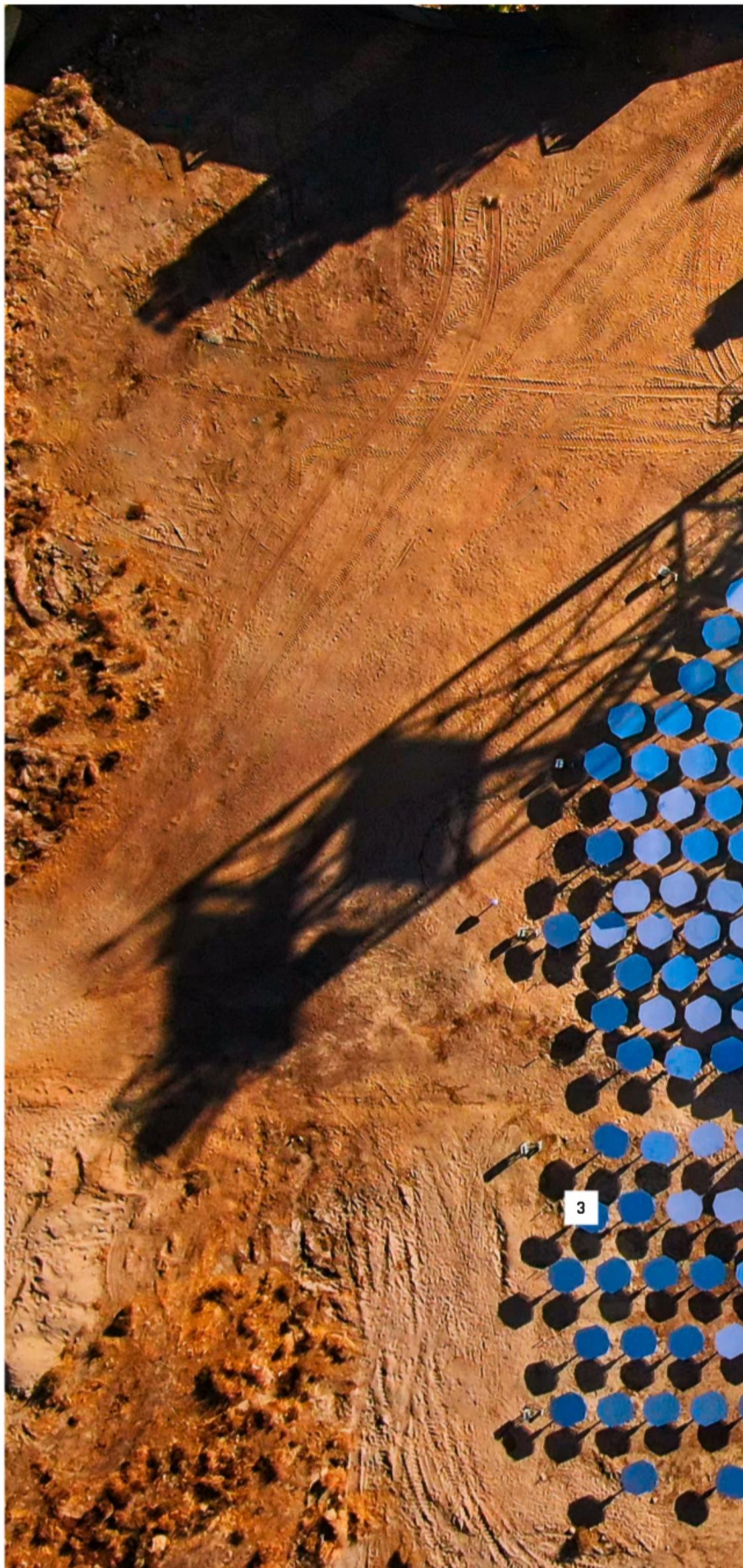
Assembled by the Pasadena-based company Heliogen, each 16-square-foot freckle, a heliostat, reflects a kilowatt of sunlight to the top of a five-story tower, where it's absorbed by a silicon carbide receiver. As the little black plate glows white, it exceeds 1,800 degrees. That's hot enough to begin manufacturing cement and other industrial products—processes that typically rely on burning fossil fuels—and to potentially cut up to 10 percent of global greenhouse gas emissions.

Heliogen CEO Bill Gross has dreamed of harnessing the sun since the 1973 energy crisis, when he sold DIY solar panels. Those sales helped put him through college. When oil prices plummeted, he took a detour to build software—you can thank him for inventing pay-per-click ads—before he founded Heliogen in 2013, with funding from Bill Gates. Last fall, the company fired up this first array. "It was a bit like watching a lunar landing," Gross says.

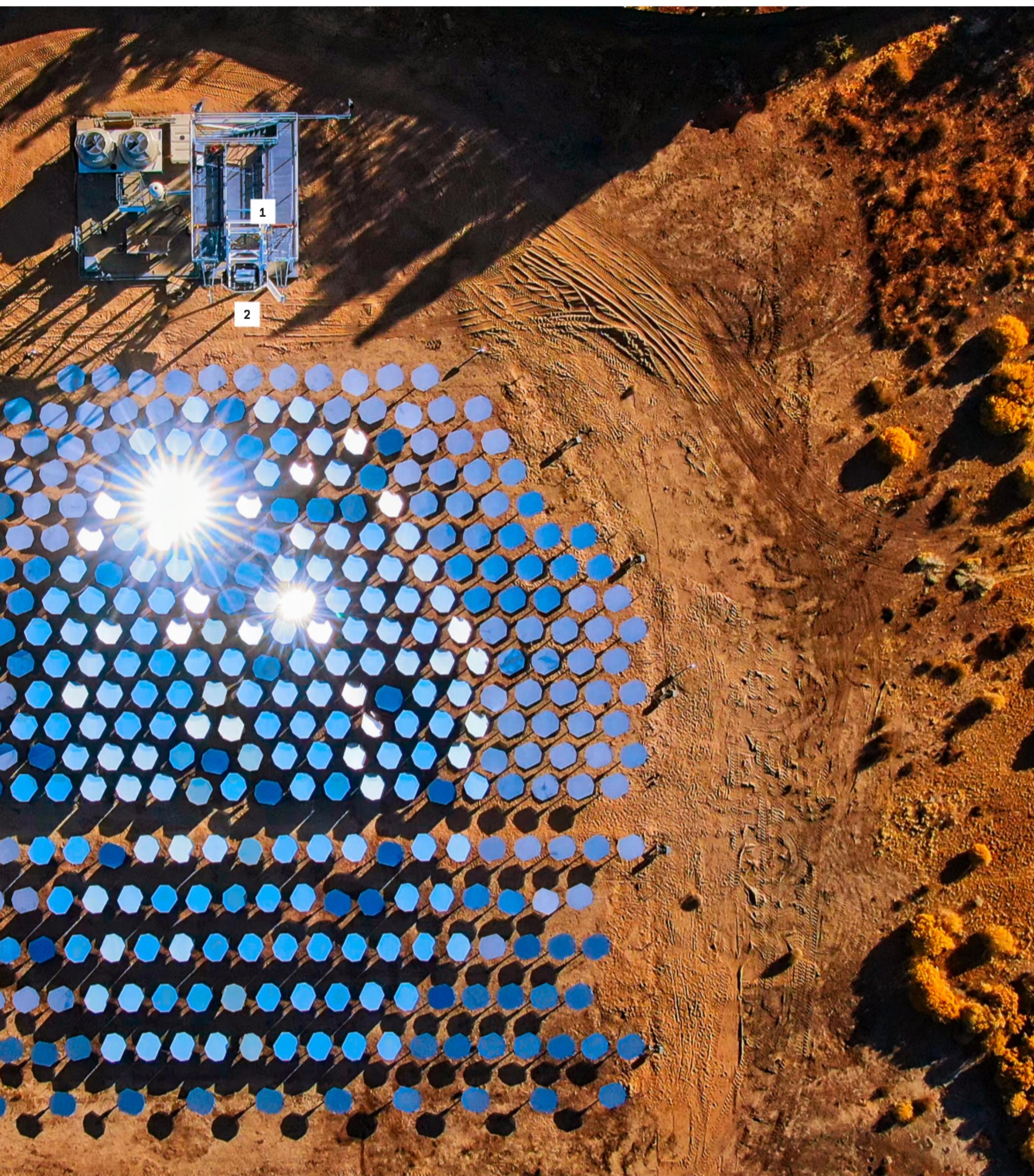
Similar arrays have been used to make electricity and tasty SunChips, and even drill for oil. But those peak around 1,000 degrees, because each heliostat has to be individually calibrated and can fall out of alignment over time. With Heliogen, cameras atop the tower scan the sky, and image analysis software computes the optimal position for each mirror, which can rotate in increments smaller than 1/160 of a degree. Gross says such efficiency can deliver heat 20 percent more cheaply than fossil fuels can.

As proof of concept, Heliogen has mounted a kiln atop the tower to directly heat limestone, a key step in making cement. This year the company plans to link with commercial partners that have the ample shadowless land required. Gross is also building a receiver that can handle temperatures above 2,700 degrees. That kind of hellfire can create synthetic hydrogen, which could replace oil-based fuels. "Civilization depends on cement and steel—our roads, travel, everything," Gross says. "We've found a way to clean it up." ■

LAURA MALLONEE (@LauraMallonee) writes about photography for WIRED.



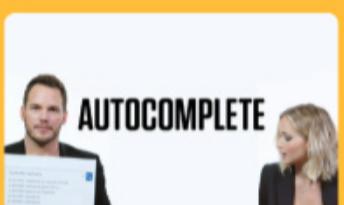
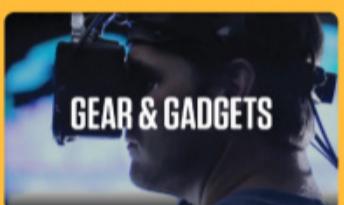
Photograph courtesy of Cineatra Media



1. Collected heat can also be transferred into gas and shot down ducts into manufacturing plants.

2. The 3.5-square-foot receiver takes in 400 kW of light, 1,200 times denser than direct sunlight.

3. Each heliostat gets realigned every few seconds so maximum light hits the receiver all day.



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It's Glow Time

Dyson's sleek, internet-connected light uses real-time data to illuminate your workspace and protect you from eye strain.

—Jess Grey

\$600

DYSON LIGHTCYCLE TASK LIGHT

Most modern task lamps consist of little more than a power cord, an LED, and a few strips of metal. But if anyone's going to over-engineer such a simple object, it's Dyson. With the Lightcycle, the British company applies the same delightful reinvention it brought to fans and vacuums. The lamp's height and position adjust easily: A gentle push with one finger raises, lowers, extends, and pivots its cranelike limbs, which glide noiselessly on tiny rollers. Adjusting the LED bulb requires even less work—its color and brightness can be set automatically. Plug your age and current mental mode (Precision, Study, Relax) into Dyson's companion app, let it access your location, and the app will command the lamp (via Bluetooth) to pour out a pool of light perfectly tuned to the task at hand. It takes into account the time of day, the natural light in your vicinity, even the speed at which your eyes might fatigue. Store up to 20 profiles in the app and, with one tap, the Lightcycle will know exactly which way to glow.

FETISH



Minor Keys

People love mechanical keyboards for their tactile springiness, but their size can overwhelm your desk space. Try a compact version instead. —Boone Ashworth



ZSA TECHNOLOGY LABS
PLANCK EZ GLOW

The oddly labeled command keys flanking the Planck's teensy space bar are the real space savers. They provide access to up to 32 different characters or functions per letter key. Plus, the Planck is ortholinear; the keys are aligned on a grid rather than staggered. This makes it more compact and, ortho adherents argue, more ergonomic.

\$195



Rise Above

Get up, get down. Get your work done at a flexible desk. Here are two outstanding options. —Michael Calore

The image shows two different types of standing desks side-by-side. On the left is the Varidesk ProPlus 30, which has a light-colored wooden frame and a dark grey top. It features a built-in monitor mount and a pencil holder. A small orange circle with the text 'HEAD TO HEAD' is overlaid on the left side. A white mug is resting on the desk. A price tag '\$295' is visible on the right side of the desk. On the right is the Beyond the Office Door VertDesk V3, which has a dark grey frame and a black top. It is shown from a top-down perspective, holding three oranges and a yellow sticky note with a pen. A price tag '\$532 AND UP' is visible on the right side. The background consists of overlapping geometric shapes in shades of blue, yellow, and grey.

VARIDESK PROPLUS 30

Best for: Cubicle commandos

When a workspace is already crowded with furniture, the best sit-stand option is one that converts any desk into a dual-mode station. The multilayered Varidesk holds just the essentials—monitor, keyboard, mouse. Your wireless phone charger, headphone stand, and stacks of paperwork stay on the tabletop. Squeezing the paddlelike levers on either side releases the locking mechanism that keeps the 30-inch work surface stable, and a system of springs allows you to lift the whole assembly up or push it back down with relative ease. The Varidesk locks into one of 11 heights between 4.5 and 17.5 inches off the desktop. There are no motors and nothing to plug in. It even arrives fully assembled.

\$295

BEYOND THE OFFICE DOOR VERTDESK V3

Best for: Upright managers

This Wisconsin shop has long sold other companies' office furniture. So when BTOD finally made its own desk, it folded in years of industry experience. The third version of its motorized VertDesk can lift up to 275 pounds—enough to handle a multidisplay workstation, heaps of external storage, and a few potted aeschynanthuses. Plus, it can be programmed to stop at up to four heights between 30 and 50 inches. A sensor keeps the work surface from crushing any hard objects (mug) or soft ones (office lapdog) that may be resting on your under-desk cabinet. The Vert is customizable too. Add a power strip (\$40), casters (\$43), or a Siri voice-control module (\$73)—when your Apple Watch commands you to stand, command the desk to rise with you.

0 2 6

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OFF THE
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Jet Set

Stay productive, comfortable, and entertained while you wing your way to yet another important meeting.

—Boone Ashworth

GEARHEAD

SONY WF-1000XM3

With up to eight hours of listening time per charge (and 24 hours of reserve power in the case), these brilliant-sounding buds make great in-flight companions. The noise-canceling system adapts to the environment, adjusting automatically to block out the snore monster in the middle seat. Just pack decent wired headphones too, for plugging into the plane's entertainment system.

\$200



YETI RAMBLER 12-OUNCE BOTTLE WITH HOTSHOT CAP

This vacuum-sealed vessel keeps 12 ounces of artisanal Yirgacheffe brew piping hot for up to five hours. The two-piece lid is the real standout here: The center clicks open with just half a twist, letting you sip from anywhere along the rim. No more aligning your mouth with a tiny spout. A leakproof seal prevents the precious caffeine from sloshing onto that clean white shirt.



\$30

TOM BIHN PILOT LAPTOP BAG

When you're flying light, this travel briefcase could be all the luggage you need. Choose an exterior made of lightweight ripstop nylon or tougher ballistic fabric. The inside is roomy enough for a 13-inch laptop (or the Microsoft Surface Pro 7), toiletries, and a change of clothes. The front pocket has a vertical zipper for easy access to a water bottle or travel mug.



\$165

\$749

MICROSOFT SURFACE PRO 7

The latest iteration of Microsoft's flagship tablet is one of our favorite ultraportables. The sub-2-pounder has a bright, hi-res 12.3-inch touchscreen, gets eight hours of battery life, and runs all the critical Windows apps. Add a Type Cover (\$160) and Surface Pen (\$100) to turn the Pro 7 into a full-fledged laptop replacement.

\$18

**BOMBAS COMPRESSION SOCKS**

If your feet swell when you fly—or even when you sit for long stretches—try a pair of compression socks. They'll improve circulation to curb swelling and lower the risk of blood clots forming in the lower limbs. Also, with each pair you buy, the company donates one pair to a homeless shelter.



The Parent Trap

The same technology that's made working from home easier than ever has fundamentally changed what "home" means to me.

—Adrienne So

It's 10:50 am when my Apple Watch dings. I lurch unsteadily to my feet. I spent the early part of the morning in a whirlwind, dressing, feeding, and packing my 2- and 4-year-olds off to day care and preschool. Then I returned home, plopped down at my desk, and started my workday. Since 8 am, I've barely moved.

My smartwatch sends a reminder to stand up once an hour, but I've been ignoring it. Now, at its urging, I finally stop to stretch. Thoughts that I'd pushed to the back of my brain start to rebound forward: "Have I showered today? When did I last eat? I need to go to the bathroom."

As I get up and walk through the kitchen, I pass the table still cluttered with my children's crusty breakfast dishes. Pause. Cleaning up the mess will take just a few minutes. Aw, heck. I'll wash their sticky water bottles too. As I'm drying my hands, my watch dings again. Someone has a question for me on Slack! I hurry back

to my computer. A half-hour later, I start to feel uncomfortable again. What's that about? Oh, right, I still haven't gone to the bathroom. Wait, have I eaten yet?

I'm grateful that my employer views my having a family and living 700 miles from the office as an asset, not a liability. I have a bevy of hardware and software that makes working remotely flexible—and not so lonely. Slack and Google Docs let me approve my editor's changes while I wait in a pediatrician's exam room for our doctor to look at a weird rash (on the kid, not me). I can joke around in team meetings over Zoom while wearing my ancient *Big Lebowski* cardigan. Also, I'm a gear reviewer, which means I get to test gadgets that ease motherhood's many stresses: robot vacuums, electric-assist strollers, and kid-friendly tablets. My family enjoyed testing a new pizza oven, though I had to send it back in a box that had been entirely scribbled over in crayon. My children have also

begun asking when they get to send the latest toy back and get a new one.

Sometimes, everything goes according to plan. The commute to my kids' day care is an easy half-mile through a quiet residential neighborhood; we can all do it on a cargo bike. If I forgot to bring my son's nap blanky to school, it's a 10-minute error correction and not a half-day disaster. If I get stuck while writing, I can take my dog for a brain-refreshing walk through a forest of 80-foot pines.

So yes, I love my job; I love this setup. Mostly. The big hitch is that the tools that allow me to keep up during the day are the same ones that melt the line between work and home. I sit on the couch after everyone else has gone to sleep and schedule my emails to send at 8 am—an attempt to hide my weird hours from my coworkers. (Until now. Hi guys!) And because I'm always in my office, sometimes I can't rest until I've examined all 12 color options for this one particular ebike. Oh no. It's 1 am ...

As plenty of people know, being a work-from-home parent also complicates things. Not only do you have to do your job, you also end up being the primary caregiver, the chief household officer, the dog walker, and the front-door receptionist. My brain's CPU gets overloaded, and when I try to clear my cache, someone tugs at my pants and asks me to glue their Fossil Friend back together.

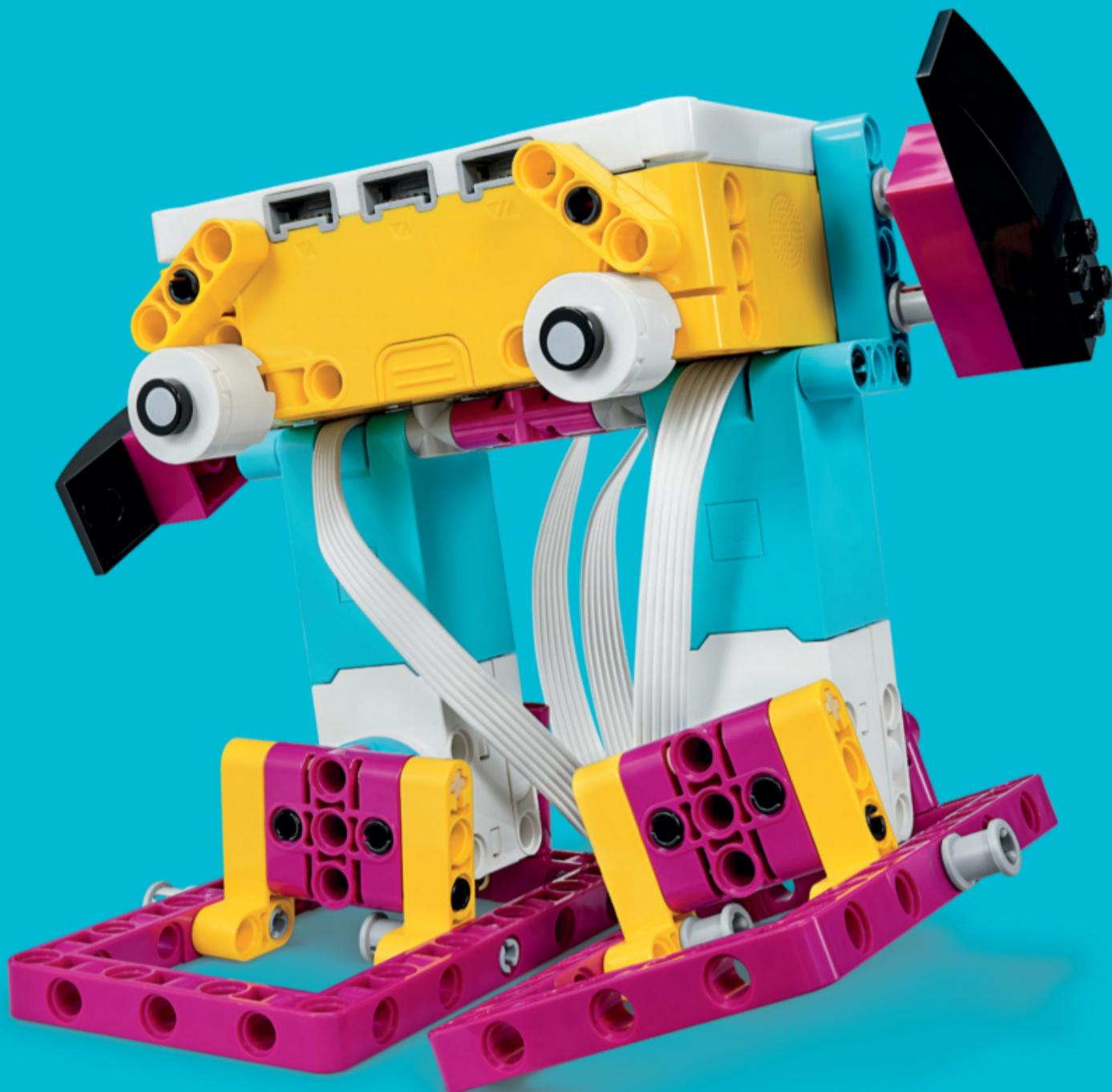
If I regret anything, it's that while my family views our house as a welcoming haven, I can view it as a source of stress. It's where I'm trapped all day, every day. It's my workplace, my lunchroom, my pit of never-ending chores.

In the evenings, my loved ones come home and start to wind down. They pick at the last of their home-cooked dinner, then take a hot bath and change into their jammies. Their little bodies sink into the sofa as they watch 10 minutes of *Stinky & Dirty* before bed.

Then they fall asleep easily, but with my CPU still whirring away, I have to reboot. I lace up my shoes and go for a run in the dark. I love my family, I love my job, and I love my house—but sometimes I just can't wait to break free. And I don't need my watch to remind me to do so. ■

Senior writer ADRIENNE SO
(@adriennemso) lives in Portland and reviews consumer technology for WIRED.

Meet the new face of STEAM education



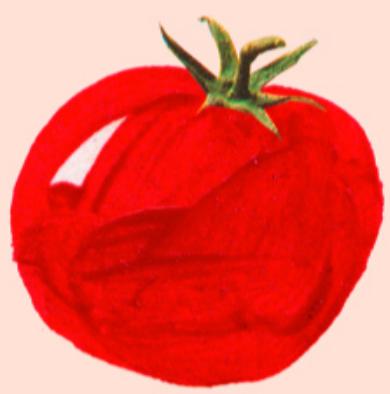
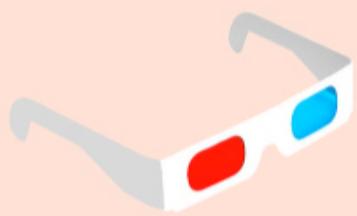
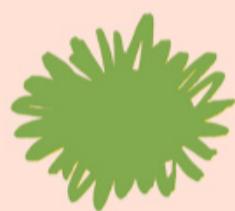
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CERTIFIED ORGANIC

Tim Ryan is an excitable 42-year-old film savant with a mop of reddish hair. In his early twenties, he worked as a newspaper reporter in Rhode Island and spent his downtime bingeing the classics. “Like Godard, and Russian propaganda films,” he says. Eventually he moved to the Bay Area, where the fledgling movie-rating website Rotten Tomatoes was then based. In his quest to devour the entire canon, Ryan had become a Rotten Tomatoes obsessive. When a job opened up at the site in 2004, it felt like a life-changing opportunity. He landed it, and now Ryan compares himself to the Mark Wahlberg character in the critically panned movie *Rock Star*. He went from “being the biggest fan to being the lead singer.”

Ryan is the site’s longest-tenured employee, and he recently committed himself to an ambitious project he’d been chipping away at for a while. When I visited the Rotten Tomatoes offices—now in Beverly Hills—in October, he put it this way: “One thing I’ve been thinking about is, what if Rotten Tomatoes always existed?” Ryan was going to rate every movie ever made. Or, more precisely, every review of every movie ever made.

The world’s first feature film, called *The Story of the Kelly Gang*, is an hour-plus romp about a band of outlaw Australian bushrangers. Events depicted include cattle theft, bank robbery, and attempted train derailment. It premiered on December 26, 1906, in Melbourne’s Athenaeum Hall, to general delirium. A day later came the world’s first proper feature-film review, which Ryan tracked down in a digitized version of the Melbourne paper *The Age*. From the review:

A conscientious and, on the whole, a credible, effort has been made to reproduce the tragedies as they occurred, and if there were any imperfections in detail probably few in the hall had memories long enough to detect them.

Humans, not algorithms, determine those ubiquitous Rotten Tomatoes scores. Good ingredients, imperfect recipe.

BY SIMON VAN ZUYLEN-WOOD

POST

The movie played for five sold-out weeks at the Athenaeum, before migrating to a theater in Sydney. So Ryan checked out Sydney's *Daily Telegraph*, where he found world movie review number two.

The films are clear and distinct, the chief actors concerned in the bush drama are fairly recognizable, the photographs are taken in "Kelly country" and after due allowance is made for certain acknowledged liberties taken, the illustrated record is probably as satisfactory as anything of the kind procurable at this distant date.

Then, 112 years after they were first published and immediately forgotten, the reviews were uploaded to Rotten Tomatoes. Ryan interpreted the first review as "Fresh," and the second one "Rotten." Until further notice, and possibly until the end of time, the internet's authoritative appraisal of *The Story of the Kelly Gang* will feature one glistening red tomato and one fetid green splat.

Strange as it is, a website that evaluates films via cartoon tomatoes might be the closest thing our fractured, post-gatekeeper culture has to an arbiter of good taste. The site's Tomatometer has become, as one early employee put it, a Good Housekeeping Seal for visual entertainment. Red means good, green means bad. The Tomatometer is run by a team of "curators" who read just about every known review from a gigantic pool of approved critics, then decide if each is positive or negative. Once a movie has five reviews, it is Tomatometer-eligible.

For those who've never paused to wonder what the metric actually means, a tutorial: Each film's Tomatometer score is equivalent to the percentage of "positive" reviews it has accumulated. For example, when John Travolta's 2018 mobster biopic *Gotti* generated a 0 percent rating, it meant that literally none of the 55 critics who appraised the film had any remotely warm feelings about it. If a movie generates a 59 percent or lower, it's Rotten. Sixty percent or higher, it's Fresh.

The site's founder has said he landed on the name Rotten Tomatoes while watching a movie called *Leolo*, about a boy who thinks he was conceived when an Italian peasant fell into a cart of semen-covered tomatoes. Of course the name more straightforwardly

evokes the supposed old-time practice of hurling fruit at unsatisfactory stage performers. In that spirit, the site also offers a second, more Yelp-like rating called the Audience Score, determined by hundreds of thousands of Rotten Tomatoes users who grade movies from 0.5 to 5.

Tim Ryan's maximalist archival project befits the growth of the site. Founded in 1998 by Berkeley postgrads who wanted to rate Jackie Chan movies, Rotten Tomatoes matured into a powerhouse by proving its usefulness to corporate America. Steve Jobs, an early evangelist, name-checked the site during his keynote presentations. Though routinely denounced by the Hollywood elite, from Meryl Streep to Martin Scorsese, Rotten Tomatoes has proved an irresistible asset to companies that want you to watch movies.

In 2010 it was bought by Flixster, which was bought the following year by corporate overlord Warner Bros., which in 2016 sold most of its stake to new corporate overlord Fandango, which is itself owned by corporate overlord Comcast NBCUniversal. Now, when you browse for showtimes on Fandango, which is the country's dominant ticket seller, you'll see a Tomatometer beside each release. Rent a movie on Google Play, DirecTV, or iTunes—Rotten Tomatoes' corporate partners—there it is again. For studios, the Tomatometer has become a ubiquitous marketing tool, while news coverage of the scores has become its own odd internet subgenre.

As the site's influence grew, it inevitably led to a reckoning. In 2017 producers started blaming low scores for the dismal performance of expensive summer fare—like the *Baywatch* reboot and the latest terrible *Pirates of the Caribbean* installment. Casual conspiracy theorists, meanwhile, imagined that Rotten Tomatoes intentionally goosed movie scores according to the wishes of studio bosses. While there is no evidence that curators can be bought, the site's Audience Score is definitely corruptible. In late 2018 and early 2019, it fell prey to a trolling epidemic, as bigoted male comic book fans appeared to bull-rush the site to take down the audience score of superhero movies, like *Black Panther* and *Captain Marvel*, whose stars they deemed unacceptably black or female. All of a sudden, along with the rest of the internet, Rotten Tomatoes was not to be trusted. The crowds were not wise.

Still, there is an authoritative allure in the site's numerical scores. As a Rotten Tomatoes user, I reflexively—and nonsensically—trust a Fresh 60 percent Tomatometer over a Rotten 59 percent. Yet the numbers themselves, as I found, can be close to meaningless. In a world of endless choice, on an internet increasingly dictated by predictive algorithms that recommend "for you," Rotten Tomatoes represents something more analog. And it raises the question: What's the best way to choose? Or, more to the point, who do you trust?

"Is it a review?" This is the question the Rotten Tomatoes curation team asks itself every two weeks, during a meeting called Review of Reviews. On the day I attended, it was led by Haña Lucero-Colin, the site's 27-year-old TV czar. Rotten Tomatoes' office, which it shares with the larger Fandango staff, has a Silicon Valley feel. Walls you can write on. Walls you can remove. Pods, booths, nooks. The orange of Fandango's logo everywhere. But this meeting felt less startup and more extremely random J-school seminar.

The meeting works like this: Curators submit articles that may or may not be reviews, and the room decides if they are. That's it. Rotten Tomatoes will not consider reported features, tweets, or—to its eternal credit—recaps. Today's submissions include a *Guardian* piece on *30 Rock*'s overreliance on celebrity guests, a rambling discussion on a culture podcast, and a 2008 *Entertainment Weekly* piece about the short-lived daytime program *The Bonnie Hunt Show*. All were swiftly labeled nonreviews.

The slippiest example of the day was a piece by Matt Zoller Seitz on *New York* magazine's Vulture site about a new *Nancy Drew* show on the CW. Robert Fowler, a TV curator, laid out the problem. It seemed to Fowler that when Zoller Seitz started to write about the series, "he decided, 'Maybe I'm just going to pontificate on the nature of television.' As is sometimes his wont. In this case, I think it's kind of a byproduct of a very established television critic maybe being a little bored by his subject matter." Lucero-Colin concurred. "I think he got into that *Nancy Drew* is *Twin Peaks* is *Nancy Drew* is *Sabrina* time loop and got stuck." Review or not? Nobody could tell. (The solu-

There are no official Fresh-or-Rotten criteria. No quota for superlatives, no scale for snark.

There's only a curator's gut check. I asked Jeff Giles what he likes in a reviewer. "Clearly stated opinion," he said.

tion: Lucero-Colin emailed Zoller Seitz. He responded concisely: "It's fresh."

Meetings like this are crucial to maintaining Tomatometer integrity. Few contemplate this more than Jeff Giles. Bearded, wearing a Henley and a flannel shirt when I met him, he exudes steadiness and chill, which is a good quality to have when you read *Joker* reviews for a living. A New Hampshire resident who mostly works remotely, Giles began curating for Rotten Tomatoes in 2005. Since then he's also started a pop-culture site and written a 381-page oral history of the soap opera *One Life to Live*.

Giles, 45, leads the theatrical department. That sounds grander than it is. Of Rotten Tomatoes' four dozen employees, just 12 are curators. Three work on historical reviews. Seven monitor the content fire hose that is peak TV. That leaves just two, including Giles, working full-time on movies.

Giles, who was in Beverly Hills on a regular visit, stared at his laptop while I observed his daily labors. Each curator is responsible for a list of publications. Giles, as eminence grise, handles many of the critics—or "sources," in Rotten Tomatoes argot—at

A-list publications: *The New Yorker*, *The New York Times*, Slate. The job: Evaluate a review's freshness, then trawl for a good pull quote to slap on the website. First up on his list is a *Hollywood Reporter* review of an Indian film called *The Wayfarers*. The review is meandering and difficult to evaluate. Luckily, it comes with a helpful "bottom line" that makes the decision for Giles: "A slow starter turns into something deeply moving." OK, then. Fresh. After that we plow through a pretty clear-cut Richard Brody review in *The New Yorker* entitled "Springtime for Nazis: How the Satire of *Jojo Rabbit* Backfires."

Craving a challenge, I ask Giles for a tougher call. He cites a condescending but lighthearted review he had already logged of the *Downton Abbey* movie. "He seems to think that it didn't need to exist," Giles remarks of the critic, Anthony Lane, also of *The New Yorker*. "But it wasn't a painful experience, you know?" Reminder: There are no official Fresh-or-Rotten criteria. No quota for superlatives, no scale for snark. There is only a curator's gut check. Conflicted, and kind of a *Downton* homer, I was

leaning Fresh. Giles agreed. "Sometimes we call those a Gentleman's Fresh." Benefit of the doubt. But he had forgotten his official assessment: Lane's review was marked Rotten. (I asked Giles what he likes in a reviewer. "Clearly stated opinion," he said.)

For publications that use letter grades, Giles tends to mark Fresh any review that gets a B– or higher. Speed and shortcuts are appreciated. Kristin Livingstone, who spent a year as a curator, says curators often lob nebulous reviews to their colleagues on a company Slack channel. "Some curators would tell you almost immediately if it was Fresh or Rotten," she says. "Like, there was no way you read this!"

Curators were expected to rate at least 50 reviews a day, Livingstone says, a pace that allowed little time for contemplation, especially when powering through the site's expanded YouTubed and podcasted criticism. Weekly review counts were shared on a Google spreadsheet. "It felt like a leaderboard, like in *Glengarry Glen Ross*." (Rotten Tomatoes says that the target benchmark is 200 reviews per week and that employees face no penalty if they don't hit it.)

POST

Used properly,
Rotten Tomatoes
becomes a resource
of nearly infinite
vastness. Which
was kind of the point
of the internet in
the first place.

Simon Van Zuylen-Wood (@svzwood) is a journalist in New York. He thinks *Avengers: Endgame* has way too high a rating on the Tomatometer. This is his first article for WIRED.

Rotten Tomatoes has started to tackle its volume problem by allowing critics to upload and rate their own reviews. About 30 percent now do, but I get the sense many would prefer the Tomatometer didn't exist at all. *Time* film critic Stephanie Zacharek bemoans the site's inability to reckon with "an amazing performance in a terrible film." Most critics—apologies to Roger Ebert—are in the thumbs-up, thumbs-down business.

The Tomatometer has been further distorted by the triumph of "poptimism"—critical faith in commercial success stories. "TV critics during the '90s were insanely mean," says Lucero-Colin, who spent last year on a team reviewing reviews of every scripted TV show to premiere in the 1990s. "Every other review was like, 'This show is crap and we'll never watch it again.' When you read a lot of TV criticism today, it's much more didactic. It's like, 'Well, they do this really well. And this is not great. But I still like the star.'" Furthermore, because the Tomatometer doesn't distinguish between raves and Gentleman's Freshes, popcorn crowd-pleasers and classics are often rated identically. (*Spider-Man: Into the Spider-Verse*: 97 percent; Alfred Hitchcock's *Vertigo*: 95 percent.) Annual average Tomatometer scores, according to a recent analysis, have never been higher.

Understood as a shorthand for film quality, the Tomatometer, as Alison Willmore, a critic at *New York*, puts it, is actually a measurement of "consensus": film criticism as popularity contest. This, conveniently, boosts Rotten Tomatoes' visibility. "Because everything boils down to positive or negative, that's why you get stuff up in the 90s and stuff in the single digits," says Matt Atchity, the site's former editor, who left in 2017. Rotten Tomatoes' brainier, less popular rival Metacritic culls from a smaller number of reviews and seems to assign a lot more ho-hum scores. "What keeps Rotten Tomatoes popular, what helps keep them in the news, are those extreme numbers," Atchity says.

So back to *The Story of the Kelly Gang*. The world's first review, rated Fresh, didn't have anything explicitly bad to say about the movie. And yet adjectives like "creditable" and "conscientious" are not exactly glowing. The second review opened with the assertion that the real-life story of the gang was not a "splendid advertisement" for

Australian values. It was rated Rotten. But the critic didn't impugn the film itself, and in fact seemed to think it was pretty well made. The point isn't that Ryan reviewed the films incorrectly. I probably would have done the same. The point is, the Tomatometer forces a false choice: Fresh or Rotten. There is no Underripe or Overripe tomato.

Giles recently heard from a critic who objected to a Fresh rating he'd given a review. "She said, 'I really didn't like this movie. Can you make it Rotten?' And I said, 'Absolutely. However, I have to ask, why did you make it a B-?' And the response was basically, 'I hate grading things. It's arbitrary.'" Giles added, "I agree completely."

My second day at Rotten Tomatoes, I went to lunch with some of the site's editorial staff. These are the front-facing Tomatopeople, separate from the curators. They interview movie stars. They schmooze at film festivals. They write hot takes for the site. I asked if, as de facto brand ambassadors, they find that people understand Rotten Tomatoes. No, came the reply, they do not. One editor, Jacqueline Coley, said that she tells Uber drivers she's a traveling nurse, so they don't start accosting her about scores she can't control. She also hears complaints about "the algorithm." Says Coley, incredulous: "We don't have an algorithm!"

Indeed not. This is why review-bombing trolls caused such grief not just to studios but to Rotten Tomatoes itself. When audience scores for *The Last Jedi* began plummeting to suspiciously low depths a couple of years ago (it's currently at 43 percent, with a Tomatometer score of 91), casual users couldn't know if the criticism was representative of the film-going public or just Gamergate runoff protesting the film's casting inclusivity (or some other niche superfan grievance, for that matter). Absent its reputation for accurate ratings, Rotten Tomatoes is nothing.

To bolster that trust, Rotten Tomatoes fixed an obvious problem: It forbade people from rating movies before they actually came out. It also began verifying the reviews of tomato throwers who could prove they bought their tickets on Fandango. The new verified rating is now the site's default Audience Score. (Rotten Tomatoes says it is working with cinema chains to verify their ticket stubs too, but for now this arrangement obviously benefits ... Fandango.) Still, there's noth-

ing stopping people from bombing a movie for nefarious purposes *after* it comes out.

These changes took place in tandem with a parallel overhaul of its critics' criteria, designed to make its Tomatometer more representative. Prior to August 2018, Tomatometer-approved critics were almost exclusively staff writers from existing publications, who tended to be whiter, maler, and crustier. Since the site changed its policies, it's added roughly 600 new critics—the majority of whom are freelancers and women. But that also means there are now a stunning 4,500 critics, some of whom inevitably will be terrible. A couple of years ago, an approved critic named Cole Smithey, who writes for Colesmithey.com, bragged about intentionally tanking *Lady Bird*'s then-100 percent rating with a negative review.

It's hard to know how much of a difference high or low scores make at the box office. In late 2018, Morning Consult conducted a national poll and found that one-third of Americans look at Rotten Tomatoes before seeing a movie, and 63 percent of those have been deterred by low scores. Whatever the effect, appearance is everything in Hollywood. Nobody wants a green tomato. Studios hold screenings for critics as close to release dates as possible, to delay splats, while disputing rotten ratings to curators like Giles.

"I've noticed over the last year that Certified Fresh is more important for studios and filmmakers," he says, referring to the little badge movies get if the Tomatometer is 75 percent or higher for a minimum of 40 film reviews. "They know the value we add to their marketing." The AMC movie chain—the largest in the country—displays the Tomatometer on its websites, but only next to movies that are Certified Fresh.

In any case, Fandango did not buy Rotten Tomatoes to *discourage* people from seeing movies. To that point, the site doesn't have its own boss. Instead, it's led by Fandango's president, a fit, ageless-looking Canadian named Paul Yanover. He started out developing software for animators working on Disney's original *Beauty and the Beast*, and he doesn't seem like a suit, exactly. But he knows how the popcorn gets buttered. "I think we actually see ourselves as a really useful marketing platform for the studios," he told me.

Fandango makes money in several ways. It earns a cut of the "convenience fee" you pay when you buy a ticket on its platform. It also strikes licensing agreements with content providers who want to use the Tomatometer.

"Obviously, Rotten Tomatoes practices enormous independence," Yanover says. "But Fandango, equally so, is a retailer of tickets and streaming." As he sees it, the missions of Rotten Tomatoes and Fandango are identical: to get you in front of content you'll enjoy.

That, of course, is also the job of Netflix's predictive algorithm. Difference is, Netflix knows your preferences better than the critics do, maybe even better than you know them yourself. Netflix does not show you a Tomatometer when you browse. It doesn't show you any user ratings at all. Instead, it suggests movies and shows it thinks you'll like, based on movies and shows you've already watched. This, of course, is how Spotify's playlists and Facebook's News Feed work; they're content curators too. In our era of digital excess, we're being recommended to all the time. Paralyzed by choice, we'll take the suggestions.

Given the flaws of the Tomatometer, why use Rotten Tomatoes at all? Here's one reason: While the point of Netflix's algorithm is to keep you on its site as long as possible, the intent of Rotten Tomatoes, ultimately, is to get you off the site. Sure, it'd like you to go first to Fandango, but then to the movies or maybe a random *Gunsmoke* rerun. It will lead you—or not, if the reviews are bad—to whatever you looked up in the first place, presumably of your own volition. "What you kind of hope is that someone will have a list of Rotten Tomatoes critics they kind of like and trust," says Zacharek, the *Time* critic. "They'll click on a link and look at a review." Used properly, Rotten Tomatoes becomes a resource of nearly infinite vastness. Which was kind of the point of the internet in the first place.

Since Tim Ryan started his archival project, Rotten Tomatoes has created roughly 210 pages for old-time movies on its site, thanks to 5,500 ancient reviews he unearthed, many by critics who are all but forgotten. For anyone actually interested in reading movie reviews, there they are.





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HOW
WASHINGTON
WENT
TO WAR
AGAINST
HUAWEI,
AND
WHY THE
RUNAWAY
CONFLICT
COULD
SPELL
THE END
OF A
SINGLE,
GLOBAL
INTERNET.

CLOUDY WITH A CHANCE OF CATASTROPHE

BY
GARRETT M.
GRAFF

ILLUSTRATIONS BY
ALVARO
DOMINGUEZ

on THE morning OF DECEMBER 1, 2018.

the vast central plaza in Mexico City was thronged by tens of thousands of people. Andrés Manuel López Obrador, a left-wing populist, had just been sworn in as Mexico's 58th president. In his inaugural address, he thumbed his nose at decades of neoliberal rule and promised a sweeping political and economic transformation of Mexico.

The people converging on the Plaza del Zócalo from all over the country weren't the only ones who sensed opportunity in the new administration. At that very moment, high over the Pacific Ocean, a Chinese executive named Meng Wanzhou was winging her way from Shenzhen to Mexico.

Meng is chief financial officer of Huawei, the world's largest manufacturer of telecommunications equipment and second-largest maker of smartphones. Though Huawei's Android handsets are all but unknown in the United States, they are everywhere in Mexico, as they are in China, South Asia, and the Middle East. Even more ubiquitous in some 170 countries around the world are pieces of Huawei equipment that ordinary consumers rarely touch: arrays of radio antennas perched atop cell towers and electronic base stations that sit beneath them on the ground, converting between digital and radio signals. By some accounts, about 40 percent of the world's population relies on Huawei equipment. But even with

191,000 employees and \$108 billion in annual revenue, Huawei remained hungry for growth.

That desire, however, faced a formidable obstacle: the US government. For years, the US had pressured Mexico to block Huawei's expansion within its borders. Washington argued that Huawei's technology was an elaborate Trojan horse for Chinese government surveillance—that installing its networking equipment was akin to giving Beijing's Ministry of State Security the ability to spy on Western computer and wireless networks.

López Obrador's victory, however, suggested a new political moment and an opening for Huawei to strike. Meng was on her way to Mexico to secure a new beachhead for the next generation of wireless infrastructure, known as 5G. The transformation to a 5G network promised inconceivably fast wireless speeds but required a new and denser network of cellular base stations. And Huawei was the world leader in supplying precisely that equipment.

But before Meng could lay the groundwork in Mexico, she made a stop in Vancouver, Canada.

The 47-year-old executive—who also goes by the names Sabrina Meng or Kathy Meng—made her way through customs and immigration wearing a dark tracksuit. At some point, she must have realized that something was amiss. Perhaps it was when one of the two Canadian Border Services officers who questioned her stepped away to speak on his cell phone. Maybe it was when the officers began searching the two carts of luggage she'd brought along, or when two female officers came to escort her into a secure portion of the airport's border facility.

The Royal Canadian Mounted Police finally told her she was under arrest. “Me?” she responded. “Why would I have an arrest warrant?” The officers said they were acting on US charges that she and her company had allegedly violated sanctions against Iran. “You’re saying because of my company, you’re arresting me?” she responded. Could she at least call her family?

The answer was firm: “You cannot.”

The officers placed each of her four devices—a Huawei phone, an iPhone, a rose gold iPad, and a pink MacBook—in a secure bag that would block any attempts to wipe them remotely.

Back in Shenzhen, the home of Huawei’s global headquarters, Joe Kelly was awakened by a phone call. A veteran of British telecommunications, Kelly heads the company’s international media affairs. On the other end of the line was a reporter: Sabrina has been arrested in Canada at the request of the US government. Do you have any response? Kelly sighed and offered the only comment he could muster: “I haven’t had my coffee yet.”

Kelly grasped immediately the enormity of what was happening. Meng isn’t just the CFO of Huawei; she is also the daughter of the company’s founder, 75-year-old billionaire Ren Zhengfei. The US had jabbed sharp elbows at Huawei before. But this was a dramatic escalation of hostilities.

Over the next several months, that escalation would continue. Huawei would find itself caught in a geopolitical vise as the United States seemed to project all of its technological anxiety about China and globalization onto a single company.

For the US, China represents both a critical trading partner and a leading foreign adversary. US companies see China as a market with a billion consumers and as home to the factories that make everything from Apple iPhones to children’s books. It’s also an authoritarian superpower that exerts an ambiguous level of control over its private sector. As tech firms like Huawei become ever more indispensable across the globe, American leaders have, not unreasonably, become possessed by the fear that Chinese technology will offer a ruthless Beijing many “backdoors” into Western affairs of state, security, and commerce. And in the past two years, the US has, at least

in the case of Huawei, begun to toy with a policy of complete technological quarantine.

The stakes are enormous. Huawei itself is a huge player in the global telecommunications industry—so large that as Huawei goes, so goes the interconnected world. A full US ban on Huawei products could mark the beginning of the end of a one-world internet. It could calve the world into two separate tech ecosystems, one in North America and parts of Europe and the other across Asia and the Southern Hemisphere. The former would be dominated by Nokia, Amazon, Google, Facebook, Microsoft, and Apple, and the latter by Huawei, Alibaba, Tencent, and Baidu.

The Trump administration’s escalating fight has left US companies that supply Huawei reeling and left Huawei wondering if it can ever count on access to US supply chains again. About the only thing that is clear is that the Trump administration’s fight isn’t really about Huawei at all.

“There’s a big geopolitical battle going on,” one Huawei executive told me, “one that’s far above Huawei’s pay grade.”

II

**"WE'RE
NOT
HAWAII"**

REN ZHENGFEI GREW UP IN GUIZHOU PROVINCE, one of China’s poorest regions, where his parents were middle school teachers. He was studying civil engineering in college when Mao Zedong’s Cultural Revolution came into force. Ren joined the People’s Liberation Army and became a member of the Chinese Communist Party in 1978. As he told reporters in 2013, it was a period when all “exceptional people” were expected to sign up with the party. “At that time my personal belief was to work hard, dedicate myself—or even sacrifice myself—for the benefit of ‘the people,’ ” he said. “Joining the Communist Party was in line with that aspiration.”

Ren left the military in the early 1980s. After a lackluster start in business, he founded Huawei with \$5,600 in capital. He based the company in the southern city of Shenzhen, which at the time was a small coastal town that had just been designated a Special Economic Zone.

REN FOSTERED A CORPORATE CULTURE OF MILITARISTIC ZEAL. "THE MARKET HAS NO TIME FOR TEARS," REN ONCE TOLD EMPLOYEES. "IT RESPECTS ONLY THE BRAVE."



Ren hit on his first commercial success with small telephone exchange switches that connected calls inside hotels. From there, Huawei expanded into selling and manufacturing the guts of telephony. Most of its early customers were in rural China, in areas that were ill served by the giant European telecom companies just beginning to expand into the country.

In 1992, Ren led a delegation of company executives to the United States, where they visited Texas Instruments, IBM, and firms in Silicon Valley. “We recognized that our own methods of R&D are extremely backward,” Ren later wrote. “We simply have a long way to go to catch up.” Back home, he pushed his engineers to create the next generation of telephone switches. Telephones were then still a luxury in China, but as China’s middle class began to prosper, Huawei was well positioned to grow.

Eager to become a global player, Ren hired IBM to tutor the company on management and operations. Beginning in 1998, Huawei started pitching its switching technology overseas. Just as it had first cracked rural markets in China, it initially looked to underserved countries in Southeast Asia, Africa, and Latin America. “We had to spend a lot of time covering how to pronounce our name,” recalls David Wang, a longtime employee who now serves as the executive director of Huawei’s board. *We’re not Hawaii*, the telecom emissaries would explain. *We’re Huawei. Like “how are we?” said fast.*

Ren fostered a corporate culture of militaristic zeal. “The market has no time for tears,” he once told employees. “It respects only the brave. If Huawei intends to survive, it has to carve out a bloody path for itself.” Today, walls throughout Huawei’s buildings—and the cardboard sleeves on the campus’s Illy coffee cups—show a battered World War II fighter, its wings and fuselage shot to pieces, still flying triumphantly. As the poster says, “Heroes are forged, not born.”

Gradually, Huawei’s success in the developing world opened up doors in more advanced economies. Edward Zhou, who started as an engineer in 1996 and is now vice president of global public affairs, remembers sleeping in customers’ machine rooms to debug systems on the fly during the early days when Huawei still had a lot to prove. Back then, Huawei’s telephone technology was not equal to that of its Western peers, but it was much cheaper to operate. “Our custom-

ers didn’t trust the technology, but they trusted the people, because we worked very hard,” Zhou says. He later went to posts in Spain, Germany, and Japan.

In 2003, Huawei won a contract in Russia to build an optical-cable transmission project stretching across 1,800 kilometers in Siberia. The same year, it landed a contract to build a backbone transmission network for France. By 2005 more than half of the company’s revenue was coming from outside of China. *Time* named Ren to its 100 Most Influential People list. As the smartphone age arrived, Huawei began making not only hulking transmission equipment but also its own branded phones, some 600 million of which are now in circulation. Today, Huawei’s red logo and retail stores full of sleek furniture, pale wood, tablets, laptops, and smartphones seem to be as common on Chinese streets as Starbucks mermaids.

Even as Huawei has grown into a global player, its structure remained unusual among major Chinese companies. It is not publicly traded like Alibaba, Tencent, and Baidu. Unlike ZTE, the other major Chinese telecom manufacturer, it does not have the state as its biggest shareholder. Instead, the company is employee-owned, with Ren holding just over 1 percent of its ownership shares. Some 96,000 employees and retirees own the remainder of the company. To make matters more complicated, legally the employees’ shares are owned by a Chinese worker trade union, which is registered with the Shenzhen city government’s union.

Huawei’s financials are released every year and audited by the global accounting firm KPMG. This offers some insight into the company. But Huawei’s decisionmaking structure is shrouded in mystery. Huawei only began publicly naming its executives in 2011, and the company is run by a rotating set of chairs with Ren named founder, director, and CEO. This structural opacity has long concerned US officials; as one senior law enforcement official said to me, “It’s turtles all the way down.”

Ren’s relationship to China’s ruling Communist Party is similarly ambiguous. In 2018, China named Ren one of the country’s 100 “outstanding private entrepreneurs” who “firmly support the leadership of the Communist Party of China,” an honor bestowed as the country celebrated its 40th anniversary of economic reforms. (Huawei executives

might also point out that many US executives have military ties—and that their service is heralded.)

In 2007 the US confronted Huawei directly about its loyalties. That year, during a trip through New York, Ren met with FBI agents who were concerned about the company's business dealings in Iran. At the time, Ren maintained that Huawei abided by the international sanctions the US had levied against the Islamic Republic.

In the years that followed, the US government began to more publicly question Huawei's role in the evolving tech landscape and moved to prevent it from becoming an integral part of the internet's plumbing. In 2008 the US government blocked Huawei's planned \$2.2 billion deal with Bain Capital to buy the networking manufacturer 3Com, which made antihacking software for the US military. US officials feared that Huawei could subtly tweak the software to allow the Chinese military access to US computers. As one official told *The New York Times* at the time, a backdoor "is easier to hide than it is to find." Then, in 2010, the US blocked the company's efforts to acquire 3Leaf Systems, a server technology firm.

In 2012 the US House Intelligence Committee warned of Huawei's growing ubiquity in telecom networks: "The investigation concludes that the risks associated with Huawei's and ZTE's provision of equipment to US critical infrastructure could undermine core US national-security interests."

Just a few months later, Reuters published a story that heightened US suspicions of Huawei even further: Documents acquired by the news service appeared to show that a company called Skycom, which had supplied equipment to Iran's main mobile phone operator, was actually a shadow operation run by Huawei—in apparent violation of US trade sanctions. As Reuters discovered, Skycom had a familiar name on its board: Meng Wanzhou, aka Sabrina Meng, Huawei's CFO. At the time, the report seemed to come and go. But the Justice Department evidently took note. It started digging for a case against Huawei.

end of the Obama administration, that theory had been laid to waste. President Xi Jinping had consolidated power and become more baldly authoritarian at home. On the global stage, China had grown more assertive, not less. It had expanded its Belt and Road Initiative, intended to build big infrastructure projects around the world, and was projecting its military might in the South China Sea and parts of Africa.

In his final years in power, President Barack Obama had tried to rebalance the relationship between China and the US through the Trans-Pacific Partnership trade agreement. The 12-country pact was meant to act as a counterweight to China's rising economic and military power. At the same time, the US government began to loudly confront the rampant intellectual property theft that had accelerated China's growth.

As Donald Trump arrived in the White House, the country's national security agencies were already pivoting away from the global war on terror and toward a new era in which geopolitics was increasingly a contest between the US and two other superpowers, one fading and one rising. Russia, with its attack on the 2016 presidential election and its ongoing aggression in Ukraine, was certainly a handful, but it paled in comparison to the long-term threat posed by the rise of China, top officials believed. "Russia is a hurricane," as Rob Joyce, the White House cybersecurity coordinator at the time, is fond of saying. "China is climate change."

Trump inherited a foreign policy that was already mid-shift. But he quickly added to the air of indeterminacy with his signature mix of bluster, contradiction, and shoot-from-the-hip pronouncements—beginning with his immediate decision to back out of the TPP and its attempt to use a multilateral agreement to box in Chinese ambitions.

In early 2017, as the administration fumbled its way toward a China strategy, Brigadier General Rob Spalding joined the National Security Council as its senior director of strategic planning. A former B-2 stealth bomber pilot, Spalding's whole career

III

"CHINA IS CLIMATE CHANGE"

NO MATTER WHO WON THE 2016 PRESIDENTIAL ELECTION, the US relationship with China was bound to be overhauled. For years, a bipartisan consensus had held that as China's economy matured and became more integrated into the global system, the government would change its behavior. A stronger China, the theory went, would be a nicer China—one that acted more like a traditional Western democracy. But by the

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had been shaped by the study of China. As a junior officer on a prestigious Olmsted Fellowship, he had learned Chinese and attended Tongji University in Shanghai. Later, at the Pentagon, he had worked with the Chinese government to search for missing Korean War POWs. From 2014 to 2016, he headed the China division at the Joint Chiefs of Staff. When Trump was elected, Spalding had recently been named as the defense attaché at the US Embassy in Beijing. The National Security Council spot, though, was the job of a lifetime—the chance to help play a role in the advanced political art of grand strategy.

As with other China experts, Spalding's wariness of Beijing had grown over time. He'd spent a year on a fellowship with the Council on Foreign Relations in New York, where he met with countless business leaders concerned about China's intellectual property theft and economic espionage. He was also troubled by how entangled US military supply chains were with China. As retired Army brigadier general John Adams wrote in 2015, "Our almost complete dependence on China and other countries for telecommunications equipment presents potentially catastrophic battlefield vulnerabilities."

Trump's foreign policy ranks were in turmoil from the get-go—the first national security adviser, Michael Flynn, lasted barely three weeks. Spalding seemed a steady presence. Before Spalding left his post in Beijing, he had outlined a seven-page draft strategy to counter China's rise. In Washington he hosted regular forums for White House staff, inviting outside speakers to discuss China's approach to nontraditional warfare. "The Chinese Communist Party is not this benign organization," Spalding told me. "It's much more insidious."

Spalding was particularly worried about 5G, the backbone upon which the next generation of the digital economy will be built. Each advance in cell phone technology has brought a change in user habits. The second generation of cellular networks delivered texting; the third generation boosted speeds to a few megabits per second, allowing for the first smartphones. More recently, 4G networks have delivered streaming video to people waiting in line at the DMV. The promise of a 5G network seems almost mythic in comparison—a leap of perhaps a hundredfold over 4G speeds, with virtually no latency and the ability to connect an astonishing number of devices and sensors to the network. Evangelists today proclaim that 5G will usher in the true internet of things.

But the 5G network can't piggyback on the existing 4G infrastructure. The technology operates on millimeter-wave frequencies that drop off quickly with distance, thus requiring oodles of small, low-power wireless base stations that connect to the internet. At Huawei, Ren had possessed the foresight to start developing the fundamental technology early, and by 2017 it appeared his bet was paying off. As countries began

making long-term decisions about which manufacturers would build and install thousands of base stations, Huawei was at the top of the heap. The US, with no companies able to manufacture base stations, wasn't in the heap at all. Moreover, analysts estimated that Huawei was 18 months ahead of Western competitors like Ericsson and Nokia.

Huawei's lead in 5G infrastructure was especially vexing because China had recently enacted something called the National Intelligence Law. "All organizations and citizens," the law states, "shall support, cooperate with, and collaborate in national intelligence work." It seemed to require that companies like Huawei open their networks to Chinese intelligence.

Spalding began convening meetings at the National Security Council with engineers from manufacturers like Samsung, Nokia, and Ericsson to talk about what the US should do to counter Huawei. "It wasn't about 5G per se," Spalding says. "It was about data. It's about how we create the most secure internet for the American people."

Spalding came to the conclusion that the only way to ensure an uncompromised 5G system would be for the US to have a single, large network. He cooked up a PowerPoint presentation that called for an "Eisenhower National Highway System for the Information Age." The goal: to establish a "network that reflects our principles," from the rule of law to freedom of speech and religion, and to build it fast. "China has achieved a dominant position in the manufacture and operation of network infrastructure," the presentation read. "We are losing."

Spalding didn't get far. When word of his idea leaked to the news website Axios, US telecom carriers complained vociferously. While they didn't have the ability to build base stations themselves, they were building networks on top of those made by Nokia and other providers, and they didn't want a "nationalized" entity competing in their industry. The Trump administration promptly distanced itself from the idea. Spalding's time at the NSC was over.

Huawei executives had heard Donald Trump's anti-China rhetoric on the campaign trail. And, as at many companies, they contemplated what would happen if President Trump were to lash out at them in a tweet. "I think it'd be great," one executive said at a meeting in 2017. "No one knows our name right now."

The levity didn't last long. As it turned out, Spalding was hardly the only one inside the US government concerned about Huawei and Chinese telecom companies. The Justice Department and intelligence agencies were also homing in on the Chinese giant.

IV

SHUTTING HUAWEI OUT

HUAWEI'S ANNI HORRIBILES BEGAN IN EARLY JANUARY of 2018. Word leaked that AT&T was going to announce at that year's Consumer Electronics Show that it would start selling Huawei phones in the United States. US officials argued that AT&T shouldn't field the phones in the US; the deal was quashed.

That same month, President Trump, who had been steadily ratcheting up pressure on China to make a new trade deal with the US, announced tariffs against Chinese solar cells and washing machines. These were the first in a series of escalating tariffs that kept stock markets off kilter for months. "Trade wars are good, and easy to win," Trump tweeted.

A series of crackdowns on Huawei followed. In February top US intelligence officials testified in the Senate that Huawei's phones posed a security threat. In May the Pentagon banned the sale of Huawei and ZTE smartphones on US military bases. In July the intelligence chiefs of the "Five Eyes"—the Western intelligence alliance of the US, UK, Canada, Australia, and New Zealand—gathered in Nova Scotia for a semiregular private confab. Over a lobster dinner, the heads of agencies like MI6 and the CIA discussed how to box in China's telecom ambitions.

Just weeks after that dinner, President Trump signed the annual National Defense Authorization Act, which included a provision barring the US government from using certain products from Huawei, ZTE, and a handful of smaller Chinese firms as a "substantial or essential component of any system."

Australia followed shortly thereafter with a similar prohibition. Then New Zealand intervened to prevent a domestic company from using Huawei's equipment to build a 5G network. Most significantly for Huawei, one of its most prestigious customers, the British telecom BT, said that it would decommission part of the

Huawei 4G network and that Huawei's equipment would not be part of its 5G rollout.

Days after the New Zealand announcement, Ren's daughter boarded the plane for Canada.

Meng Wanzhou is one of two children from Ren's first marriage. She attended college in China and joined her father's startup in the mid 1990s, after a year working for the China Construction Bank. She'd risen through the finance side of Huawei to become its CFO and one of four deputy chairs. By the age of 46, she had assumed the role of Huawei's public ambassador. A tutor helped perfect her English grammar and pronunciation, and she traveled the world wooing banks and clients. The trip to Mexico was to be a routine journey for a polished global executive.

Meng may have suspected that she'd become the target of US prosecutors. In April 2017 the US Attorney's office made public that it was investigating Huawei's involvement with SkyCom and Iran and served Huawei with a grand jury subpoena. Meng, who had visited the US in 2014, 2015, and 2016, made no more trips to the country after that subpoena, according to the Justice Department.

Following her arrest in Vancouver, the US alleged in 2019 that Meng and Huawei had tried to circumvent sanctions against Iran. Huawei has long maintained that SkyCom was a completely independent company and, according to the indictment, Meng, a SkyCom director, had personally assured US banks that it complied with US sanctions. But the US said otherwise. The documents obtained by Reuters suggested that SkyCom's leadership was made up of Huawei executives, its shares were controlled by Huawei's own holding company, and the signatories on its bank accounts were Huawei employees. Reuters also reported that SkyCom employees seemed even to have Huawei email addresses and badges. According to US prosecutors, Huawei had used SkyCom for business that would otherwise have been prohibited under the US sanctions, citing more than \$100 million in SkyCom transactions that flowed through US banks.

The Justice Department wasn't done. It also brought criminal charges against Huawei related to a civil case in which T-Mobile claimed that Huawei had stolen technology for "Tappy," its phone testing robot. Though T-Mobile won \$4.8 million in damages in the civil case, Huawei pleaded not guilty to the criminal charges.

"THEY HAVE AWOKEN A DRAGON. THIS IS A BIG-BOY GAME."



v

THE ENTITY LIST

MENG'S ARREST STRUCK LIKE A THUNDERCLAP. BUT AT least at first, it seemed as if it might fit into a context of relatively cool-headed, established US strategy. Since the later years of the Obama administration, the Justice Department had been prosecuting alleged Chinese lawbreaking aggressively while the rest of the US government carried on with cordial diplomatic and trade relations with Beijing.

In 2014, in a first-of-its-kind case, the Justice Department indicted five Chinese hackers on charges of stealing intellectual property from US companies. The hackers were also members of the People's Liberation Army, but their employer was immaterial; theft was theft. The rule of law, the Obama administration argued at the time, was nonnegotiable. In the years since, economic espionage charges against Chinese companies and hackers became all but routine.

President Trump, however, almost immediately appeared to indicate that Meng's case might be handled differently, and that the independence of the judicial process was up for negotiation. Just days after her arrest, Trump suggested to Reuters in an Oval Office interview that he might be willing to intercede on Meng's behalf in exchange for better trade terms. "Whatever is good for this country, I will do—if I think it's good for what will be certainly the largest trade deal ever made," he said, "I would certainly intervene."

Trump's comments left both Justice officials and Huawei executives fuming. Huawei leaders, who told me that they'd long respected the sacred place of the rule of law in the US system and wanted China to model it, now wondered how sacred it really was.

China's retaliation for Meng's arrest, meanwhile, was swift and pointed: Two Canadians in China were taken into custody, and one, already in custody, was given a one-day retrial at which his previous prison sentence was hardened to the death penalty. (The Chinese government denies that these events were related to Meng's arrest.) US companies reconsidered sending their employees on trips to China. One executive from Koch Industries faced multiple days of interrogation, until the US State Department secured his departure.

The Trump administration pressed a broader case against Huawei outside the courtroom. From corporate boardrooms to foreign capitals, it argued that 5G was too important to cede to a foreign adversary, and despite its protestations of respectability, Huawei had a troubled history of skirting US law and helping some of the world's worst regimes.

These attacks left Huawei scrambling. It rushed to hire public relations talent—reporters approached by the company to join its PR shop said the company dangled salaries upward of \$200,000—and it retained the law firms Jones Day and Squire Patton Boggs. The company took out paid advertorials in *The New York Times* and other publications.

Privately and publicly, its executives complained that they were being held to a double standard. They pointed out that US telecom companies had cooperated with US intelligence agencies. US agencies had even pressured tech companies to weaken key technological standards, like encryption, for their own espionage purposes. "PRISM, PRISM, on the wall, who is the most trustworthy of them all?" Huawei's rotating chair, Guo Ping, asked the Mobile World Congress in February, referring to the codename of one of the National Security Agency's large-scale surveillance programs. "If you don't understand that question, you can go ask Edward Snowden."

Secretary of State Mike Pompeo spent much of the winter and spring warning Western allies to avoid Huawei's products. He told Germany that if it allowed Huawei to supply its 5G network, the US would consider curtailing its long-standing intelligence-sharing agreement with the key European ally. Similar warnings went out to Poland.

Then, in May, the US dropped an anvil on Huawei. US firms would be barred from doing business with the Chinese telecom altogether; its name had been added to what's known as the "entity list," a roster of international personae non gratae compiled by the Commerce Department. Usually the list is reserved for criminals, shady holding companies, and suspicious banks that fund things like terrorism or drug trafficking. No company as prominent as Huawei had ever landed there.

In a matter of hours, Huawei's very existence seemed uncertain. The company had stockpiled key components, some lasting three months, others maybe 12. But then what?

The ban, if implemented, would have crippling effects beyond Huawei. Of the Chinese company's \$70 billion procurement budget, \$11 billion is spent on parts made by some three dozen US companies, from cables and connectors purchased from Connecticut's Amphenol to memory chips from Ida-

ho's Micron Technology. Huawei's smartphones and telecom equipment run on parts and chips made by Qualcomm, Intel, and Broadcom. Industry analysts projected the Huawei ban could cost NeoPhotonics, a California manufacturer of optical devices, nearly half its business.

US companies rushed to implement worst-case scenarios: Google and ARM, a primary chip manufacturer, both announced they'd halt contracts with Huawei. Crisis meetings were convened both inside the suppliers and at trade groups like the Semiconductor Industry Association.

One executive for a US supplier said how surprised he and colleagues had been by the administration's seemingly ill-considered attack on Huawei and the shock waves it created. "If you're trying to wipe out China's leadership by using a bomb," the executive cautioned, "you're not looking at the collateral damage." (No US supplier contacted by WIRED would speak for the record, at "the risk of pissing off one side or the other," as one told me.)

Understanding now the gravity of the fight it faced, Huawei enlisted Michael Esposito, a Trump fundraiser and lobbyist, and paid him more than \$500,000 a month to lobby the White House and the Commerce Department.

In the following weeks, as suppliers raised their voices behind the scenes, the Commerce Department eased up. Huawei would remain on the entity list, but US companies could seek exemptions. Many have been able to keep selling parts to Huawei, but they're proceeding cautiously, unsure if those exceptions might be yanked in the future.

China, meanwhile, announced plans for its own "unreliable entities list." As the supplier executive told me, "We're stuck between two governments."

VI

THE VIEW FROM SHENZHEN

LAST SPRING, AS MENG SETTLED INTO THE 8,170-SQUARE-foot Vancouver mansion where she would serve house arrest during the long US extradition process, Huawei took out pleading full-page ads in American papers. One, which ran in *The Wall Street Journal*, invited the US media to visit the company. "Don't believe everything you hear," the ad's headline explained. "Come and see us."

I emailed the address included in the ad, which was how in June—just days after Huawei was hit with the entity list sanction—I found myself in Dongguan, an hour outside Shenzhen, with three other US journalists, in what is surely one of the most surreal landscapes globalization has produced.

(Although Huawei had offered to pay the way for journalists, WIRED paid for my trip.) We were traveling aboard an imported Swiss train through a 3.5-square-mile, \$1.5 billion R&D campus. Opened last year, the campus was conceived by a Japanese architecture firm that re-created 12 European cities, each with distinctive and unmistakable architecture. We went from Paris to Heidelberg to Bologna in a matter of minutes. ("I've been to that church in Germany before," I said to Huawei's US spokesperson at one point, pointing to one of the buildings that looked identical to one in Bavaria.)

A model of Hungary's Liberty Bridge rose in the background, and beyond it, high-rise towers that will one day house some of Huawei's 25,000 workers. As lunch approached, the company's largely young workforce flooded the streets, alleys, and paths as they headed to dining options that included Chinese food cafeterias, French cafés, and a KFC. The Dongguan campus is meant to inspire its workers to think creatively, but it's also sending another message: Huawei is a global company.

The day after exploring the surreal European mashup village, we visited the company's main headquarters in Shenzhen. At the gates to the Shenzhen campus, guards in Huawei uniforms with blue berets and white gloves snapped sharp salutes as vehicles entered. Inside, attendants in burnt umber flight-attendant-style uniforms escorted visitors through low-slung modern buildings.

Mr. Ren, as he is called, passed us in the lobby, his presence with a single aide causing barely a ripple among the employees. But our itinerary did not include a meeting with the founder. Instead, in an ornate meeting room, we sat with David Wang, the executive director of the board. Over two hours and three cups of coffee delivered discreetly by a steward, Wang spoke passionately about Huawei's troubles with the US government. "We've seen a lot of inconsistency in the US position," Wang said, through an interpreter. "We've seen allegations not based on logic or facts—or based in the rule of law."

Wang has worked at Huawei for 22 years. He said he had read hundreds of books on US history, business leadership, and politics, and he was clearly disillusioned by the new combative stance of the US government and the whiplash induced by Trump's various edicts. He argued that if the US had legitimate security concerns, it should name them. The health and security of the internet should be important to everyone and ought to be discussed apart from the superpower machinations of the US and China. If there were ways for Huawei to make the internet safer, it would do so. "Politics should be separated from cybersecurity," Wang said. "Let cybersecurity be cybersecurity and politics be politics."

"WE'VE HEARD FROM THE WHITE HOUSE, 'YOU SHOULDN'T DO BUSINESS WITH CHINA.' THERE'S NO ONE COMPANY VERSUS ANOTHER—IT'S JUST 'YOU SHOULDN'T BE IN BUSINESS WITH CHINA.' "



I asked Huawei employees about the national security criticism—posed by Pompeo and others—that its 5G systems might be used to siphon off data and share it with the Chinese government. They said they didn't know what he was talking about. “The US hasn't shown any vulnerability to us about Huawei products,” said Jeff Nan, a lead engineer in Huawei's cybersecurity lab. “They haven't given any evidence on our products. The US hasn't given us a chance.”

In protesting the allegations against his company, Ren himself said in January 2019 that he would close the company rather than comply with an order from the Chinese government to compromise customer data or privacy. Privately, US officials concede there's no evidence Huawei's products have ever been compromised by Chinese intelligence; there's no smoking gun that they will even wink or nod at.

In one way, at least, Huawei's technology is among the most scrutinized in the world. In 2010, in partnership with UK intelligence, the company established the Huawei Cyber Security Evaluation Centre, where its software and hardware are continuously evaluated by engineers from British intelligence. A 2019 report from that organization argued that Huawei did continue to pose a “serious” security risk—not because it was sharing data but because its code is so buggy. “We know we've found issues. That's the point of testing,” Joe Kelly, the Huawei spokesperson, says, adding that it's not clear any other telecommunications company would fare better. “Who knows? We're the only vendor that's given over our source code.”

Buggy software certainly leaves critical systems vulnerable to exploitation. The concern voiced by US officials in private conversation is, as they put it, “not backdoors but bug doors.” China would never be dumb enough to force Huawei or other tech companies to insert something that was as easily identifiable as a backdoor. Instead, buggy software offers a low-profile, more pernicious opportunity for spying. The UK intelligence community also has raised repeated concerns about the fact that the Huawei code it tests in the cybersecurity lab is often later modified, tweaked, or customized for use by specific customers out in the field well after the gauntlet of intelligence analysts and engineers in the lab.

Nor does the fact that Huawei hasn't been compromised to date mean it couldn't be compromised in the future, US offi-

cials say. Spalding's concern stands: 5G is a foundational technology, and the temptation to use it for nefarious purposes is simply too high. Some officials, in an almost Kafkaesque twist of logic, point to the fact that Huawei hasn't been compromised as evidence of China's ulterior motives: You wouldn't expect China to lean on Huawei until Huawei is positioned inside 5G networks in the US. After all, the Greeks didn't leap out of the horse in Troy until it was inside the city gates. As one US official told me, “This is how China dominates. You move silently and quietly until you dominate—then you can launch an attack.”

Christopher Krebs, the Trump administration's top cyber official at the Department of Homeland Security, says the US government is particularly concerned about not just the operations of the technology but who ultimately can exert control over a network. In the US government's view, Huawei and the Chinese government are inseparable because of China's 2017 national security law.

During my visit to Shenzhen, I asked Wang about the company's relationship to the Communist Party. “I think this is an interesting topic, because Huawei has always been a wholly employee-owned, private company,” he said. “Throughout most of our history, there have been suspicions about our identity.” He continued: “Due to the US campaign against Huawei, we have finally figured out our identity: We are a global company based in China.” Is he a member of the Communist Party, I asked? No, he replied, but his wife is.

Communist Party connected or not, Huawei seems to have skirted US laws to do business with Western adversaries. Besides the allegations about evading Iran sanctions, Huawei has also been reported to have helped North Korea build out its cellular network and has been warmly embraced in places like Russia and Venezuela. Documents obtained by *The Wall Street Journal* appear to show that Huawei employees helped governments in Uganda and Zambia spy on political dissidents. Similar allegations have arisen that Huawei employees helped the Algerian government eavesdrop on its political opponents. (Huawei denies the African allegations and says that it does not do business in North Korea.)

Impossible to dodge, though, have been the allegations that, in its home country, Huawei is helping

the Chinese government suppress its Uighur population. The Muslim minority are being surveilled, and many are held in concentration camps. John Suffolk, who is Huawei's top security official and a former chief information officer for the UK government, was chastised at a British parliamentary hearing last year for selling equipment to monitor Uighurs in China's northwest region. "It's the government's job to set the law, whether in the East or West," Suffolk said. "It is our job as a supplier to work within that law."

"You're a moral vacuum," a member of Parliament spat back.

Huawei's executives—including its top American security official, Andy Purdy, who was formerly with the Department of Homeland Security—say they are committed to demonstrating that Huawei is worthy of trust. Huawei says it would happily construct a joint testing lab in the US, akin to the one in the UK, but US officials have never responded to offers. US officials, for their part, ask why NSA engineers should tear apart Huawei's code and suggest to a Chinese company how to build more secure systems that would meet the standards of the US market. That would only improve China's ability to field technology to compete against Western companies.

That stumbling block lays bare the real struggle. The fight with Huawei is less about bugs or backdoors than the three technologies that will drive the future of innovation: 5G, advanced computer chips, and artificial intelligence. And, most important, which country will dominate in those technologies.

"The security issue is normally technical, but currently they are using security as an excuse to try to block us," says Zhou, the longtime Huawei employee. "It's a pure political excuse now."

VII

TRUMP US. CHINA

US OFFICIALS HAVE WATCHED WARILY AS CHINA HAS exercised its influence on the world stage, in ways big and small. In a private conversation this summer, a senior US national security leader asked me if I'd noticed anything in the latest trailer for the new *Top Gun* sequel, backed by China's Tencent. He had: The trailer shows Tom Cruise's character wearing a leather bomber jacket that had apparently undergone a few alterations since the original film. Gone were the patches of the Taiwanese and Japanese flags. More recently, National Basketball Association executives gave groveling, abject apologies after the general manager of the Houston Rockets tweeted support for pro-democracy protesters in Hong Kong. It was a sign of the league's fear of angering a fast-growing fan base—and business opportunity—in mainland China.

Meanwhile, as one US supplier told me, "We've heard from members of the White House, 'You shouldn't do business with China.' There's no reason for one company versus another—it's just 'You shouldn't be in business with China.'"

China and the US are forcing consumers, companies, and whole countries to decide how they see the world. Will it be the Chinese way or the Western way?

Over the past year, Trump officials have been concerned to discover that not all traditional allies will automatically side with the US. Despite bombast and threats, Mike Pompeo's lobbying efforts in Europe against Huawei met with only mixed success. Germany forged ahead with incorporating Huawei into its 5G system. "Our allies aren't standing with us in the way that we thought," one senior Trump administration official says.

In some ways, the companies that face such questions say it's precisely because of the Trump administration's hard-hitting strategy that its appeals are falling on deaf ears. As the supplier executive told me, "Huawei has become a scapegoat for our broader issues. Is it any wonder some of our allies aren't going along with our bazooka strategy?"

Standing alongside hard-hat-wearing telecom workers in the White House last spring, President Trump trumpeted his commitment to "winning" the 5G race. As he said, "We cannot allow any other country to outcompete the United States in this powerful industry of the future. We are leading by so much in so many different industries of that type, and we just can't let that happen. The race to 5G is a race America must win, and it's a race, frankly, that our great companies are now involved in."

Yet by almost any measure, the US seems set for defeat. South Korea deployed a 5G network last year, claiming to have signed up more than a million customers in just 10 weeks. (According to South Korea's government, Huawei's hardware represents about 10 percent of the network, with the remainder from Samsung and other firms.) China surely will end up with more 5G users than any other country.

In recent months, the administration has begun to tap special government programs to encourage further 5G growth and innovation, but such efforts appear to be both late and underwhelming. Elsa Kania, a senior fellow at the Center for a New American Security and an astute observer of China's military technology, concluded in a report this fall that "the US government has yet to commit to any funding or national initiatives in 5G that are close to comparable in scope and scale to those of China, which is dedicating hundreds of billions to 5G development and deployment."

This shortfall has sparked broader concerns about future US technological development. Verizon is leading the push to set up 5G networks, with pilot projects in several cities using Ericsson-made base stations. But the US is a very, very long way from ubiquitous 5G. “This is the first example of what’s going to happen again and again,” Senator Mitt Romney said in an October hearing on 5G and supply chain security, warning that the US is now ill-equipped to face China as a technological rival. “We as a nation don’t have a strategy. We respond on an ad hoc basis.”

That lack of a larger, coordinated strategy has frustrated US tech companies too. “We’re not increasing our own competitiveness,” one senior tech executive told me. “We have a national AI strategy that hasn’t been funded. We’re horrible at allowing very smart people to come here and stay here. We have a shortage of STEM talent. Those things really need attention.”

On the other side of the Pacific, meanwhile, the irony is that the Trump administration’s crusade against Huawei might actually accelerate the Chinese tech dominance it professes to want to thwart. In August, Ren announced a plan to develop an “invincible iron army” of friendly suppliers over the next three to five years—a plan B if the company permanently loses its US partners. It’s also taken the first steps toward developing its own operating system, which would allow Huawei to break from Google’s Android platform and compete with Apple’s iOS. It will be a “painful long march,” Ren wrote in an internal email, a possible nod to the Communist Party’s road to victory.

“They have awoken a dragon. This is a big-boy game,” one Huawei executive told me over drinks in Shenzhen. “We will develop chip sets that we had no intention of building. China will develop a chip industry faster than anyone thinks it can.”

US suppliers say they’re deeply nervous watching Huawei’s moves and angry about how counterproductive the Trump administration’s push is turning out to be. One supplier pointed out that Huawei’s investment in chip development could put US jobs at risk. Indeed, it’s not hard to imagine a world where the current US strategy to isolate Huawei succeeds. It would

be shut out of the US, Canada, and much of western Europe, but it could also sweep across the Southern Hemisphere and Asia, linking up billions of users in developing countries and splitting the world into two internets. That’s not necessarily the future Huawei wants, but it may be the future it’s forced into.

Huawei executives say they don’t want the geopolitical standoff to last forever, and they’re hopeful that the internet will remain a united, global enterprise. “The world will return to its normal order,” Wang told me confidently in Shenzhen. “The management of Huawei still believes that globalization is the trend of the times.”

To that end, President Trump’s larger trade war with China may be easing. In late December, he announced a tentative deal on tariffs. But no one knows when the next tweet may drop.

Sabrina Meng, meanwhile, is settling into what could be a long-term detention in Canada. She paid a C\$10 million bail and obeys a curfew. At a September court appearance, while earpiece-wearing guards cleared her path, Meng followed behind, her Jimmy Choo stilettos tapping along the courthouse hallways, legs bare except for a black ankle monitor. On December 1, she released a letter online for her supporters, thanking them for their unending cheer. “Time seems to pass slowly,” she wrote. “It is so slow that I have enough time to read a book from cover to cover. I can take the time to discuss minutiae with my colleagues or to carefully complete an oil painting.”

In a sign of just how long the fight could last, Huawei told me that Meng plans to pursue a PhD while she’s under house arrest. During a recent interview with CNN, Ren suggested he’s patient. “The experience of hardship and suffering is good for Meng and her growth,” he said, and described how he sends her funny stories he finds online. Whenever Meng steps outside her house, there are paparazzi. She is no longer a nearly anonymous businesswoman. Nor, for that matter, is her employer. No one needs to explain how to pronounce its name. As Zhou says, “It’s very different now. We’re very famous now, thanks to Mr. Trump.”

NOISE

28.02

SIGNAL

THE SECRET HISTORY

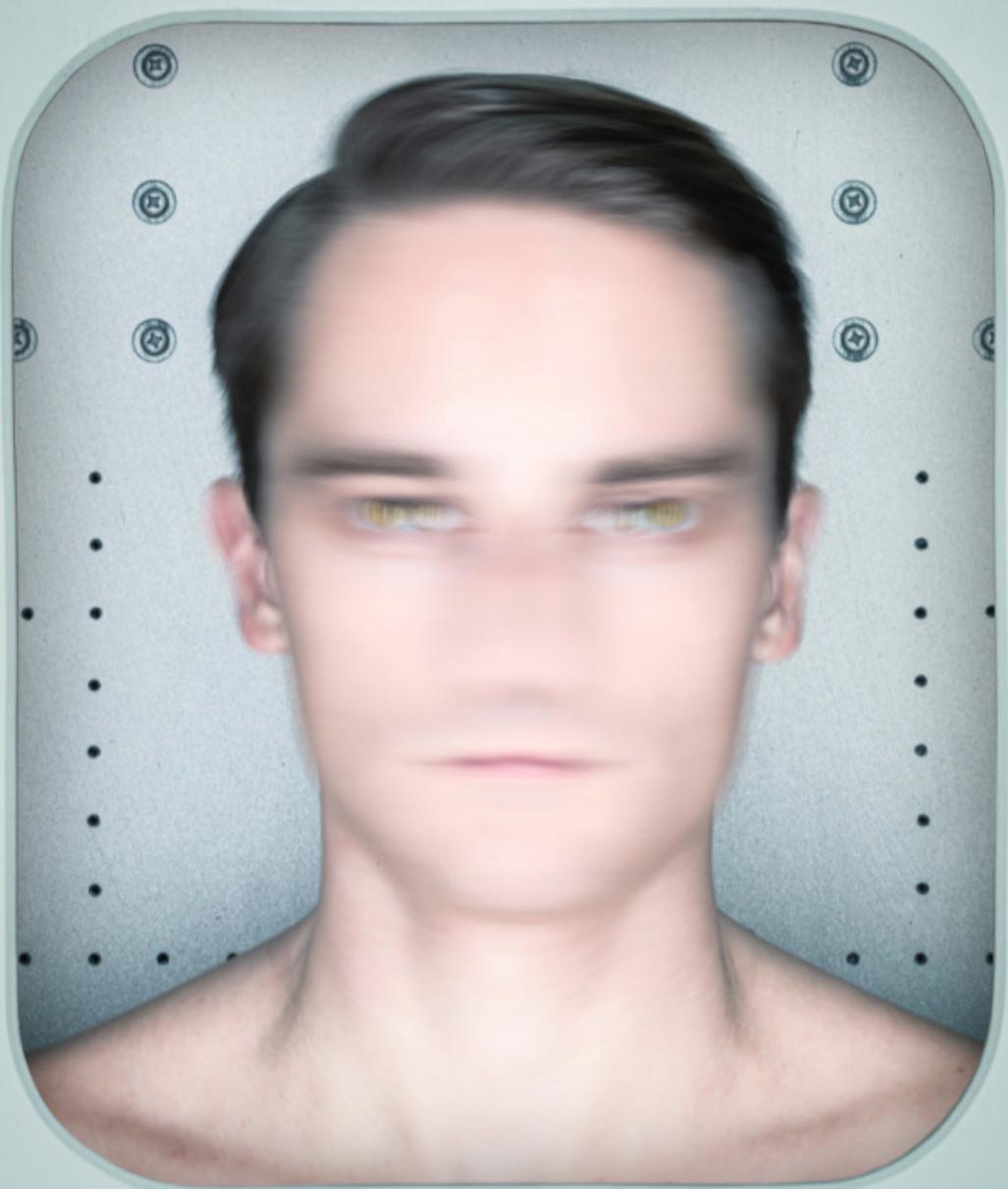
BY
SHAUN RAVIV

PHOTOGRAPHS BY
DAN WINTERS

OF FACIAL RECOGNITION

SIXTY YEARS AGO, A SHARECROPPER'S SON INVENTED
A TECHNOLOGY TO IDENTIFY FACES.
THEN THE RECORD OF HIS ROLE ALL BUT VANISHED.
WHO WAS WOODY BLEDSOE,
AND WHO WAS HE WORKING FOR?

3





this area—the earliest research on facial-recognition technology—had attracted the interest of the US government’s most secretive agencies. Woody’s chief funders, in fact, seem to have been front companies for the CIA. Had Lance just incinerated the evidence of Washington’s first efforts to identify individual people on a mass, automated scale?

Today, facial recognition has become a security feature of choice for phones, laptops, passports, and payment apps. It promises to revolutionize the business of targeted advertising and speed the diagnosis of certain illnesses. It makes tagging friends on Instagram a breeze. Yet it is also, increasingly, a tool of state oppression and corporate surveillance. In China, the government uses facial recognition to identify and track members of the Uighur ethnic minority, hundreds of thousands of whom have been interned in “reeducation camps.” In the US, according to *The Washington Post*, Immigration and Customs Enforcement and the FBI have deployed the technology as a digital dragnet, searching for suspects among millions of faces in state driver’s license databases, sometimes without first seeking a court order. Last year, an investigation by the *Financial Times* revealed that researchers at Microsoft and Stanford University had amassed, and then publicly shared, huge data sets of facial imagery without subjects’ knowledge or consent. (Stanford’s was called Brainwash, after the defunct café in which the footage was captured.) Both data sets were taken down, but not before researchers at tech startups and one of China’s military academies had a chance to mine them.

Woody’s facial-recognition research in the 1960s prefigured all these technological breakthroughs and their queasy ethical implications. And yet his early, foundational work on the subject is almost entirely unknown. Much of it was never made public.

Fortunately, whatever Woody’s intentions may have been that day in 1995, the bulk of his research and correspondence appears to have survived the blaze in his garage. Thousands of pages of his papers—39 boxes’ worth—reside at the Briscoe Center for American History at the University of Texas. Those boxes contain, among other things, dozens of photographs of people’s faces, some of them marked up with strange mathematical notations—as if their human subjects were afflicted with some kind of geometrical skin disease. In those portraits, you can discern the origin story of a technology that would only grow more fraught, more powerful, and more ubiquitous in the decades to come.

Woody Bledsoe was sitting in a wheelchair in his open garage, waiting. To anyone who had seen him even a few months earlier—anyone accustomed to greeting him on Sundays at the local Mormon church, or to spotting him around town on his jogs—the 74-year-old would have been all but unrecognizable. The healthy round cheeks he had maintained for much of his life were sunken. The degenerative disease ALS had taken away his ability to speak and walk, leaving him barely able to scratch out short messages on a portable whiteboard. But Woody’s mind was still sharp. When his son Lance arrived at the house in Austin, Texas, that morning in early 1995, Woody immediately began to issue instructions in dry-erase ink.

He told Lance to fetch a trash can from the backyard—one of the old metal kinds that Oscar the Grouch lives in. Lance grabbed one and set it down near his father. Then Woody sent him into the house for matches and lighter fluid. When Lance got back, Woody motioned to two large file cabinets inside the garage.

They’d been around ever since Lance could remember. Now in his late thirties, Lance was pretty sure they hadn’t been opened since he was a kid. And he knew they weren’t regular file cabinets. They were the same kind he’d seen when he worked on sonar equipment for US nuclear submarines—fireproof and very heavy, with a strong combination lock on each drawer. His father slowly began writing numbers on the whiteboard, and to Lance’s astonishment, the combination worked. “As I opened the first drawer,” he tells me almost 25 years later, “I felt like Indiana Jones.”

A thick stack of old, rotting documents lay inside. Lance began removing them and placing them in his father’s hands. Woody looked over the piles of paper two inches at a time, then had his son toss them into the fire he’d started in the burn barrel. Some, Lance noticed, were marked “Classified” or “Eyes only.” The flames kept building until both cabinets were empty. Woody insisted on sitting in the garage until all that remained was ash.

Lance could only guess at what he’d helped to destroy. For nearly three decades, his father had been a professor at the University of Texas at Austin, working to advance the fields of automated reasoning and artificial intelligence. Lance had always known him to be a wide-eyed scientific optimist, the sort of man who, as far back as the late 1950s, dreamed of building a computer endowed with all the capabilities of a human—a machine that could prove complex mathematical theorems, engage in conversation, and play a decent game of Ping-Pong.

But early in his career, Woody had been consumed with an attempt to give machines one particular, relatively unsung, but dangerously powerful human capacity: the ability to recognize faces. Lance knew that his father’s work in

Woodrow

Wilson Bledsoe—always

Woody to everyone he knew—could not remember a time when he did not have to work. He was born in 1921 in the town of Maysville, Oklahoma, and spent much of his childhood helping his father, a sharecropper, keep the family afloat. There were 12 Bledsoe kids in all. Woody, the 10th, spent long days weeding corn, gathering wood, picking cotton, and feeding chickens. His mother, a former schoolteacher, recognized his intelligence early on. In an unpublished essay from 1976, Woody described her as an encouraging presence—even if her encouragement sometimes came from the business end of a peach-tree switch.

When Woody was 12 his father died, plunging the family even deeper into poverty in the middle of the Great Depression. Woody took on work at a chicken ranch while he finished high school. Then he moved to the city of Norman and began attending classes at the University of Oklahoma, only to quit after three months to join the Army on the eve of World War II.

Showing an aptitude for math, Woody was put in charge of a payroll office at Fort Leonard Wood in Missouri, where wave after wave of US soldiers were being trained for combat. (“Our group handled all black troops,” wrote the Oklahoman, “which was a new experience for me.”) Then on June 7, 1944, the day after D-Day, Woody was finally deployed to Europe, where he earned a Bronze Star for devising a way to launch large naval vessels—built for beach landings—into the Rhine.

Having landed in the European theater just as Allied troops were accelerating to victory, Woody seemed to have an unusually positive experience of war. “These were exciting times,” he wrote. “Each day is equivalent to a month of ordinary living. I can see why men get enamored with war. As long as you are winning and don’t sustain many casualties, everything is fine.” He spent the following summer in liberated Paris, his mind and his experience of the world expanding wildly in an atmosphere of sometimes euphoric patriotism. “The most sensational news I ever heard was that we had exploded an atomic bomb,” Woody wrote. “We were glad that such a weapon was in the hands of Americans and not our enemies.”

Woody couldn’t wait to get back to school once the war ended. He majored in mathematics at the University of Utah and finished in two and a half years, then went off to Berkeley for his PhD. After grad school, he got a job at the

Sandia Corporation in New Mexico, working on government-funded nuclear weapons research alongside such luminaries as Stanislaw Ulam, one of the inventors of the hydrogen bomb. In 1956 Woody flew to the Marshall Islands to observe weapons tests over Enewetak Atoll, parts of which to this day suffer worse radioactive contamination than Chernobyl or Fukushima. “It was satisfying to me to be helping my own dear country remain the strongest in the world,” he wrote.

Sandia also offered Woody his first steps into the world of computing, which would consume him for the rest of his career. At first, his efforts at writing code tied directly to the grim calculations of nuclear weapons research. One early effort—“Program for Computing Probabilities of Fallout From a Large-Scale

Thermonuclear Attack”—took into account explosive yield, burst points, time of detonation, mean wind velocity, and the like to predict where the fallout would land in the case of an attack.

But as his romance with computing grew, Woody took an interest in automated pattern recognition, especially machine reading—the process of teaching a computer to recognize unlabeled images of written characters. He teamed up with his friend and colleague Iben

Browning, a polymath inventor, aeronautical engineer, and biophysicist, and together they created what would become known as the *n*-tuple method. They started by projecting a printed character—the letter *Q*, say—onto a rectangular grid of cells, resembling a sheet of graph paper. Then each cell was assigned a binary number according to whether it contained part of the character: Empty got a 0, populated got a 1. Then the cells were randomly grouped into ordered pairs, like sets of coordinates. (The groupings could, in theory, include any number of cells, hence the name *n*-tuple.) With a few further mathematical manipulations, the computer was able to assign the character’s grid a unique score. When the computer encountered a new character, it simply compared that character’s grid with others in its database until it found the closest match.

The beauty of the *n*-tuple method was that it could recognize many variants of the same character: Most *Q*s tended to score pretty close to other *Q*s. Better yet, the process worked with any pattern, not just text. According to an essay coauthored by Robert S. Boyer, a mathematician and longtime friend of Woody’s, the *n*-tuple method helped define the field of pattern recognition; it was among the early set of efforts to ask, “How can we make a machine do something like what people do?”

Around the time when he was devising the *n*-tuple method, Woody had his first daydream about building the machine that he called a “computer person.” Years later, he would recall the “wild excitement” he felt as he conjured up a list of skills for the artificial consciousness:

I wanted it to read printed characters on a page and handwritten script as well. I could see it, or a part of it, in a small camera that would fit on my glasses, with an attached earplug that would whisper into my ear the names of my friends and acquaintances as I met them on the street ... For you see, my computer friend had the ability to recognize faces.

In 1960,

Woody struck out with Browning and a third Sandia colleague to found a company of their own. Panoramic Research Incorporated was based, at first, in a small office in Palo Alto, California, in what was not yet known as Silicon Valley. At the time, most of the world’s computers—massive machines that stored

48 23a

5

1965



1945

data on punch cards or magnetic tape—resided in large corporate offices and government labs. Panoramic couldn't afford one of its own, so it leased computing time from its neighbors, often late in the evenings, when it was cheaper.

Panoramic's business, as Woody later described it to a colleague, was "trying out ideas which we hoped would 'move the world.'" According to Nels Winkless, a writer and consultant who collaborated on several Panoramic projects and later became a founding editor of *Personal Computing* magazine, "Their function was literally to do what other people find just too silly."

The company attracted an odd and eclectic mix of researchers—many of whom, like Woody, had grown up with nothing during the Great Depression and now wanted to explore everything. Their inclinations ranged from brilliant to feral. Browning, who came from a family of poor farmers and had spent two years of his youth eating almost nothing but cabbage, was a perpetual tinkerer. At one point he worked with another Panoramic researcher, Larry Bellinger, to develop the concept for a canine-powered truck called the Dog-Mobile. They also built something called the Hear-a-Lite, a pen-shaped device for blind people that translated light levels into sound.

Bellinger, who had worked as a wing-walker as a teenager (he kept the pastime secret from his mother by playing off his bruises from bad parachute landings as bicycle injuries), had also helped design the Bell X-1, the sound-barrier-breaking rocket plane made famous in Tom Wolfe's *The Right Stuff*. Later he created the Mowbot, a self-propelled lawnmower "for cutting grass in a completely random and unattended manner." (Johnny Carson featured the device on *The Tonight Show*.)

Then there was Helen Chan Wolf, a pioneer in robot programming who started at Panoramic a couple of years out of college. She would go on to help program Shakey the Robot, described by the Institute of Electrical and Electronics Engineers as "the world's first robot to embody artificial intelligence"; she has been called, by one former colleague, "the Lady Ada Lovelace of robotics." In the early 1960s, when Wolf's coding efforts could involve stacks of punch cards a foot and a half high, she was awed by the range of ideas her Panoramic colleagues threw at the wall. At one point, she says, Woody decided that he "wanted to unravel DNA, and he figured out that it would take 30 or 37 years to do it on the

computers that we had at the time. I said, 'Well, I guess we won't do that.'"

Perhaps not surprisingly, Panoramic struggled to find adequate commercial funding. Woody did his best to pitch his character-recognition technology to business clients, including the Equitable Life Assurance Society and *McCall's* magazine, but never landed a contract. By 1963, Woody was all but certain the company would fold.

But throughout its existence, Panoramic had at least one seemingly reliable patron that helped keep it afloat: the Central Intelligence Agency. If any direct mentions of the CIA ever existed in Woody's papers, they likely ended up in ashes in his driveway; but fragments of evidence that survived in Woody's archives strongly suggest that, for years, Panoramic did business with CIA front companies. Winkless, who was friendly with the entire Panoramic staff—and was a lifelong friend of Browning—says the company was likely formed, at least in part, with agency funding in mind. "Nobody ever told me in so many words," he recalls, "but that was the case."

According to records obtained by the Black Vault, a website that specializes in esoteric Freedom of Information Act requests, Panoramic was among 80 organizations that worked on Project MK-Ultra, the CIA's infamous "mind control" program, best known for the psychological tortures it inflicted on frequently unwilling human subjects. Through a front called the Medical Sciences Research Foundation, Panoramic appears to have been assigned to subprojects 93 and 94, on the study of bacterial and fungal toxins and "the remote directional control of activities of selected species of animals." Research by David H. Price, an anthropologist at Saint Martin's University, shows that Woody and his colleagues also received money from the Society for the Investigation of Human Ecology, a CIA front that provided grants to scientists whose work might improve the agency's interrogation techniques or act as camouflage for that work. (The CIA would neither confirm nor deny any knowledge of, or connection to, Woody or Panoramic.)

But it was another front company, called the King-Hurley Research Group, that bankrolled Woody's most notable research at Panoramic. According to a series of lawsuits filed in the 1970s, King-Hurley was a shell company that the CIA used to purchase planes and helicopters for the agency's secret Air Force, known as Air America. For a time King-Hurley also funded psychopharmacological research at Stanford. But in early 1963, it was the recipient of a different sort of pitch from one Woody Bledsoe: He proposed to conduct "a study to determine the feasibility of a simplified facial recognition machine." Building on his and Browning's work with the *n*-tuple method, he intended to teach a computer to recognize 10 faces. That is, he wanted to give the computer a database of 10 photos of different people and see if he could get it to recognize new photos of each of them. "Soon one would hope to extend the number of persons to thousands," Woody wrote. Within a month, King-Hurley had given him the go-ahead.

Ten faces

may now seem like a pretty pipsqueak goal, but in 1963 it was breathtakingly ambitious. The leap from recognizing written characters to recognizing faces was a giant one. To begin with, there was no standard method for digitizing photos and no existing database of digital images to draw from. Today's researchers can train their algorithms on millions of freely available selfies, but Panoramic would have to build its database from scratch, photo by photo.

And there was a bigger problem: Three-dimensional faces on living human beings, unlike two-dimensional letters on a page, are

AN IMAGE OF WOODY BLEDSOE FROM A 1965 STUDY. THE COMPUTER FAILED TO RECOGNIZE THAT TWO PHOTOS OF HIM, FROM 1945 AND 1965, SHOWED THE SAME PERSON.

not static. Images of the same person can vary in head rotation, lighting intensity, and angle; people age and hairstyles change; someone who looks carefree in one photo might appear anxious in the next. Like finding the common denominator in an outrageously complex set of fractions, the team would need to somehow correct for all this variability and normalize the images they were comparing. And it was hardly a sure bet that the computers at their disposal were up to the task. One of their main machines was a CDC 1604 with 192 KB of RAM—about 21,000 times less working memory than a basic modern smartphone.

Fully aware of these challenges from the beginning, Woody adopted a divide-and-conquer approach, breaking the research into pieces and assigning them to different Panoramic researchers. One young researcher got to work on the digitization problem: He snapped black-and-white photos of the project's human subjects on 16-mm film stock. Then he used a scanning device, developed by Browning, to convert each picture into tens of thousands of data points, each one representing a light intensity value—ranging from 0 (totally dark) to 3 (totally light)—at a specific location in the image. That was far too many data points for the computer to handle all at once, though, so the young researcher wrote a program called NUBLOB, which chopped the image into randomly sized swatches and computed an *n*-tuple-like score for each one.

Meanwhile, Woody, Helen Chan Wolf, and a student began studying how to account for head tilt. First they drew a series of numbered small crosses on the skin of the left side of a subject's face, from the peak of his forehead down to his chin. Then they snapped two portraits, one in which the subject was facing front and another in which he was turned 45 degrees. By analyzing where all the tiny crosses landed in these two images, they could then extrapolate what the same face would look like when rotated by 15 or 30 degrees. In the end, they could feed a black-and-white image of a marked-up face into the computer, and out would pop an automatically rotated portrait that was creepy, pointillistic, and remarkably accurate.

These solutions were ingenious but insufficient. Thirteen months after work began, the Panoramic team had not taught a computer to recognize a single human face, much less 10 of them. The triple threat of hair growth, facial expressions, and aging presented a “tremendous source of variability,” Woody wrote in a March 1964 progress report to King-Hurley. The task, he said, was “beyond the state of the art of the present pattern recognition and computer technology at this time.” But he recommended that more studies be funded to attempt “a completely new approach” toward tackling facial recognition.

Over the following year, Woody came to believe that the most promising path to automated facial recognition was one that reduced a face to a set of relationships between its major landmarks: eyes, ears, nose, eyebrows, lips. The system that he imagined was similar to one that Alphonse Bertillon, the French criminologist who invented the modern mug shot, had pioneered in 1879. Bertillon described people on the basis of 11 physical measurements, including the length of the left foot and the length from the elbow to the end of the middle finger. The idea was that, if you took enough measurements, every person was unique. Although the system was labor-intensive, it worked: In 1897, years before fingerprinting became widespread, French gendarmes used it to identify the serial killer Joseph Vacher.

Throughout 1965, Panoramic attempted to create a fully automated Bertillon system for the face. The team tried to devise a program that could locate noses, lips, and the like by parsing patterns of lightness and darkness in a photograph, but the effort was mostly a flop.

So Woody and Wolf began exploring what they called a “man-machine” approach to facial recognition—a method that would incorporate a bit of human assis-

tance into the equation. (A recently declassified history of the CIA's Office of Research and Development mentions just such a project in 1965; that same year, Woody sent a letter on facial recognition to John W. Kuipers, the division's chief of analysis.) Panoramic conscripted Woody's teenage son Gregory and one of his friends to go through a pile of photographs—122 in all, representing about 50 people—and take 22 measurements of each face, including the length of the ear from top to bottom and the width of the mouth from corner to corner. Then Wolf wrote a program to process the numbers.

At the end of the experiment, the computer was able to match every set of measurements with the correct photograph. The results were modest but indeniable: Wolf and Woody had proved that the Bertillon system was theoretically workable.

Their next move, near the end of 1965, was to stage a larger-scale version of much the same experiment—this time using a recently invented piece of technology to make the “man” in their man-machine system far more efficient. With King-Hurley's money, they used something called a RAND tablet, an \$18,000 device that looked something like a flatbed image scanner but worked something like an iPad. Using a stylus, a researcher could draw on the tablet and produce a relatively high-resolution computer-readable image.

Woody and his colleagues asked some undergraduates to cycle through a new batch of photographs, laying each one on the RAND tablet and pinpointing key features with the stylus. The process, though still arduous, was much faster than before: All told, the students managed to input data for some 2,000 images, including at least two of each face, at a rate of about 40 an hour.

Even with this larger sample size, though, Woody's team struggled to overcome all the usual obstacles. The computer still had trouble with smiles, for instance, which “distort the face and drastically change inter-facial measurements.” Aging remained a problem too, as Woody's own face proved. When asked to cross-match a photo of Woody from 1945 with one from 1965, the computer was flummoxed. It saw little resemblance between the younger man, with his toothy smile and dark widow's peak, and the older one, with his grim expression and thinning hair. It was as if the decades had created a different person.

And in a sense, they had. By this point, Woody had grown tired of hustling for new contracts

for Panoramic and finding himself “in the ridiculous position of either having too many jobs or not enough.” He was constantly pitching new ideas to his funders, some treading into territory that would now be considered ethically dubious. In March 1965—some 50 years before China would begin using facial pattern-matching to identify ethnic Uighurs in Xinjiang Province—Woody had proposed to the Defense Department Advanced Research Projects Agency, then known as Arpa, that it should support Panoramic to study the feasibility of using facial characteristics to determine a person’s racial background. “There exists a very large number of anthropological measurements which have been made on people throughout the world from a variety of racial and environmental backgrounds,” he wrote. “This extensive and valuable store of data, collected over the years at considerable expense and effort, has not been properly exploited.” It is unclear whether Arpa agreed to fund the project.

What’s clear is that Woody was investing thousands of dollars of his own money in Panoramic with no guarantee of getting it back. Meanwhile, friends of his at the University of Texas at Austin had been urging him to come work there, dangling the promise of a steady salary. Woody left Panoramic in January 1966. The firm appears to have folded soon after.

With daydreams of building his computer person still playing in his head, Woody moved his family to Austin to dedicate himself to the study and teaching of automated reasoning. But his work on facial recognition wasn’t over; its culmination was just around the corner.

In 1967, more than a year after his move to Austin, Woody took on one last assignment that involved recognizing patterns in the human face. The purpose of the experiment was to help law enforcement agencies quickly sift through databases of mug shots and portraits, looking for matches.

As before, funding for the project appears to have come from the US government. A 1967 document declassified by the CIA in 2005 mentions an “external contract” for a facial-recognition system that would reduce search time by a hundredfold. This time, records suggest, the money came through an individual acting as an intermediary; in an email, the apparent intermediary declined to comment.

Woody’s main collaborator on the proj-

THE MACHINE. THEY CONCLUDED, “DOMINATES” THE HUMANS.

ect was Peter Hart, a research engineer in the Applied Physics Laboratory at the Stanford Research Institute. (Now known as SRI International, the institute split from Stanford University in 1970 because its heavy reliance on military funding had become so controversial on campus.) Woody and Hart began with a database of around 800 images—two newsprint-quality photos each of about “400 adult male caucasians,” varying in age and head rotation. (I did not see images of women or people of color, or references to them, in any of Woody’s facial-recognition studies.) Using the RAND tablet, they recorded 46 coordinates per photo, including five on each ear, seven on the nose, and four on each eyebrow. Building on Woody’s earlier experience at normalizing variations in images, they used a mathematical equation to rotate each head into a forward-looking position. Then, to account for differences in scale, they enlarged or reduced each image to a standard size, with the distance between the pupils as their anchor metric.

The computer’s task was to memorize one version of each face and use it to identify the other. Woody and Hart offered the machine one of two shortcuts. With the first, known as group matching, the computer would divide the face into features—left eyebrow, right ear, and so on—and compare the relative distances between them. The second approach relied on Bayesian decision theory; it used 22 measurements to make an educated guess about the whole.

In the end, the two programs handled the task about equally well. More important, they blew their human competitors out of the water. When Woody and Hart asked three people to cross-match subsets of 100 faces, even the fastest one took six hours to finish. The CDC 3800 computer completed a similar task in about three minutes, reaching a hundredfold reduction in time. The humans were better at coping with head rotation and poor photographic quality, Woody and Hart acknowledged, but the computer was “vastly superior” at tolerating the differences caused by aging. Overall, they concluded, the machine “dominates” or “very nearly dominates” the humans.

This was the greatest success Woody ever had with his facial-recognition research. It was also the last paper he would write on the subject. The paper was never made public—for “government reasons,” Hart says—which both men lamented. In 1970, two years after the collaboration with Hart ended, a roboticist named Michael Kassler alerted Woody to a facial-recognition study that Leon Harmon at Bell Labs was planning. “I’m irked that this second rate study will now



be published and appear to be the best man-machine system available," Woody replied. "It sounds to me like Leon, if he works hard, will be almost 10 years behind us by 1975." He must have been frustrated when Harmon's research made the cover of *Scientific American* a few years later, while his own, more advanced work was essentially kept in a vault.

In the

ensuing decades, Woody won awards for his contributions to automated reasoning and served for a year as president of the Association for the Advancement of Artificial Intelligence. But his work in facial recognition would go largely unrecognized and be all but forgotten, while others picked up the mantle.

In 1973 a Japanese computer scientist named Takeo Kanade made a major leap in facial-recognition technology. Using what was then a very rare commodity—a database of 850 digitized photographs, taken mostly during the 1970 World's Fair in Suita, Japan—Kanade developed a program that could extract facial features such as the nose, mouth, and eyes without human input. Kanade had finally managed Woody's dream of eliminating the man from the man-machine system.

Woody did dredge up his expertise in facial recognition on one or two occasions over the years. In 1982 he was hired as an expert witness in a criminal case in California. An alleged member of the Mexican mafia was accused of committing a series of robberies in Contra Costa County. The prosecutor had several pieces of evidence, including surveillance footage of a man with a beard, sunglasses, a winter hat, and long curly hair. But mug shots of the accused showed a clean-shaven man with short hair. Woody went back to his Panoramic research to measure the bank robber's face and compare it to the pictures of the accused. Much to the defense attorney's pleasure, Woody found that the faces were likely of two different people because the noses differed in width. "It just didn't fit," he said. Though the man still went to prison, he was acquitted on the four counts that were related to Woody's testimony.

Only in the past 10 years or so has facial recognition started to become capable of dealing with real-world imperfection, says Anil K. Jain, a computer scientist at Michigan State University and coeditor of *Handbook of Face Recognition*. Nearly all of the obstacles that Woody encountered, in fact, have fallen away. For one thing, there's now an inexhaustible supply of digitized imagery. "You can crawl social media and get as many faces as you want," Jain says. And thanks to advances in machine learning, storage capacity, and processing power, computers are effectively self-teaching. Given a few rudimentary rules, they can parse reams and reams of data, figuring out how to pattern-match virtually anything, from a human face to a bag of chips—no RAND tablet or Bertillon measurements necessary.

Even given how far facial recognition has come since the mid-1960s, Woody defined many of the problems that the field still sets out to solve. His process of normalizing the variability of facial position, for instance, remains part of the picture. To make facial recognition more accurate, says Jain, deep networks today often realign a face to a forward posture, using landmarks on the face to extrapolate a new position. And though today's deep-learning-based systems aren't told by a human programmer to identify noses and eyebrows explicitly, Woody's turn in that direction in 1965 set the course of the field for decades. "The first 40 years were dominated by this feature-based method," says Kanade, now a professor at Carnegie Mellon's Robotics Institute. Now, in a way, the field has returned to something like Woody's earliest attempts at unriddling the human face, when he used a variation on the *n*-tuple method to find pat-

terns of similarity in a giant field of data points. As complex as facial-recognition systems have become, says Jain, they are really just creating similarity scores for a pair of images and seeing how they compare.

But perhaps most importantly, Woody's work set an ethical tone for research on facial recognition that has been enduring and problematic. Unlike other world-changing technologies whose apocalyptic capabilities became apparent only after years in the wild—see: social media, YouTube, quadcopter drones—the potential abuses of facial-recognition technology were apparent almost from its birth at Panoramic. Many of the biases that we may write off as being relics of Woody's time—the sample sets skewed almost entirely toward white men; the seemingly blithe trust in government authority; the temptation to use facial recognition to discriminate between races—continue to dog the technology today.

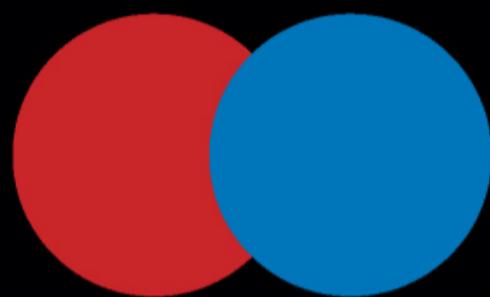
Last year, a test of Amazon's Rekognition software misidentified 28 NFL players as criminals. Days later, the ACLU sued the US Justice Department, the FBI, and the DEA to get information on their use of facial-recognition technology produced by Amazon, Microsoft, and other companies. A 2019 report from the National Institute of Standards and Technology, which tested code from more than 50 developers of facial-recognition software, found that white males are falsely matched with mug shots less frequently than other groups. In 2018, a pair of academics wrote a broadside against the field: "We believe facial recognition technology is the most uniquely dangerous surveillance mechanism ever invented."

In the spring of 1993, nerve degeneration from ALS began causing Woody's speech to slur. According to a long tribute written after his death, he continued to teach at UT until his speech became unintelligible, and he kept up his research on automated reasoning until he could no longer hold a pen. "Always the scientist," wrote the authors, "Woody made tapes of his speech so that he could chronicle the progress of the disease." He died on October 4, 1995. His obituary in the *Austin American-Statesman* made no mention of his work on facial recognition. In the picture that ran alongside it, a white-haired Woody stares directly at the camera, a big smile spread across his face. ■

IN ONE APPROACH,
WOODY BLEDSOE
TAUGHT HIS COMPUTER
TO DIVIDE A FACE
INTO FEATURES, THEN
COMPARE DISTANCES
BETWEEN THEM.

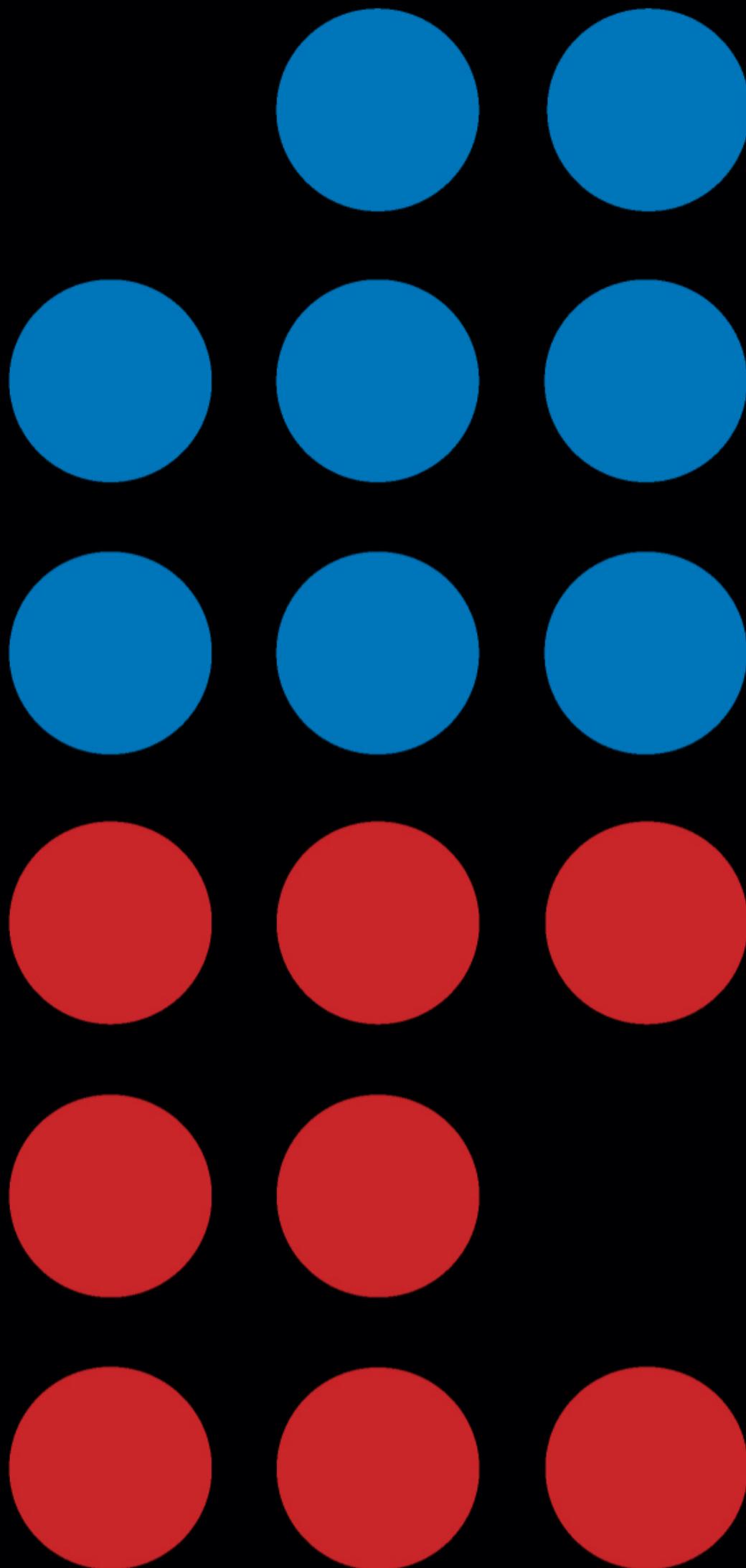
SHAUN RAVIV (@ShaunRaviv) is a writer living in Atlanta. He wrote about the neuroscientist Karl Friston in issue 26.12.





The Hardest Reset

**Sorry to burst your filter bubble,
but tech didn't break democracy,** Reset
**better algorithms won't save us,
and sometimes it's good to feed the trolls.**



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**UP FOR
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—Chris Evans Goes to Washington

The actor's new project, *A Starting Point*, aims to give all Americans the TL;DR on WTF is going on in politics. It's harder than punching Nazis on the big screen.

BY ARIELLE PARDES

PHOTOGRAPHS BY ART STREIBER





It's a languid October afternoon in Los Angeles, sunny and clear.

Chris Evans, back home after a grueling production schedule, relaxes into his couch, feet propped up on the coffee table. Over the past year and a half, the actor has tried on one identity after another: the shaggy-haired Israeli spy, the clean-shaven playboy, and, in his Broadway debut, the Manhattan beat cop with a Burt Reynolds 'stache. Now, though, he just looks like Chris Evans—trim beard, monster biceps, angelic complexion. So it's a surprise when he brings up the nightmares. "I sleep, like, an hour a night," he says. "I'm in a panic."

The panic began, as panics so often do these days, in Washington, DC. Early last February, Evans visited the capital to pitch lawmakers on a new civic engagement project. He arrived just hours before Donald Trump would deliver his second State of the Union address, in which he called on Congress to "bridge old divisions" and "reject the politics of revenge, resistance, and retribution." (Earlier, at a private luncheon, Trump referred to Chuck Schumer, the Senate's top Democrat, as a "nasty son of a bitch.") Evans is no fan of the president, whom he has publicly called a "moron," a "dunce," and a "meatball." But bridging divisions? Putting an end to the American body politic's clammy night sweats? These were goals he could get behind.

Evans' pitch went like this: He would build an online platform organized into tidy sections—immigration, health care, education, the economy—each with a series of questions of the kind most Americans can't succinctly answer themselves. What, exactly, is a tariff? What's the difference between Medicare and Medicaid? Evans would invite politicians to answer the questions in minute-long videos. He'd conduct the inter-

views himself, but always from behind the camera. The site would be a place to hear both sides of an issue, to get the TL;DR on WTF was happening in American politics. He called it A Starting Point—a name that sometimes rang with enthusiasm and sometimes sounded like an apology.

Evans doesn't have much in the way of political capital, but he does have a reputation, perhaps unearned, for patriotism. Since 2011 he has appeared in no fewer than 10 Marvel movies as Captain America, the Nazi-slaying, homeland-defending superhero wrapped in bipartisan red, white, and blue. It's hard to imagine a better time to cash in on the character's symbolism. Partisan animosity is at an all-time high; a recent survey by the Public Religion Research Institute and *The Atlantic* found that 35 percent of Republicans and 45 percent of Democrats would oppose their child marrying someone from the other party. (In 1960, only 4 percent of respondents felt this way.) At the same time, there's a real crisis of faith in the country's leaders. According to the Pew Research Center, 81 percent of Americans believe that members of Congress behave unethically at least some of the time. In Pew's estimation, that makes them even less trusted than journalists and tech CEOs.

If Evans got it right, he believed, this wouldn't be some small-fry website. He'd be helping "create informed, responsible, and empathetic citizens." He would "reduce partisanship and promote respectful discourse." At the very least, he would "get more people involved" in politics. And if the site stank like a rotten tomato? If Evans became a national laughingstock? Well, that's where the nightmares began.



IT TOOK A SPECIAL SERUM and a flash broil in a Vita-Ray chamber to transform Steve Rogers, a sickly kid from Brooklyn, into Captain America. For Chris Evans, savior of American democracy, the origin story is rather less Marvelous.

One day a few years ago, around the time he was filming *Avengers: Infinity War*, Evans was watching the news. The on-air discussion turned to an unfamiliar acronym—it might have been NAFTA, he says, but he thinks it was DACA, or Deferred Action for Childhood Arrivals, an Obama-era immigration policy that granted amnesty to people who had been brought into the United States illegally as children. The Trump administration had just announced plans to phase out DACA, leaving more than half a million young immigrants in the lurch. (The Supreme Court will likely rule this year on whether terminating the program was lawful.)

On the other side of the television, Evans squinted. Wait a minute, he thought. What did that acronym stand for again? And was it a good thing or a bad thing? “It was just something I didn’t understand,” he says.

Evans considers himself a politico. Now 38, he grew up in a civic-minded family, the kind that revels in shouting about the news over dinner. His uncle Michael Capuano served 10 terms in Congress as a Democrat from Massachusetts, beginning right around the time Evans graduated from high school and moved to New York to pursue acting. During the 2016 presidential election, Evans campaigned for Hillary Clinton. In 2017 he became an outspoken critic of Trump—even after he was advised to zip it, for risk of alienating moviegoers. Evans could be a truck driver, Capuano says, and he’d still be involved in politics.

But watching TV that day, Evans was totally lost. He Googled the acronym and tripped over all the warring headlines. Then he tried Wikipedia, but, well, the entry was thousands

of words long. “It’s this never-ending thing, and you’re just like, who is going to read 12 pages on something?” Evans says. “I just wanted a basic understanding, a basic history, and a basic grasp on what the two parties think.” He decided to build the resource he wanted for himself.

Evans brought the idea to his close friend Mark Kassen, an actor and director he’d met working on the 2011 indie film *Puncture*. Kassen signed on and recruited a third partner, Joe Kiani, the founder and CEO of a medical technology company called Masimo. The three met for lobster rolls in Boston. What the country needed, they decided, was a kind of *Schoolhouse Rock* for adults—a simple, memorable way to learn the ins and outs of civic life. Evans suggested working with politicians directly. Kiani, who had made some friends on Capitol Hill over the years, thought they’d go for it. Each partner agreed to put up money to get the thing off the ground. (They wouldn’t say how much.) They spent some time Googling similar outlets and figuring out where they fit in, Kassen says.

They began by establishing a few rules. First, A Starting Point would give politicians free rein to answer questions as they pleased—no editing, no moderation, no interjections. Second, they would hire fact-checkers to make sure they weren’t promoting misinformation. Third, they would design a site that privileged diversity of opinion, where you could watch a dozen different people answering the same question in different ways. Here, though, imbibing the information would feel more like watching YouTube than skimming Wikipedia—more like entertainment than homework.

The trio mocked up a list of questions to bring to Capitol Hill, starting with the ones that most baffled them. (*Is the electoral college still necessary?*) They talked, admiringly, about the way presidential debate moderators manage to make their language sound neutral. (Should the questions refer to a “climate crisis” or a “climate situation,” “illegal immigrants” or “undocumented immigrants”?) Then Evans recorded a video on his couch in LA. “Hi, I’m Chris Evans,” he began. “If you’re watching this, I hope you’ll consider contributing to my new civics engagement project called A Starting Point.” He emailed the file to every senator and representative in Congress.

Only a few replied.

In hindsight, Evans realizes, the video “looked so cheap” and either got caught in spam filters or was consciously deleted by congressional staffers. “The majority of people, on both sides of the aisle, dismissed it,” Evans says. Many “thought it was a joke.” Yet there are few doors in American life that a square jaw can’t open, particularly when it belongs to a man with many millions of dollars and nearly as many swooning Twitter fans. Soon enough, a handful of politicians had agreed to meet with the group.

On the morning of his first visit to Capitol Hill, as he donned a slick gray windowpane suit and a black polka-dot tie and combed his perfect hair back from his perfect forehead, Evans felt a wave of doubt. “This isn’t my lane,” he recalls thinking as he walked through the maze of the Russell Senate Office Building. Here, people were making real change, affecting the lives of millions of Americans. “And shit,” Evans said to himself, “I didn’t even go to college.”

The trio’s first stop was the office of Chris Coons, a Democrat from Delaware. “Which one is the senator?” Evans asked.

“This isn’t my lane,” Evans thought as he walked through the maze of the Russell Senate Office Building.

Coons, having never watched any of the *Avengers* movies, didn't know who Evans was, either. But in short order, he says, he was won over by the actor's charm and "very slight but still noticeable" Boston accent. The thing that got Coons the most, though—the thing that would lead him to pass out pocket cards on the Senate floor to recruit others, especially Republicans, to take part in the project—was how refreshing it was to be asked simple questions: Why should we support the United Nations? Why does foreign aid matter? Coons saw real value in trying to explain these things, simply and plainly, to his constituents.

"Look, I'm not naive," Coons says. He is the first to admit that one-minute videos won't fix what's wrong with American politics. "But it's important for there to be attempts at civic education and outreach," he adds. "And, you know, his fictional character fought for our nation in a time of great difficulty."

Evans stiffens slightly when people mention Captain America. The superhero comparison is, admittedly, a little obvious. But again and again on Capitol Hill, the shtick proved useful: Sometimes it's better to be Captain America than a Hollywood liberal elite who defends *Roe v. Wade* and wants to ban assault weapons. When Evans met Jim Risch, the Republican senator from Idaho joked about catching him up on NATO, "since he missed the 70 years after World War II." When he met Representative Dan Crenshaw, a hard-line Texas Republican and former Navy SEAL who lost his right eye in Afghanistan, Crenshaw lifted up his eye patch to reveal a glass prosthetic painted to look like Captain America's shield.

Eventually, Evans loosened up—at least he lost the tie. Since that first round of visits, he and Kassen have returned to Washington every six weeks or so, collecting more than 1,000 videos from more than 100 members of Congress, along with about half of the 2020 Democratic hopefuls. Evans has conducted every interview himself. Kassen, meanwhile, managed the acquisition of a video compression startup in Montreal. About a dozen of the company's engineers are building a custom content management system for A Starting Point, which is slated to go live in February. They're running bandwidth tests too—just in case, as Kassen worries, "everyone in Chris' audience logs on that first day."

"We have to do this now," Evans says. "It's out there. We have to finish this. *Shit.*"

B

BACK IN LA, EVANS pulls up the site on his iPhone. He hesitates for a moment and covers the screen with his hand. It's still a demo, he explains, in the same bashful tone he uses to tell me the guest bathroom is out of toilet paper.

On the homepage, there's a clip of Evans explaining how to use the site and a carousel of "trending topics" (energy, charter schools, Hong Kong). You can enter your address to call up a list of your representatives and find their videos; you can also contact them directly through the site. The rest is organized by topic and question, with a matrix of one-minute videos for each—Democrats in the left-hand column, Republicans on the right.

Early on in the development of the site, Evans and Kassen fought over fact-checking. Kassen, arguing against, was concerned about the optics: Who were they to arbitrate truth? Evans insisted that A Starting Point would only seem objective if visitors knew the answers had been vetted somehow. Ultimately he prevailed, and they agreed to hire a third-party fact-checker. They have yet to put their thousand-plus videos through the wringer, so for now I'm seeing first drafts. If they're found to contain falsehoods, Evans says, they won't appear on the site at all.

Kassen showed me a sampling of some of this raw material. Under "What is DACA?" I found dozens of videos, offering dozens of different starting points.

One representative, a Republican whose district lies near the Mexican border, describes the program's recipients as "1.2 million men and women who have only known the United States as their home." They go to school, he explains; they serve in the military; they've all passed background checks.

Another Republican representative says, "So, DACA is a result of a really bad immigration system ... We're seeing record numbers of families crossing the border because a kid equals a token for presence in the US."

Sometimes it's better to be Captain America than a Hollywood liberal elite who defends *Roe v. Wade* and wants to ban assault weapons.



The actor and director Mark Kassen, Evans' friend since 2011 and now his partner in *A Starting Point*.

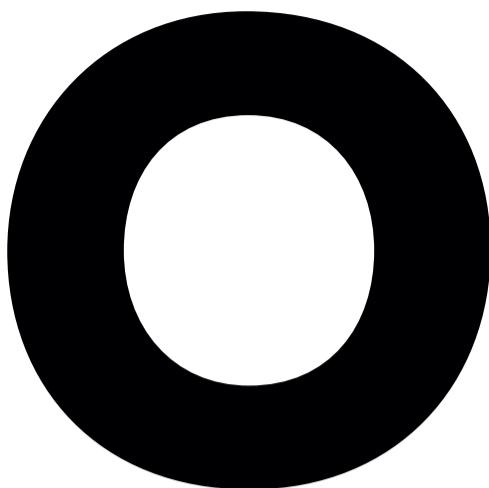
All right? We have all of these people come over, we can't process them, they're claiming asylum. I just heard from the secretary of Homeland Security this week, about nine in 10 don't have valid claims of asylum. Meaning they're not political—there's no political persecution going on. OK?"

These two responses (from politicians on the same side of the aisle, no less) illustrate some of the quandaries that Evans, Kassen, and their fact-checkers are likely to encounter. The first representative, for instance, says there are 1.2 million DACA recipients, when in fact only 660,000 immigrants are currently enrolled in the program. The higher number is based on an estimate of those who *could* be eligible published by the Migration Policy Institute, a Washington think tank. The "nine in 10" statistic, meanwhile, is a loose interpretation of data from 2018, which shows that only about 16 percent of immigrants who filed a "credible fear" claim were granted asylum. But this does not mean, as the representative implies, that the other claims weren't "valid"—merely that they weren't successful. Nearly half of all asylum claims from this time were dismissed for undisclosed reasons. These are fairly hair-splitting examples, but even the basic, definitional questions are drenched in opinion. What is *Citizens United*? "Horrible decision," says a Democratic senator in his video response.

Evans doesn't want to spend time refereeing politicians. To him, *A Starting Point* should act more like a database than a platform—rhetoric that rhymes with that of Facebook and Twitter, which have mostly sidestepped responsibility for their content. He's just hosting the videos, he says; it's up to politicians to decide how they answer the questions. There's no comment section and no algorithmically generated list of recommended videos. "You need to decide what you need to watch next," Kassen says.

information





ONE OF THE ASSUMPTIONS underlying Evans' project—and it's a very big assumption—is that the force of his fame will be enough to attract people who otherwise would have zero interest in watching a carousel of videos from their elected officials. This, by all accounts, is most people: Only a third of Americans can name their representatives in Congress, and those who can aren't binge-watching C-Span. "Celebrities bring an extraordinary ability to get attention," says Lauren Wright, a political researcher at Princeton and author of *Star Power: American Democracy in the Age of the Celebrity Candidate*. But Evans, she says, is "not taking the route that a lot of celebrities have, which is: The solution to American politics is *me*." It would be one thing if Evans were guiding you through the inner workings of Congress like a chiseled Virgil. But why would someone watch a senator dryly explain NAFTA when they could watch, say, a YouTube video of Chris Evans on *Jimmy Kimmel*?

Without its leading man in the frame, A Starting Point begins to look uncomfortably similar to the many other platforms that have sought to fight partisanship online. A site called AllSides labels news sources as left, center, or right and encourages readers to create a balanced media diet with a little from each. A browser plug-in called Read Across the Aisle ("A Fitbit for your filter bubble") measures the amount of time you spend on left-leaning, right-leaning, or

centrist websites. The Flip Side bills itself as a "one-stop shop for smart, concise summaries of political analysis from both conservative and liberal media."

The underlying idea—that there would be a new birth of civic engagement if only we could wrest control of the information economy from the hands of self-serving ideologues and deliver the news to citizens unbiased and uncut—is an old one. In 1993, when the modern internet was just a gleam in Al Gore's eye, Michael Crichton wrote in this magazine's pages that he was sick and tired of the "polarized, junk-food journalism" propagated by traditional media outlets. (This was three years before Fox News and MSNBC came into being; he was talking about *The New York Times*.) What society needed, he argued, was something more like C-Span, something that encouraged people to draw their own conclusions.

But does any of it work? Not according to Wright. "We have many years of research on these questions, and the consensus among scholars is that the proliferation of media choices—including sites like Evans'—has not increased political knowledge or participation," she says. "The problem isn't the lack of information. It's the lack of interest." Jonathan Albright, director of the Digital Forensics Initiative at Columbia's Tow Center for Digital Journalism, agrees. "All of these fact-checking initiatives, all of this work that goes into trying to disambiguate issues or trying to reduce noise—people have no time," he says. "Some people care about politics, but those are not the people you need to reach."

Naturally, this sort of talk makes Evans a little nervous. But he takes refuge in what he sees as the core strengths of the concept. For one thing, he argues, snack-size videos are more accessible than text. Also, those other sites rely on a translator to interpret the issues, while A Starting Point goes straight to the source. It's not for policy wonks. It's for average Americans, centrists, extremists, swing voters—everyone!—who want to hear

about policy straight from the horse's mouth. (Never mind that most people hold horses in higher regard.)

Evans has all kinds of ideas for how to keep people coming back. He might add a section of the website where representatives can upload weekly videos for their constituents, or a place where policymakers from different parties can discuss bipartisan compromise. He talks about these ideas with an enthusiasm so pure and so believable that you almost forget he's an actor. The whole point, he says, is giving Americans a cheap seat on the kinds of conversations that are happening on Capitol Hill. That's a show that Evans is betting people actually want to see.

The worst thing that could happen isn't that nobody watches the videos. That would suck, but Evans could deal with it. What gets him riled up most is thinking about what he might have failed to consider. What if the site ends up promoting some bizarre agenda that he never intended? What if people use the videos for some kind of twisted purpose? "One miscalculation," he says, "and you may not get back on track." (See: Facebook.)

Evans knows his idea to save democracy can come off a little Pollyannaish, and if it flops, it'll be his reputation on the line. But he really, really believes in it. OK, so maybe it won't save America, but it might piece together some of what's been broken. A fresh start. A starting point.

"This does feel to me like everybody wins here. I don't see how this becomes a problem," he says, before a look of panic crosses his face, the anxiety setting in again. ■

Evans launched A Starting Point to give users a "basic grasp on what the two parties think."

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The Anatomy Desire

rancor online, we need
want misinformation

BY GIDEON LEWIS-KRAUS



of

To get past
misinformation and tribal
to face why people
and rancor.

Over the past five decades,

America's war on drugs has been motivated and organized by the fantasy that the proliferation of substance abuse is fundamentally a supply problem. The remedy, accordingly, has been to restrict the production and distribution of narcotics: Smash the cartels, cauterize the trafficking routes, arrest the dealers. This approach has, predictably enough, devolved into a self-sustaining game of whack-a-mole.

Since 2016, the panic about misinformation online has been driven by a similar fantasy. The arguments predicated on this view have become familiar, almost boilerplate. One recent example was a November speech given by the comedian Sacha Baron Cohen.

"Today around the world, demagogues appeal to our worst instincts. Conspiracy theories once confined to the fringe are going mainstream," said the actor, in a rare performance in character as himself. "It's as if the Age of Reason—the era of evidential argument—is ending, and now knowledge is increasingly delegitimized and scientific consensus is dismissed. Democracy, which depends on shared truths, is in retreat, and autocracy, which depends on shared lies, is on the march." As Baron Cohen put it, it's "pretty clear" what's behind these trends: "All this hate and violence is being facilitated by a handful of internet companies that amount to the greatest propaganda machine in history."

As with the war on drugs, the chief villains in this account are the vectors: the social media companies and their recom-



mendation algorithms, which stoke the viral profusion of preposterous content. The people who originate the memes, like peasants who grow poppies or coca, aren't painted as blameless, exactly, but their behavior is understood to reflect incentives that have been engineered by others. Facebook and Google and Twitter are the cartels.

And the users? They go about their online business—"not aware," as technology investor and critic Roger McNamee puts it, "that platforms orchestrate all of this behavior upstream." Tech's critics offer various solutions: to break up the platforms entirely, to hold them liable for what users post, or to demand that they screen content for its truth-value.

It's easy to understand why this narrative is so appealing. The big social media firms enjoy enormous power; their algorithms are inscrutable; they seem to lack a proper understanding of what undergirds the public sphere. Their responses to widespread, serious criticism can be grandiose and smarmy. "I understand the concerns that people have about how tech platforms have centralized power, but I actually believe the much bigger story is how much these platforms have *decentralized* power by putting it directly into people's hands," said Mark Zuckerberg, in an October speech at Georgetown University. "I'm here today because I believe we must continue to stand for free expression."

If these corporations spoke openly about their own financial interest in contagious memes, they would at least seem honest; when they defend themselves in the language of free expression, they leave themselves open to the charge of bad faith.

But the reason these companies—Facebook in particular—talk about free speech is not simply to conceal their economic stake in the reproduction of misinformation; it's also a polite way for them to suggest that the real culpability for what pullulates on their platforms lies with their users. Facebook has always presented itself, in contrast to legacy gatekeepers, as a neutral bit of infrastructure; people may post what they like and access what they fancy. When Zuckerberg talks about "free expression," he is describing the sanctity of a marketplace where supply is liberated to seek the level of demand. What he is saying, by implication, is that the affliction of partisan propaganda reflects not a problem of supply but of demand—a deep and trans-



parent expression of popular desire.

This might be a maddening defense, but it is not a trivial argument to counter. Over the past few years, the idea that Facebook, YouTube, and Twitter somehow created the conditions of our rancor—and, by extension, the proposal that new regulations or algorithmic reforms might restore some arca-dian era of “evidential argument”—has not stood up well to scrutiny. Immediately after the 2016 election, the phenomenon of “fake news” spread by Macedonian teenagers and Russia’s Internet Research Agency became shorthand for social media’s wholesale perversion of democracy; a year later, researchers at Harvard University’s Berkman Klein Center concluded that the circulation of abjectly fake news “seems to have played a relatively small role in the overall scheme of things.” A recent study by academics in Canada, France, and the US indicates that online media use actually *decreases* support for right-wing populism in the US. Another study examined some 330,000 recent YouTube videos, many associated with the far right, and found little evidence for the strong “algorithmic radicalization” theory, which holds YouTube’s recommendation engine responsible for the delivery of increasingly extreme content.

Regardless of how one study or another breaks, tech companies have reason to prefer abstract arguments about the values of untrammeled expression. They have chosen to adopt the language of classical liberalism precisely because it puts their liberal critics in an uncomfortable position: It’s unacceptably patronizing to claim that some subset of our neighbors have to be protected from their own demands. It’s even worse to question the authenticity of those demands in the first place—to suggest that the desires of our neighbors are not really their own. Critics must rely on such potted ideas as “astroturfing” to explain how it might be that good people come to demand bad things.

The case for corporate blame is, at any rate, probably more expedient than it is empirical. It’s much easier to imagine how we might exercise leverage over a handful of companies than it is to address the preferences of billions of users. It’s always tempting to search for our keys where the light is better. A better solution would require tech’s critics to take what people demand as seriously as the corporations do, even if that means looking into the dark.

T

THE FIRST STEP toward an honest reckoning with the reality of demand is to admit that political polarization long predates the rise of social media. By the time Facebook opened its walled orchard to everyone in 2006, the US had already spent 40 years sorting itself into two broad camps, as Ezra Klein points out in his new book *Why We’re Polarized*. At the beginning of the 1960s, the Democratic and Republican parties both contained self-described liberals and conservatives. Then the passage of civil rights legislation and Richard Nixon’s Southern strategy set in motion the coalescence of each party around a consensus set of “correct” views. Race was the original fault line, and has remained salient. But the constellations of other views often shifted and were increasingly secondary to the simpler matter of group affiliation.

Where many technology critics see the rise of social media, some 15 years ago, as a vast shift that ushered in the era of “filter bubbles” and tribal sorting, Klein describes it as less the original cause than an accelerant—especially insofar as it encouraged individuals to see all their beliefs and preferences, if only in brief but powerful moments of perceived threat, as potential expressions of a single underlying political identity. Facebook and Twitter allotted each user one persona, with a profile, a history, and a signaling apparatus of unprecedented reach. Users faced new and acute kinds of public pressure—to be coherent, for one thing—and could only look to other members of their communities for clues to what might viably constitute coherence.

Offline, too, people were being dragooned, subtly or otherwise, into increasingly cramped partisan identities. Klein draws on the work of the political scientist Lilliana Mason to describe how political polarization has resulted in the “stacking” of otherwise unrelated identities under the heading of political affiliation. Where we might once have expressed solidarity with one another along any number of axes that had no obvious political valence—as members of the same faith, residents of the same town, fans of the same music—more and more of these affiliations were, by the 2000s, tagged and subsumed under the two flagship “mega-identities” on offer in US politics.

Neither of these two sides could exist without the other: It’s very hard to give people a strong sense of “who we are” without defining “who we are not.” We might not like everything our side does, but we would rather be dead than identify with our opponents. The construction and policing of the all important boundary between camps has come to feel like one of the daily burdens of being alive in the age of social media.

And as for social media’s role, none of this was deliberate or inevitable, as Klein sees it: “Few realized, early on, that the way to win the war for attention was to harness the power of community to create identity,” he writes. “But the winners emerged quickly, often using techniques whose mechanisms they didn’t fully understand.”

Taken on its own, however, the insight that social media both promotes and relies on swells of belonging seems insufficient to explain its contribution to Manichaean polarization. Social media could have produced a rich world of autarchic, jostling affiliations—a lively bazaar of many camps—and it’s a standard trope of internet nostalgists to long for the time when online identities could be fragmented. An individual, in those antediluvian days, could comfortably contain a range of identities, each expressed in its proper context. The fact that it hasn’t turned out that way on social media—the fact that, as Klein notes, the platforms have encouraged a more totalizing alignment—is one reason why many critics suspect that the apparatus is rigged, that we aren’t being given what we want but rather what some malign force wants us to want. It is much easier, once more, to invoke the perennial bugbear of “the algorithm” than it is to consider the idea that social sorting itself might be our most enduring preference.



IN A RECENT article in *The New York Times*, Annalee Newitz expressed the familiar notion that “social media is broken.” But, at least by one reading, it’s working precisely as intended. Facebook was founded—or at least funded—on a serious, if esoteric, theory of demand, one that accounts for the origin and cultivation of desire.

In July 2004, the investor and PayPal cofounder Peter Thiel helped organize a small conference at Stanford University to discuss current events with his former mentor, the French literary critic and self-styled anthropologist René Girard. Thiel proposed “a reexamination of the foundations of modern politics” in the wake of 9/11, and the symposium proceeded in a decidedly apocalyptic register. “Today,” Thiel wrote in the essay he contributed to the event, “mere self-preservation forces all of us to look at the world anew, to think strange new thoughts, and thereby to awaken from that very long and profitable period of intellectual slumber and amnesia that is so misleadingly called the Enlightenment.” Thiel wrote that “the whole issue of human violence has been whitewashed away” by a political culture built on John Locke and the wishful concept of a social contract; he believed we had to turn to Girard for a more satisfying account of human irrationality and vengefulness.

As Girard had it, we are defined and constituted as a species by our reliance on imitation. But we are not mere first-order mimics: When we ape what someone else does, or covet what someone else has, we are in fact trying to want what they want. “Man is the creature who does not know what to desire, and he turns to others in order to make up his mind,” Girard wrote. “We desire what others desire because we imitate their desires.” Unable to commit to our own arbitrary wants, we seek to resemble other people—stronger, more decisive people. Once we identify a model we’d like to emulate, we

train ourselves to make the objects of their desire our own.

The emotional signature of all this imitation—or mimesis—is not admiration but consuming envy. “In the process of ‘keeping up with the Joneses,’” Thiel writes, “mimesis pushes people into escalating rivalry.” We resent the people we emulate, both because we want the same things and because we know we’re reading from someone else’s script. As Girard would have it, the viability of any society depends on its ability to manage this acrimony, lest it regularly erupt into the violence of “all against all.”

Around the time of that 2004 symposium, Thiel was making a \$500,000 investment in a small startup called The Facebook. He later attributed his decision to become its first outside investor to the influence of Girard.

“Social media proved to be more important than it looked, because it’s about our natures,” he told *The New York Times* on the occasion of Girard’s death in 2015. “Facebook first spread by word of mouth, and it’s about word of mouth, so it’s doubly mimetic.” As people like and follow and dilate on certain posts and profiles, the Facebook algorithm is trained to recognize the sort of people we aspire to be, and obliges us with suggested refinements. The platforms are not simply meeting demand, as Zuckerberg would have it, but they’re not really creating it either. They are, in a sense, refracting it. We

are broken down into sets of discrete desires, and then grouped into cohorts along lines of statistical significance. The kinds of communities these platforms enable are ones that have simply been found, rather than ones that had to be forged.

As the critic Geoff Shullenberger has pointed out, Facebook’s cultivation of these communities—structured by constant and simple mimetic reinforcement—is only half of a story that gets considerably darker. Girard spent the later decades of his career elaborating how, in myth and ancient history, human societies purchased peace and stability by displacing the bad blood of mimetic rivalry into violence against a scapegoat. “The war of all against all culminates not in a social contract but in a war of all against one,” Thiel writes, “as the same mimetic forces gradually drive the combatants to gang up on one particular person.”

Ancient religions, Girard argued, advanced rituals and myths to contain this bloodthirsty process. And Christianity, a religion centered around the crucifixion of an innocent scapegoat, promised transcendence of the entire dynamic with the revelation of its cruelty. (Girard was a professed Christian, as is Thiel.)

The problem, as Thiel sees it, is that we now live in a disenchanted age: “The archaic rituals will no longer work for the modern world,” he wrote in 2004. The danger of escalating mimetic violence was, in his view, both obvious and neglected. His concern at the time was with global terrorism in the wake of September 11, but later it seems he also came to worry about resentment toward the investor class in an age of growing inequality. In a set of notes published online in 2012 by the coauthor of Thiel’s book *Zero to One*, Thiel identifies tech founders as natural scapegoats in the Girardian sense: “The 99% vs. the 1% is the modern articulation of this classic scapegoating mechanism.”

Thiel’s prescient investment in Facebook could be interpreted as a gesture of faith in the power of social media platforms (Shullenberger calls them “scapegoating machines”) to step in and replace real violence with a new symbolic surrogate. That is, social media could serve to focus and organize the chaos of our untamed desires and, at the same time, focus and organize the potential violence of our untamed animus. The opportunity to vent on social media, and occasionally to join an outraged online mob, might relieve us of our latent

Social media platforms have stepped in to replace real violence with a new symbolic surrogate.



desire to hurt people in real life. It's easy to dismiss a lot of very online rhetoric that equates social media disagreement with violence, but in a Girardian account the conflation might reflect an accurate perception of the symbolic stakes: On this view, our tendency to experience online hostility as "real" violence is an evolutionary step to be cheered. The reason this has never happened in human history is because we lacked a pervasive, no-cost signaling infrastructure. Now we have it.

Shullenberger makes a good case that Thiel might have intuited all this: that social media, with its paths of least resistance, could provide not only this kind of cheap symbolic sorting but an ultimately symmetrical version of it. What we end up with is not the 99 percent versus the 1 percent but a vast, virtual stalemate in a symbolically bipolar universe. Affinities based on the clever algorithmic sorting of refracted desires are only weakly bound. In the absence of a grand, substantive vision for who "we" are, we draw our strength and certainty from the coherent depravity of "them."

It's easy to relate to this: While most of us are rarely wholly satisfied by the goodness and purity of our own team, with its heterodoxy and lack of discipline, we're deeply satisfied by what we interpret as the uniform villainy of our opponents. Think, for example, of how confidently liberals include among the "bad guys" someone as silly as the Canadian academic and self-help guru Jordan Peterson alongside a neo-Nazi like Richard Spencer. We seek and prize intelligible solidarity in our enemies with much greater pleasure than we do in our own camp. As Shullenberger puts it in one of his essays about Thiel, "for someone overtly concerned about the threat posed by such forces to those in positions of power, a crucial advantage would seem to lie in the possibility of deflecting violence away from the prominent figures who are the most obvious potential targets of popular ressentiment, and into internecine conflict with other users." The goal is an evenly apportioned virtual antagonism in the stable perpetuity of a very vivid game.

If this was really Thiel's idea—that Facebook might detach the world of permanent symbolic conflict from the real world of actual politics—then it was, or has become, an entirely cynical one. On the basis of his public doubts about democracy, his reverence for the occult elitism of the philosopher



Leo Strauss, and his relationship to Trump, it's clear enough how he thinks reality ought to be administered: by people like him and Zuckerberg, while the rest of us are distracted by the online videogames of our lives. (According to *The Wall Street Journal*, Thiel still exerts "outsized influence" as a Facebook board member.) And in retrospect, the idea that social media might redirect our worst mimetic impulses isn't only cynical but devastatingly wrong. It's unclear how it could even begin to account for the very nonsymbolic violence that spilled off of Facebook and into the real worlds of Myanmar and Sri Lanka—and, depending on your perspective, the United States as well.

In the end, as it becomes increasingly untenable to blame the power of a few suppliers for the unfortunate demands of their users, it falls to tech's critics to take the fact of demand—that people's desires are real—even more seriously than the companies themselves do. Those desires require a form of redress that goes well beyond "the algorithm." To worry about whether a particular statement is true or not, as public fact-checkers and media-literacy projects do, is to miss the point. It makes about as much sense as asking whether somebody's tattoo is true. A thorough demand-side account would allow that it might in fact be tribalism all the way down: that we have our desires and priorities, and they have theirs, and both camps will look for the supply that meets their respective demands.

Just because you accept that preferences are rooted in group identity, however, doesn't mean you have to believe that all preferences are equal, morally or otherwise. It just means our burden has little to do with limiting or moderating the supply of political messages or convincing those with false beliefs to replace them with true ones. Rather, the challenge is to persuade the other team to change its demands—to convince them that they'd be better off with different aspirations. This is not a technological project but a political one. ■

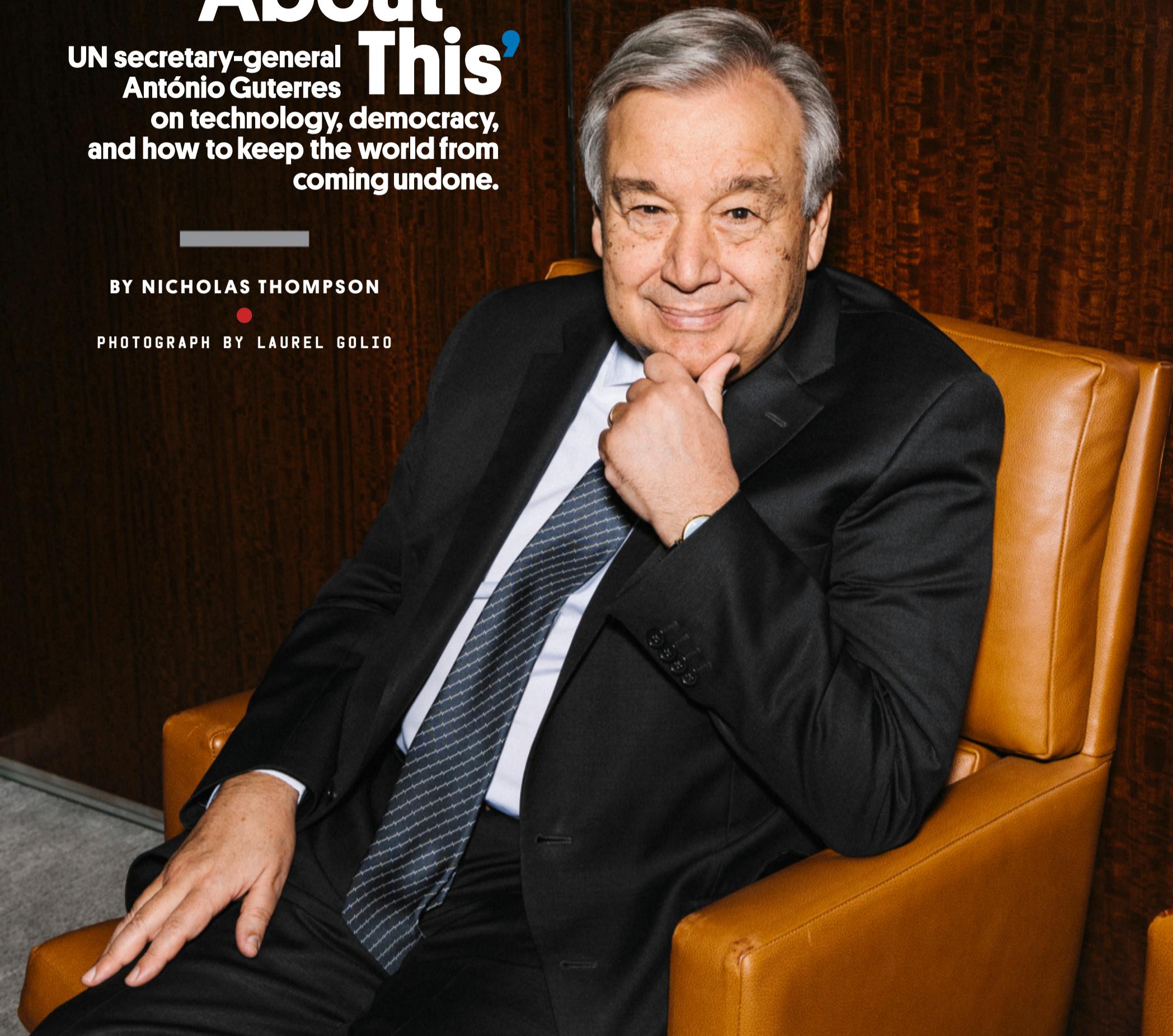
GIDEON LEWIS-KRAUS is a contributing editor at WIRED. He last wrote about the blockchain platform Tezos in issue 26.07.

— ‘I’m Not Pessimistic About This’

UN secretary-general
António Guterres
on technology, democracy,
and how to keep the world from
coming undone.

BY NICHOLAS THOMPSON

PHOTOGRAPH BY LAUREL GOLIO



THE INTERNET THESE days is defined by bots, surveillance, goat rope, and digital flopperoo. What is to be done? It’s a question that has traveled up to the top of the most powerful organization in the world with neither shareholders nor an army: the United Nations, and its secretary-general, António Guterres. • Guterres began his career as an electrical engineer. Politics diverted him, however, and he became the prime minister of Portugal and then the UN’s high commissioner for refugees. Since taking the top job in 2017, he has focused on promoting peace and climate change. But he’s recently started to talk about how the UN can help shape norms and rules to clean up our digital shambles. Recently, he invited WIRED to talk about his plans for keeping technology from driving nations apart.



Nicholas Thompson: You recently gave a speech in Paris about five great threats to the world. One was the technological break, in which the internet splits definitively into incompatible partitions, one dominated by China and the other by the US.

António Guterres: I think we have three risks of divides: a geostrategic divide, a social divide, and a technological divide. Geostrategically, if you look at today's world, with the two largest economies, the Chinese and the American, there is a risk—I'm not saying it will happen—of a decoupling, in which each of these two areas will have its own market, its own rules, its own internet, its own strategy in artificial intelligence. And then the risks of confrontation increase dramatically.

Then we have a social divide. The internet is a fantastic tool. But at the same time, we have terrorist organizations that use the internet, you have drug trafficking and trafficking of human beings using the internet, you have problems of cybersecurity.

And then we still have the other divide, between rich and poor. Half of the population of the world is not linked to the internet. And we see the impact of inequality more and more, not only among countries but within each country.

NT: One of the metaphors that people sometimes use for this fracture between the US internet and the Chinese internet is a new Cold War. Do you think that is an appropriate metaphor?

AG: The Cold War in the past was more predictable and well defined. There were two worlds that were indeed separated. But with time and wisdom, after some risky situations, mechanisms were created and a disarmament agenda was put in place.

When we look at cyberspace, it's much more complicated. I am convinced that if one day we would have a major confrontation, it would start with a massive, massive cyberattack. And we do not have clarity on legal frameworks on this. I mean, there is a general principle that international law applies in cyberspace, but it is not clear how international humanitarian law applies, and these other laws of war. The self-defense principle of the UN—how does it apply in this context? When is it war, when is it not war in these situations?

And then, of course, artificial intelligence will develop new kinds of weapons. I am

totally against autonomous weapons that can have the right to choose targets and kill people without human involvement. We know that the technology is available for that. And there is no consensus in the world about how to regulate it.

NT: How can we reverse the process of the US and China splitting further and further apart on technology?

AG: You need to build trust. You need to have cooperation. You need dialog. You need to understand each other, to understand the differences, and to have a serious commitment, also, in other areas that can be divisive. More and more, we need not rigid regulatory frameworks but ways to bring the actors together.

NT: Is the role of the United Nations to get people in the same room to talk? Or is it to set a new global regulatory framework?

AG: I think first we need to bring people together. That's why we appointed a high-level panel on digital cooperation. And there are a number of recommendations that were made. For each recommendation, we are now creating a group of champions—governments, companies, and other entities to try to push for digital cooperation. We can be the platform where they come together. We need to create the conditions for this kind of soft, flexible regulation to progressively be accepted by the different actors, and for all actors to cooperate in defining those protocols, those red lines, that will allow us to minimize the risks.

NT: If you look at the past five or 10 years, the number of democracies in the world has been declining, and the number of authoritarian states has been increasing. There are lots of causes for this. Is it possible that technology is one?

AG: First, technology can help democracy. It can connect people. We see that many social movements in favor of democracy have been boosted by technology. But there are mechanisms that allow for the political

control of people that are extremely worrying, and that if applied in a society can fully undermine democracy.

I'm not pessimistic about this. We are seeing a disquiet of people; we are seeing people wanting to make sure their voices are heard, that political systems become more participatory. I have enormous faith in human beings, and I think they will be able to overcome these difficulties and preserve the democratic values that are so essential for our societies.

NT: Do you think access to the internet should be a human right and that there should be international law, for example, forbidding the government of Iran from turning off access to the internet, as it did just recently?

AG: I think the internet should be a right. I can imagine states of emergency that can be declared in certain circumstances by democratic bodies. So in the context of a full democracy, that can happen. But we shouldn't, in my opinion, use these technologies as an instrument of political control.

NT: You've given some ideas for how the world order can be shaped. But for people who care about the future of democracy and care about the world not splitting apart, what can they do?

AG: Oh, they're doing it. I mean, look at the students in so many parts of the world. People are assuming responsibility. People are saying all voices must be heard. The idea that a very small group of people can decide everything is being put into question. In each country, the trigger is different. In some cases it's economically driven, in others it's pressure on the political system, in others corruption. But I see more and more people wanting to assume responsibility, wanting their voices to be heard. And that is the best guarantee we have that political systems will not be corrupted.

NT: And technology is often at their service.

AG: Technology can be used against people, but it can be used by people for good causes too. ■

NICHOLAS THOMPSON (@nxthompson) is WIRED's editor in chief. This interview has been edited and condensed.

Rivals on Rivalry

In the weeks before this issue went to press, WIRED wrote to every candidate running for president (including the President) and asked them to respond to the following prompt: **By some measures, America's political leaders are more ideologically divided than at any time since the Civil War. The increase in polarization in this country is one of the most profound, well documented, and disastrous trends in American civic life. Beyond simple calls for civility and moderation, how does that trend get reversed?** After 34 initial emails—and more than that many follow-up emails—six candidates responded. For the ones who didn't, we found public statements they have made on the topic.

• Michael Bennet

SENATOR, CO

We have to start with our elections and our campaign finance system. We should ban partisan gerrymandering and pass a constitutional amendment to overturn *Citizens United*, which has given billionaires the power to spend unlimited sums to punish politicians who stray from the billionaires' narrow views. We also should dramatically increase transparency in our campaign finance system, give the Federal Election Commission the power to enforce existing laws, and create a publicly financed matching program for small donors. And we should encourage local and state governments to adopt ranked-choice voting, a promising reform that can reduce slash-and-burn politics and expand voter choices at the ballot box. American tech companies must also take responsibility for the effect of their platforms on our democracy—by revisiting incentives that reward the most incendiary content, algorithms that digitally gerrymander us into echo chambers, and rules that allow politicians to microtarget lies to the public. At the same time, as citizens, we also need to reimagine how to engage with our democracy. Watching cable news for two hours a night is not the same thing as organizing in your neighborhood. Trading snarky comments on Facebook is not the same thing as going to a town hall. Shaming someone is not the same thing as persuading them. We best serve our democracy in our communities, at the ballot box, and in real dialog. There are steps we can take to bridge our divides and save this democracy.

—Response to WIRED

• Bernie Sanders

SENATOR, VT

"We must view ourselves as part of 'an inescapable network of mutuality, tied in a single garment of destiny,' as Dr. King put it. In other words, we are in this together. We must see ourselves as part of one nation, one community, and one society—regardless of race, gender, religion, sexual orientation, or country of origin. This quintessentially American idea is literally emblazoned on our coins: *E pluribus unum*. From the many, one." —June 12, 2019, speech, Washington, DC

• Cory Booker

SENATOR, NJ

"We have more animus and anger directed at each other than we do at foreign adversaries who are actively trying to undermine our election. We're failing to get the kind of things done that frankly many Americans agree on—from infrastructure investment to common sense gun safety to meeting the challenges of climate change. We need in this nation to form a new American majority. And that's not just Democrats, that means moderates and independents and Republicans ... We have so much common pain in this country that can get us back to a sense of common purpose." —July 9, 2019, interview, WBUR's *On Point*

• Pete Buttigieg

MAYOR, SOUTH BEND, IN

In Afghanistan, I learned to trust my life to fellow Americans with radically different backgrounds and political beliefs. Our common sense of purpose brought us together. We have to summon a similar sense of common purpose and mission as a nation. This instinct comes naturally to mayors as well as veterans. As a Democratic mayor in Indiana, with three Republican governors, I wouldn't have been able to get much done if I hadn't worked across party lines. But in order to do that, there has to be good faith. We need leaders in both parties who recognize that people are not all good or all bad. We're just people, capable of good or bad things. And it is the job of our leaders to bring out what's best in us, to remind us of those values we hold in common. By recognizing that our values can unite us, we can reverse the trend toward polarization, and deliver on the things the American people of all political persuasions want. —Response to WIRED

• Deval Patrick

FORMER GOVERNOR, MA

We start by not putting each other in a box. Too often we see just a sliver of a person, and then we think we know everything about them. When we reduce each other to shorthand and labels, we create the space for polarization and division. I don't fit in a box. Most people don't. I don't think you have

• Joe Walsh

FORMER CONGRESSMEMBER, IL

"Maybe a reformed outlaw like me who understands some of what I did to help create Trump can help bring the country together and heal the divide. The next president's job is going to be to unite us with our allies. Unite Americans at home. Unite different members of the media. This guy took a divided country, and he's hell-bent on dividing it even more. If I'm elected president I'm going to try to unite us." —September 24, 2019, *Business Insider* GOP debate (condensed)

• Joe Biden

FORMER VICE PRESIDENT

Our politics today have become too mean, too personal, and too ugly. Instead of questioning someone's judgments, which is appropriate and necessary in our political system, we demonize them and question their motives. It is virtually impossible to reach consensus after constantly attacking someone's integrity. You hear it from the highest office in the country, where our president finds scapegoats to blame for whatever problems emerge: immigrants, Muslims, nearly anyone of a different creed, color, or conviction. This has been a scheme used by unscrupulous politicians throughout history. But it comes at a cost—it weakens us, distracts us, divides us. It causes us to lose credibility around the world. This is not who we are. I refuse to accept the idea that we cannot come together as a nation to solve hard problems. We must remember that compromise itself is not a dirty word, and consensus is not a weakness—it's a necessity. It's how this government was designed to work. It's what I did when I worked across the aisle to save us from a depression and to put together the historic Cancer Moonshot to enable critical scientific research, find a cure, and end cancer as we know it. It's what I'll do as your president. I'm more optimistic about America's future today than I was when I got elected to the Senate as a 29-year-old. We can make progress and restore the soul of this nation. We are almost 330 million Americans who must do what our president will not: treat everyone with dignity and respect. Give hate no safe harbor. Choose unity over division. There's not a single thing we can't do if we stand together. —Response to WIRED

• Michael Bloomberg

FORMER MAYOR, NYC

"Healthy democracy is about living with disagreement, not eliminating it ... An approach that demands silence on contested issues, or that extends bitter political division into commerce and every other sphere of life, will succeed only in fracturing the country even more deeply. Demagogues of the left or right will certainly prosper in such an environment. Liberal democracy will not. Enough with 'speech is violence.' Restoring the ability to disagree without becoming mortal enemies is a new and urgent civic imperative." —September 15, 2019, "Democracy Requires Discomfort," Bloomberg Opinion

to hate Republicans to be a good Democrat. I don't think you have to hate conservatives to be a good progressive or to hate business to be a good social justice warrior—any more than I think you have to grow up poor and stay poor to care about chronic poverty or to hate police to believe Black lives matter. I try to be the kind of man who rejects false choices, not for the sake of tamping down disagree-

ment but because the range of my life experience has taught me that so many of the choices we present in politics are false. We can reverse this trend when we have a president who leads by example, who understands they are the president of the people who voted for them as much as the people who didn't, and who takes that responsibility seriously.

—Response to WIRED

• Tulsi Gabbard

CONGRESSMEMBER, HI

"The longer we continue to allow ourselves to be divided like this, for people to further their own political interests, the weaker we are as a people and as a country. There is so much that unites us. This is what I find inspiring as we go and meet with different people all across the country—the diversity that we have in this country and how beautiful it is that we can come together around these uniting principles."

—September 28, 2019, interview, *The Hill*

• Julián Castro

FORMER HUD SECRETARY

"It's become harder over the years to appeal to this common sense of national purpose. But I believe that we can do it. And climate change and immigration are both good opportunities to do that, where people can see a value for all of us as we tackle the climate crisis in creating jobs and opportunity for millions of people in a clean energy economy. When it comes to immigration, feeling better as a nation morally about how we're treating human beings, and then also recognizing ... that all of us can win if we harness the potential of immigrants, I think we can find these commonalities in these issues and seek to bring people together." —October 4, 2019, round-table discussion, NPR (condensed)

• Tom Steyer

BUSINESSPERSON

Today's political polarization is a symptom of a larger problem—the corporate takeover of our democracy. For years, unchecked corporate power has run roughshod over the American people, buying influence in the halls of government and pushing narrow interests at the expense of workers' rights, our health, and our environment. Corporations have attempted to deepen and exploit political divisions by spreading misinformation and fear to increase profits and boost stock prices. We need to restore political power directly to the people and allow them a more direct role in deciding on the important issues that affect their lives. We also must organize and unite around an urgently needed action—fighting our climate crisis. We have 10 years left to stave off the worst effects of climate change; it threatens humanity and the world, our lives and our communities. But the United States and the American people were built to take on the big problems. We can rise to this challenge and make it our greatest opportunity—and we must do it together. —Response to WIRED

• Donald Trump

PRESIDENT

"We must reject the politics of revenge, resistance, and retribution—and embrace the boundless potential of cooperation, compromise, and the common good. Together, we can break decades of political stalemate. We can bridge old divisions, heal old wounds, build new coalitions, forge new solutions, and unlock the extraordinary promise of America's future. The decision is ours to make."

—February 5, 2019, State of the Union address

• John Delaney

FORMER CONGRESSMEMBER, MD

"One of the things I've pledged is in my first hundred days to only do bipartisan proposals. Wouldn't it be amazing if a president looked at the American people at the inauguration and said, 'I represent every one of you, whether you voted for me or not, and this is how I'm going to prove it?' ... You prove to the American people that we can actually start solving problems and getting things done." —January 13, 2019, interview, ABC's *This Week With George Stephanopoulos* (condensed)

• Bill Weld

FORMER GOVERNOR, MA

"America is stronger, and can afford to be more generous, when it is united rather than divided. There is a place and time for opposition and dissent; there is always room for healthy debate. But there should be no hatred, no intimidation, no name-calling between the various arms of the federal government or between groups of citizens. Like President Reagan, like President Eisenhower, our leaders in government should seek to unite us and make us all proud to be Americans—and never, ever seek to divide us." —February 15, 2019, speech, NH

• Amy Klobuchar

SENATOR, MN

"One of my main goals in the Senate, where there is so much polarization and people standing in opposite corners, has been to be a force of good, to work to get things done. There are some things where I take a stand and I'm on a bill just with Democrats. But then if I can find some middle ground and actually get something done, like on human trafficking, I'm going to go for it. And I think that's what not just people of America want. I think that's what Democrats want." —March 19, 2019, interview, NPR

• Elizabeth Warren

SENATOR, MA

"The way we achieve our goals and bring our country together is we talk about the things that unite us, and that is that we want to build an America that works for the people, not one that just works for rich folks ... That's something that Democrats care about, independents care about, and Republicans care about, because regardless of party affiliation, people understand: Across this country, our government is working better and better for the billionaires, for the rich, for the well-connected, and worse and worse for everyone else. We come together when we acknowledge that and say we're going to make real change." —November 20, 2019, Democratic debate, Atlanta (condensed)

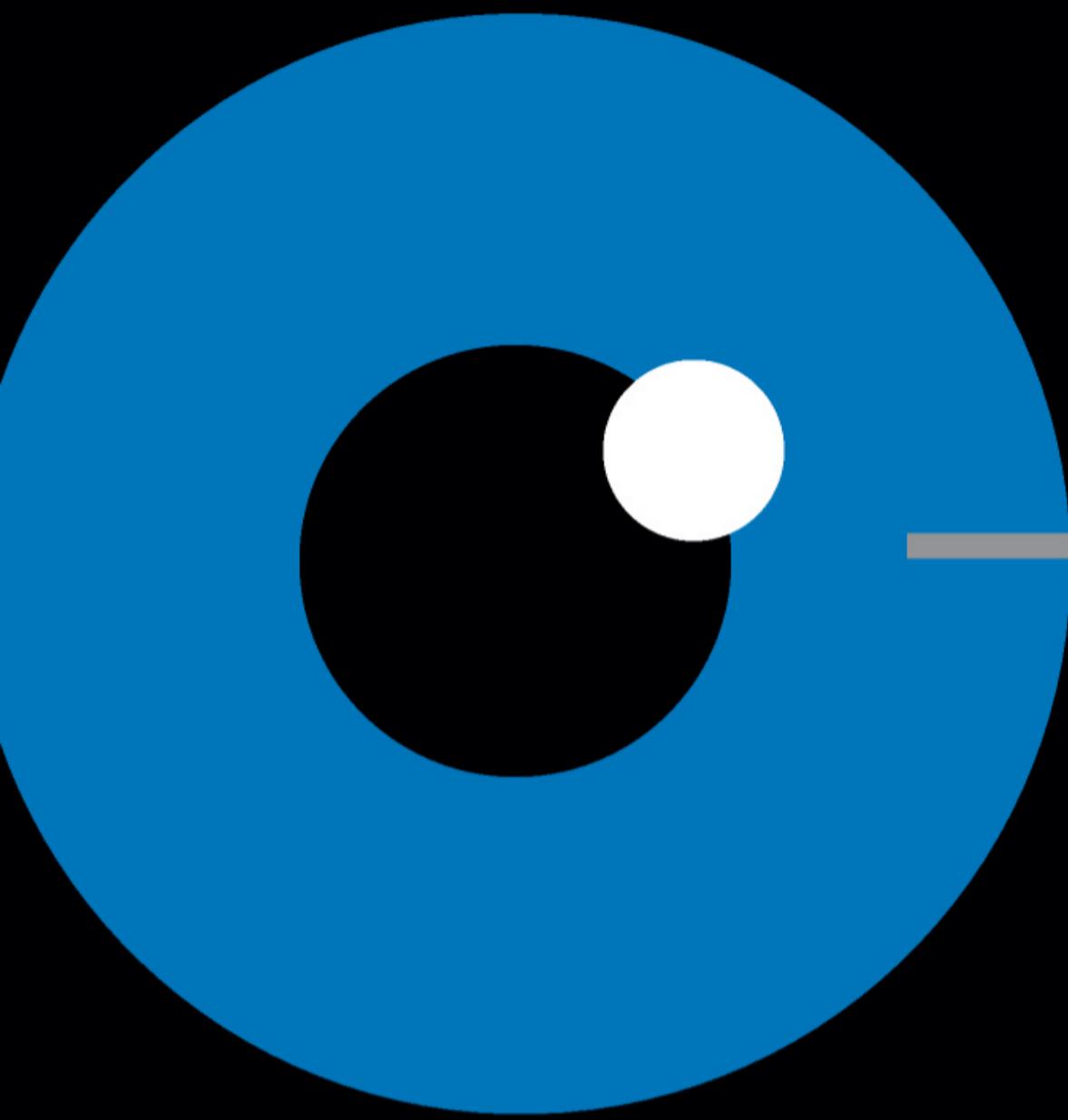
• Andrew Yang

ENTREPRENEUR

This country is deeply divided along partisan lines, with both sides pushing increasingly partisan and ideological agendas that don't align with the views of a majority of Americans. A study called "The Hidden Tribes of America" that sought to understand the reasons behind political polarization and the views of Americans found that fewer than 15 percent of respondents fell into ideological extremes. Most people—two-thirds of Americans—fall into what the study calls the Exhausted Majority, a group that feels forgotten in the public debate and desires compromise. I think most Americans are exhausted by the pummeling inanity and want real solutions that improve our lives. To break the gridlock in Washington, DC, we need to build a team of people that will work with just about anyone who wants to solve problems. That team will be pragmatic and ideologically diverse.

I'm glad to say that Americans of every part of the political spectrum already support my campaign. I'm building a coalition of disaffected Trump voters, independents, libertarians, and conservatives, as well as Democrats and progressives. What holds this group together is their desire to focus on building a country that we can be proud of. It's not left, not right, but forward.

—Response to WIRED



Up

**Can a reformed troll bring
real facts and logic to the most
toxic corners of the internet?**

for
Debate

BY TREVOR QUIRK



PHOTOGRAPHS BY SPENCER LOWELL



“My overall point,”

Dick Masterson says, barely a minute into his conversation with Steven Bonnell, “is that I think you’re kind of a weaselly piece of shit.”

“Why do you think I’m weaselly?” Bonnell replies in his slight, entreating lisp.

“You argue like a scumbag,” Masterson explains.

It’s less than a year into Donald Trump’s presidency and Bonnell is hosting a debate on his Twitch stream with Masterson, a chippy, mustached “Rand Paul Republican” who helms a weekly podcast called *The Dick Show*. Bonnell, known online as Destiny, has recently made a career of tussling with right-wing figures for the entertainment of his followers, who total about 200,000 on YouTube and more than 500,000 on Twitch. He has already dispatched a number of opponents whose notoriety exceeds Masterson’s. But this debate—this utterly fruitless debate—is where Bonnell’s intervention into the politics of the internet sublimates into its ideal.

The disagreement at hand, ostensibly, is whether Trump is racist toward Mexican people, with Bonnell arguing in favor of the motion and Masterson against. For the most part, though, they bicker over the conventions of argumentation itself. Bonnell says that Masterson must cite evidence, not “feelings,” to support his claims; Masterson insists that Bonnell is a “condescending fuck” who uses “stupid arguing tricks.” These hopeless

exchanges go on for 45 minutes, as fans flood the stream chat with Pepe the Frog memes and call Masterson names like “scrawny little bitch.” He is reduced to a mumbling state of rage. The two men end by trading insults: Bonnell is short, Masterson bald. “All right, that was about as cancerous as I thought it’d be,” Bonnell says as he logs off.

The vitriol is a typical hazard of the job Bonnell has given himself. Eight hours a day, seven days a week, he sits in the sunless office of his apartment in Los Angeles, playing games like *Starcraft 2* or *League of Legends* and arguing with anyone who’s in the mood. His desk has the quality of a nerve center. Wires converge from around the room on a pair of monitors, a softbox light, a glaring LED panel, and a camera whose eye is positioned less than two feet from Bonnell’s pale, faintly perspiring forehead. On either side of his chair are an old Casio keyboard and a pearl white Fender Strat, recently purchased. He usually starts streaming around noon; within half an hour, he’s discussing the rights of trans people, or the theory of consequentialism, or the fate of American democracy.

Bonnell first waded into the online political discourse a few years ago, driven by a kind of intellectual fury. As he sees it, many of the web’s most influential gurus and luminaries are bewilderingly incapable of critical thought. Since 2016, Bonnell says, he has confronted more than a hundred figures from across the ideological spectrum, especially on the far right. His opponents have included self-proclaimed “skeptics” and “race realists,” a libertarian activist currently running for “Not-President of the United States,” an anonymous representative of the neo-Nazi website The Daily Stormer, and the Scottish provocateur Mark Meechan (aka Count Dankula), who was once arrested and fined by the Scottish government for posting a video of his girlfriend’s pug giving the Nazi salute. Bonnell has even debated his mother for her—by his lights untenable—support of Trump and the Republican Party. “Most people,” he says, “are two to three questions away from utter collapse.”

Bonnell’s contests are nothing like competitive forensics or the polite affairs at your local university. He made his bones in the more trollish quarters of the internet, where civility is a laughable and dead tradition. The humor—at the expense of disability, ethnicity, tragedy—is depraved. Everything is



game. When Bonnell is intellectually stimulated or annoyed, which is most of the time, his rate of speech rises to that of a seasoned auctioneer. He has called his opponents “too fucking stupid to tell your ass from your fucking sister”; he has also advised them to “sterilize” themselves. So far, his boorish behavior has gotten him suspended four times from Twitch and banned three times from Twitter. But it’s been good for business: He recently moved to LA from Nebraska, where his 8-year-old son lives, in order to increase his exposure.

As in any respectable blood sport, the fights last as long as they need to, sometimes as many as six hours. Eventually, everybody runs out of bullshit, and this is when Bonnell’s work truly begins. He seems all but immune to intimidation or cruelty, and he isn’t bothered by views that might seem vile to others. (Indeed, he subscribes to a few of them himself.) What enrages him most is mendacity. “If you’re a Nazi or a KKK person, if you want to talk about white supremacy, then go for it,” Bonnell says. “Just don’t lie about it. Don’t make information up. I want to make sure everybody is in the same world and is dealing with the same factbook.”

Without that common set of truths, Bonnell says, we enter the dangerous condition of “epistemic polarity.” The idea is that there exist in the United States a variety of decoupled social realities: a reality in which undocumented immigrants and asylum seekers pose an existential threat to the nation and one in which they do not; a reality in which vaccines cause autism and one in which they do not; a reality in which climate change is a farcical means of social control and one in which it presents a threat to civilization; a reality in which a clandestine cabal of Jews subjugates humanity and one in which this is known as a virulent lie. These realities share no factual basis with each other and thus present no hope of ever establishing consensus. “I think the path we’re on now sends us to destruction,” he says.

B

BONNELL GREW UP in a conservative Catholic household in the suburbs of Omaha. Now 31, he belongs to the first generation for whom it was possible to be raised on video-games—in his case, Japanese role-playing games, whose text-heavy interfaces he credits with making him an adept reader. His parents moved away when he was a teenager to take care of an aging relative with Alzheimer’s, and he lived with his grandmother until he turned 18. He learned, he says, to be intensely self-reliant.

After high school, Bonnell enrolled at the University of Nebraska to study music while working full time as a restaurant manager at a nearby casino, mostly at night. His experience of juggling the two commitments was frustrating, sleepless, and ultimately unmanageable. Forced to choose between a paycheck or an education, he dropped out of school in 2010. Within a year, he was fired from his job. Bonnell attributes this to his own failure to navigate workplace politics. “Empathy isn’t something that comes naturally to me,” he says. “It’s very hard for me to understand other people’s emotional experiences.”

Crestfallen, he cashed out his 401(k) and took refuge in videogames and internet culture. Although the streaming industry didn’t really exist yet, Bonnell discovered a community of brash young gamers who shared his morbid sense of humor and his penchant for confrontation. When the casino money ran out, he took a job cleaning carpets. He spent 12-hour days lugging power scrubbers in and out of a company truck; sometimes he encountered water damage and would cut his bare hands on fiberglass insulation he pulled from sodden walls. He was paid on commission, averaging \$3 or \$4 an hour. “The worst part about being poor,” he says, “is the understanding that every day is potentially the worst day of your life.” It was during this time that Bonnell received “one of the

most hurtful comments I’ve heard.” A customer told him, after chatting with him for a few moments, “Wow. You’re really smart for a carpet cleaner.”

By 2011, the streaming industry was rapidly growing. Bonnell began selling ad space on his channels. Eventually, he quit his job and made streaming a full-time gig, earning more than \$100,000 his first year. But even as his financial prospects improved, Bonnell was painfully withdrawing from a relationship with the mother of his son. (The two are now on friendly terms, and Bonnell sees his son often.) This experience, along with the indignities of forgoing college, being fired from a job at which he felt he excelled, and enduring years of profitless, grueling labor, did not soften Bonnell’s combative personality nor lighten his view of the world. He describes his political identity at the time as “anti-SJW”—against “social justice warriors.” These were days when words like *cunt* and *retard* would reflexively exit Bonnell’s mouth, along with what has become a debased salutation on the internet: “Kill yourself.” The comic value of a gag was measured by its repugnance. Bonnell once quarreled on Twitter with a woman who claimed she’d been sexually assaulted. At the end of their exchange, she told him to go fuck himself. “I hope you get raped with a fucking shovel,” he replied.

Bonnell’s early antics are indefensible, but they were not, and are not, unusual. It’s fairly well documented that when a large cohort of young men express themselves online, many choose to engage in a perverse kind of catharsis, uttering precisely what they have been forbidden to say in daylit civilization. This happens in the physical world too, but is typically curbed by the normal process of socialization: A child says something inappropriate, subverting what he sees as the arbitrary nature of social norms, and an adult corrects him. But for those who spend most of their free time in front of screens, behind the veil of anonymity, the feedback loop fails. When these young men go online, their behavior betrays that they *know* they should not thoughtlessly abuse others (how could it be funny otherwise?), but they fundamentally cannot grasp *why*.

Bonnell’s political outlook began to change in 2012, when he was 23. On a trip to Poland for a gaming competition, he heard a fellow streamer say of a mutual acquaintance who was gay, “I hate that fucking faggot.” The





Bonnell at home
in Los Angeles.

slur was not a subversive joke; it was used with sincerity and venom—and for the first time it unnerved Bonnell. “It made me feel so incredibly uncomfortable,” he says, “because it was like, holy shit, *this guy hates gay people*.” He decided that it was not reasonable, nor really possible, to expect his audience to discern the intentional subtleties in his use of certain slurs, so he stopped using them. Mostly. It’s an ongoing effort, he concedes, because he’s always discovering new ways his language can cause offense. (He recently eliminated the insult *virgin* from his vocabulary.) And he sees no reason to censor his humor in private; not long ago, he admitted on Twitch to using the n-word when joking among close friends.

After the incident in Poland, Bonnell’s views began to shift from a reactionary libertarianism toward more liberal terrain. Lucas Nuzzo, a fellow streamer who befriended him years ago, says Bonnell took to politics in the same obsessive way he approaches games. “He does a deep dive into anything he does,” Nuzzo says. “He reads about it all the time; he talks about it all the time.” A true creature of the internet, Bonnell relies on Wikipedia for general knowledge. His understanding of political issues is deep but not especially wide; what he cares about most is being able to verify or disprove specific claims. (He is intimately familiar, for example, with the work of George Borjas, a Harvard economist who studies immigration, mostly because Borjas is frequently miscited by the right in order to demonize immigrants.)

From his new vantage, Bonnell could see an alarming trend: Online political discourse, whether on forums like Reddit or on YouTube, was dominated by reactionary thinking, antifeminism, and white nationalism. This was true even among his own fans, some of whom reacted savagely to the inclusion of Hispanic or gay characters in videogames. What irritated Bonnell most, though, was not so much the rightward skew but the anti-intellectualism that drove it. “It was around the Trump election cycle when I started to look at the online political conversation and realized how many stupid arguments were being made,” he says.

B

BONNELL'S FIRST MAJOR political debate took place about a month after the 2016 election. For weeks, his fans had been skirmishing on Twitter with the followers of a YouTube firebrand called Sargon of Akkad, the bizarre Mesopotamian nom de guerre of Carl Benjamin, who recently ran for a seat in the European Parliament as a member of the far-right UK Independence Party. After much instigation, the two agreed to meet online and have it out. It would be a pivotal moment for Bonnell: He would get a chance to establish his bona fides—his argumentative style, his celestial capacity for patience—before an enormous audience. And he would have an opportunity to marshal the new knowledge he had garnered in his political transition.

Benjamin was in many ways a perfect foil for Bonnell. He was among a cohort of early YouTubers who had colonized the platform with a politics constituted by antifeminism, stalwart individualism, a disdain for religion (especially Islam), and opposition to social justice. Borrowing the obfuscatory tactics of white supremacists, they masked their beliefs in high-flown words like *reason*, *science*, *rationality*, *facts*, and *logic*. They weren't reactionaries; they were "skeptics." (Benjamin calls himself an "English liberal.")

This sort of language infuriated Bonnell. He saw it essentially as a snake-oil version of his own ambition to foster independent thinking in viewers. The seductive ruse assured young, confused viewers that their restless doubt about politics—*Who is right? Which cause is mine?*—was not a kind of moral ignorance but a distinguishing talent, one that set them apart from belligerent feminists, chattering liberals, and other unthinking ideologues. One could calmly reason toward political truths; it just so happened that these truths curiously resembled those proffered by the alt-right.

Within an hour after the debate started, Bonnell and Benjamin had wrapped them-

selves around an axle. They disagreed over the causes of the disproportionate poverty found in certain black communities in the United States. Benjamin blamed low rates of marriage and high rates of children born out of wedlock. The solution, he maintained, was more marriages, because marriage is correlated with higher levels of wealth.

Bonnell seized upon the logical fallacy. "You're putting the cart before the horse," he said. "Wealthy people tend to get married. That doesn't mean getting married makes you wealthy." He unwrapped a cheeseburger and began chewing. "You understand the difference between correlation and causation, right?"

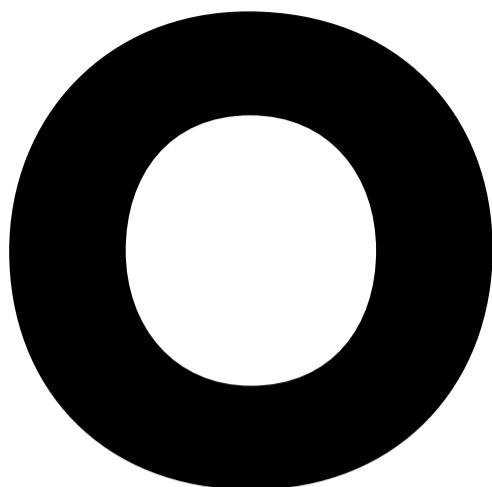
"But this is causative," Benjamin said.

Sensing vulnerability, Bonnell applied pressure. If there were a causal link between single parenthood and poverty, he said, then he should never be able to find a successful single parent at all.

"O-OK," Benjamin stammered. "I walk that back."

This, Bonnell would discover, is how a successful debate very often ends—not with a logical coup de grâce or a stunning rhetorical maneuver but with a small humdrum admission of intellectual laziness. Most of Bonnell's opponents, under the scrutiny of thousands of eyes, would rather seem thick, dishonest, or emotionally unstable than merely ignorant, which is what makes that tiny admission so powerful—and the hours of pedantry and contempt worthwhile. Bonnell was rewarded with sardonic comments on his YouTube page. One viewer wrote, "If there was one conclusion drawn here, it is that the solution to racism is forcing black kids to marry each other." Another wrote: "I was poor, then I got married 10 times and now I'm a billionaire! Carl is right!"

Bonnell estimates he has received hundreds of emails from disaffected former alt-righters. One man found himself "drifting away from extremist content." He thanked Bonnell for giving him "the tools to disprove my own opinions."



OVER THE PAST several years, as politicians, journalists, and researchers have sought an explanation for the rise of extremism online, a familiar technocratic narrative has emerged. It says that the social media behemoths—and YouTube in particular—are shepherding innocent young minds into the cognitive snares of white nationalists and neo-Nazis by tuning their recommendation algorithms to favor extremist content. One 2019 working paper on the “radicalization pipeline” even characterized viewers’ radicalization by varying degrees of “infection”; someone who was highly active in the alt-right digital universe was said to carry a “severe” infection, like tuberculosis or MRSA.

YouTube does not regularly make the mechanics of its recommendation system available to the public, and it frequently changes its algorithmic recipes. Until 2016, the system optimized for “watch time.” Now, according to a company spokesperson, it privileges attributes like “information quality” and “user satisfaction,” neither of which the spokesperson was willing to define in any detail. The lack of transparency makes independent analysis virtually impossible. Perhaps as a result, YouTube’s algorithms have earned a sinister place in the public imagination, right alongside Facebook’s News Feed.

If the recommendation system is truly a horrifyingly competent engine of radicalization, then it’s difficult to imagine Bonnell or anyone else making much of an impact. Yet the familiar narrative may be incomplete. Last fall, Kevin Munger and Joseph Phillips, a pair of political scientists at Penn State, published a corrective study of radicalization on YouTube. Using the platform’s API, which is publicly available, they examined metadata from nearly a million videos, drawn from 54 different channels. They sorted the channels into five segments: liberals (including Bonnell), skeptics, conservatives, alt-lite, and alt-right. (These last two categories distinguished

between carnival barkers like Milo Yiannopoulos and white supremacists like Richard Spencer.) Munger and Phillips found that while overall viewership in all five categories has boomed in the past decade, viewership of alt-lite and alt-right channels has actually declined since mid 2017. The highest growth, by far, occurred in the conservative category, which includes mainstream commentators like Ben Shapiro.

In seeking to explain their results, Munger and Phillips eschew the “radicalization by algorithm” hypothesis. Instead, they propose a “supply and demand” framework. YouTube, they point out, has an unprecedented ability to match “radical alternative political canons” with the communities that are prone to be persuaded by them. It allows these underserved audiences to begin “consuming media more consistent” with their true beliefs and sentiments. So while the platform may well facilitate the spread of radical ideas, it does not implant them into the minds of unsuspecting viewers. What it does do, Munger and Phillips write, is afford radicalized viewers a sense of community and shared purpose that they struggle to find in their ordinary lives.

That the far right has been able, however artificially, to fulfill these needs for thousands of people—mostly white men—is what makes this phenomenon genuinely dangerous. Scott Atran, a widely respected anthropologist who studies terrorism, religion, and international conflict, has written about the similarities between the far right in America and violent extremists in the Muslim world. In both groups, Atran says, the ability to divert or deradicalize someone “depends on where along the path to radicalization” they are. Earlier on in the process, he says, various forms of persuasion—an income, a prison sentence, a supportive community—“might

do the trick.” But if the person has bought into the radical group’s “sacred values,” the beliefs they will not compromise for anything (like, say, ethnic purity or racial supremacy), then it becomes vastly more difficult to deter them.

Bonnell shares none of the far right’s values, sacred or otherwise, but he is uniquely positioned to intervene. In 2018 the Data & Society Research Institute published a report charting the relationships between some of YouTube’s popular political voices. There, in a visualization on the report’s 11th page, lodged above the men’s rights activist Stefan Molyneux, pinched between the anti-immigrant pundit Lauren Southern and the self-proclaimed “disaffected liberal” Tim Pool, is Destiny. Bonnell has entangled himself, like a gadfly, into a web of contrarianism and derangement.

To the extent that Bonnell manages to deter radicalization and make people think critically, then, it is not because he has hijacked YouTube’s recommendation algorithms but because he knows the cultural norms that the far right trades in. If you’re someone who has succumbed to reactionary politics online, you’ll see in Bonnell a kindred spirit—a college dropout from Nebraska who scoffs at political civility, revels in seamy, self-referential humor, and will talk openly about *literally anything*. And, perhaps most important, you’ll see someone who has spent years cultivating a community that is more likely to forgive your past indiscretions than to shame you for them.

It’s more or less impossible for Bonnell to measure how effective he has been, so he grudgingly relies on intuition. After any debate, he spends a great deal of time scouring the various forums of the internet—Reddit, 4chan, comment threads on YouTube or Facebook—in search of minds perturbed. In doing so, he has noticed a common formulation of doubt among viewers, which he generalizes as, “You know, I normally really like Figure X and I think Destiny is a fucking idiot, but I don’t think Figure X responded well to what he said.”

One seemingly anodyne admission of doubt can, like a potent acid, slowly dissolve an entire system of thought. Bonnell estimates he has received hundreds of emails from disaffected former alt-righters. One man found himself “drifting away from extremist content.” He thanked Bonnell for giving him “the tools to disprove my own opinions, while avoiding the propaganda

The threats are constant. Threats against Bonnell's life, threats to rape his son, threats against the mother of his son—these come with regularity through every channel imaginable.

that reinforced it." Another grateful fan wrote that "the tipping points for me were when you covered Jordan Peterson (a seemingly wholesome do-gooder) [and] made Sargon look like a buffoon."

Bonnell's most public success story was his influence on Caleb Cain, a white college dropout who, in a recent *New York Times* feature, credits two YouTubers—Bonnell and the left-wing "video essayist" Natalie Wynn—with his turn away from the alt-right. After watching a few Destiny debates, Cain recalls, "I started learning how a lot of the crises and fears of the far right were overblown. And a lot of their facts were misused." He adds that Bonnell's "edgy personality" and barbed humor were familiar and made him feel at ease.

Bonnell's political debates have invited a somewhat predictable criticism from the left. As spectacular as many of the contests are, they carry a risk of legitimizing the lies inherent in the subjects discussed—that Jews control the world, that black people are intellectually inferior to white people, that minorities aspire to commit white genocide. A popular leftist YouTuber named Shaun, who asked that his last name not be used for reasons of personal safety, thinks Bonnell's is probably a lost cause. Far-right figureheads can never actually be persuaded, he believes, because they aren't arguing in good faith. "It is very difficult to have an honest debate with someone whose paycheck depends on them refusing to admit they are wrong," he writes in an email.

Bonnell's fans have confronted him with similar criticisms, which he regards as a manifestation of the same naivete that allowed so many to be shocked by the election of Donald Trump. The strategy of ignoring those who hold detestable views and ideas, Bonnell believes, is simply counterproductive. Besides, he agrees that there is no convincing his interlocutors. That's not his goal. The audience—a small section of the audience—is his ultimate target. He abides by what he calls the 40-40-20 rule, which holds that, in any debate, 40 percent of the audience holds an implacable allegiance to one side, another 40 percent is equally committed to the other side, and an ambivalent 20 percent in the middle is movable.

Bonnell says he is reluctant to abandon his strategy, because, for one thing, it feeds his narcissism. It also earns him a lot of money. More than that, though, Bonnell feels, not

without reason, that he is uniquely equipped to handle the emotional toll of confronting some of the worst people on the internet. The threats are constant. Threats against his life, threats to rape his son, threats against the mother of his son—these come with regularity through every channel imaginable. Once, he made the mistake of publicly discussing the death of a close friend who committed suicide 10 years ago. Later, an opponent erupted in baby talk: "My friend killed himself, guys! My friend killed himself, so you guys should feel bad for me!"

People falsely report him to the authorities for making bomb threats, harboring child pornography, and threatening to kill conservatives. "I just had my third FBI visit," Bonnell says. He's on a first-name basis with one local agent. "Usually Chris calls me and says, 'Hey, we need you to come in and chat,'" Bonnell explains, smiling darkly.



IT'S A WARM AUGUST afternoon in Los Angeles and Bonnell is debating the merits of capitalism with American "EJ" Johnson, a self-described anarcho-communist who hosts a YouTube channel and Twitch stream called Non-Compete. Bonnell's larger project has recently taken an unexpected detour into the left-wing discourse of the internet. He sees partisans like Johnson as strikingly similar to their right-wing nemeses, particularly in the ways they argue (evasively, he says) and invoke history (misleadingly, he says).

This particular contest pits the idealism and punishingly theoretical vernacular of leftism—Johnson introduces his partner, Luna, who is Vietnamese, as a "Marxist-Leninist of the Ho Chi Minh school"—against the prosaic reformism of liberal capitalism. Caleb Cain, who recently launched his own

deradicalization project, modeled after Bonnell's debates, moderates.

Johnson's main contention is that capitalism is a system of unjustifiable hierarchies that restrains humanity's potential. Its central socioeconomic promise—that you can grasp some control of your fate through work—is a lie. And when capitalism inevitably fails the majority of the population, Johnson says, the wrong people, be they Mexican or black or Jewish, are blamed for society's dysfunction and decadence.

Bonnell admits all of this but sees no reason to abandon a system that has demonstrated its potential for improvement. The experience of black Americans, he argues, has gotten marginally but measurably better in the United States over the centuries since its founding. Bonnell is also deeply skeptical of the nebulous systems of thought that constitute contemporary socialism. He presents Johnson with a scenario in which a fully democratic factory (the favored socialist synecdoche) happens to be composed of a majority of racist white workers, who vow to never elect a black manager. His question is, How can the black workers rectify this injustice? Johnson answers with anemic hypotheticals, such as the black workers forming a political coalition to concentrate their power.

When Bonnell is at his best, he is able to make a superior version of his opponent's case; this is both his most impressive and, for his adversaries, his most humiliating ability. But during the debate with Johnson, his thinking becomes uncharacteristically lazy. At the contest's highest point of tension, Bonnell claims, hyperbolically, that if Vietnam had not been a communist country in the '60s and '70s, it could have better withstood being manipulated and carpet-bombed by a capitalist superpower. "If your countries roll over because they can't defend themselves, that sounds like a good argument for my system," he says, laughing at Luna's dismay. A more cognizant Bonnell might have noted that the US' imperial dominance after World War II cannot be attributed solely to capitalism.

As the debate winds down, Bonnell seems bored, depleted. He sighs. Now years into his intervention into online politics, he is discovering that many of his leftist and progressive fans merely want a mouthpiece for their own views, which, though he considers them less barbaric and inane than the far right's, sometimes carry their own delu-

sions. That people can fail to reason seems to him, at times, unimaginable—or, at any rate, intolerable. This feeling is the source of Bonnell's defining mannerism: When he encounters a profoundly stupid idea, he stops speaking, a slightly pained look creeping across his cheeks. As his incredulity builds, he squeezes his eyes shut, twists his neck, and begins violently convulsing in his chair. It's as if his nervous system simply cannot accept that people *sincerely believe* the crazy shit they so often say.

To some extent, Bonnell's experience validates the vague liberal concern that infectious ideas are spreading online. But this popular notion commits itself to a perfunctory metaphor—that ideas are pathogens passed from one mind to the next upon exposure. In this view, the YouTube user is not an independent moral agent but a helpless victim of the algorithm. The liberal complaint isn't that YouTube is engaged in a kind of social engineering; it's that the platform is engineering for a politically undesirable output. Bonnell's approach to radicalization, so far, could not be further from this casual anti-intellectualism. As hopeless and sapping as his project often seems, it puts stock in the human capacity for reason.

Still, there have been times when Bonnell wondered aloud whether the American population is cognitively equipped to govern itself. As he said to one viewer, rather frankly, "I think that people in general are stupid, and I've actually lost my appreciation for democracy at this point." Not too long ago, Bonnell inveighed against efforts to "deplatform" prominent figures on the internet, citing his commitment to freedom of speech. Today he supports, albeit waveringly, the opposite: Those who willingly lie and misinform at great scale should be silenced. His weary cynicism about the ordinary intellect is what you might expect from someone who has spent years trying to get people to change not what they think but *how they think*. That has always been slow, hard work. And it would be almost understandable, in the midst of so much thankless labor, in a climate so wracked by fear over the dangerous contents of the American mind, to forget why you started in the first place. ■

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COLOPHON

Compromises that helped get this issue out:

Letting the dirty, shoddy dog sleep in the bed—on a specific corner of a specific blanket; flower arrangements from Costco; bowing to a passive verb when your heart cries out for an active one; handing over the carefully curated party playlist to your guests in the name of a good time; giving your dog a bone instead of bringing him to work; agreeing to move to Los Angeles so your wife could restart her acting career; eating only a tiny sliver of cake; agreeing to not talk about work and Marvel superheroes while in bed next to my significant other; choosing volume over quality; reading but not retweeting the article about the thousands of beached penis fishes; showing up late > not showing up; agreeing on a safe word before embarking on a holiday road trip with your mother; voting for a bake-off winner without tasting all the entries; taking mass transit on the way to the party, then Lyft on the way home; making the best of a bonobo handshake.

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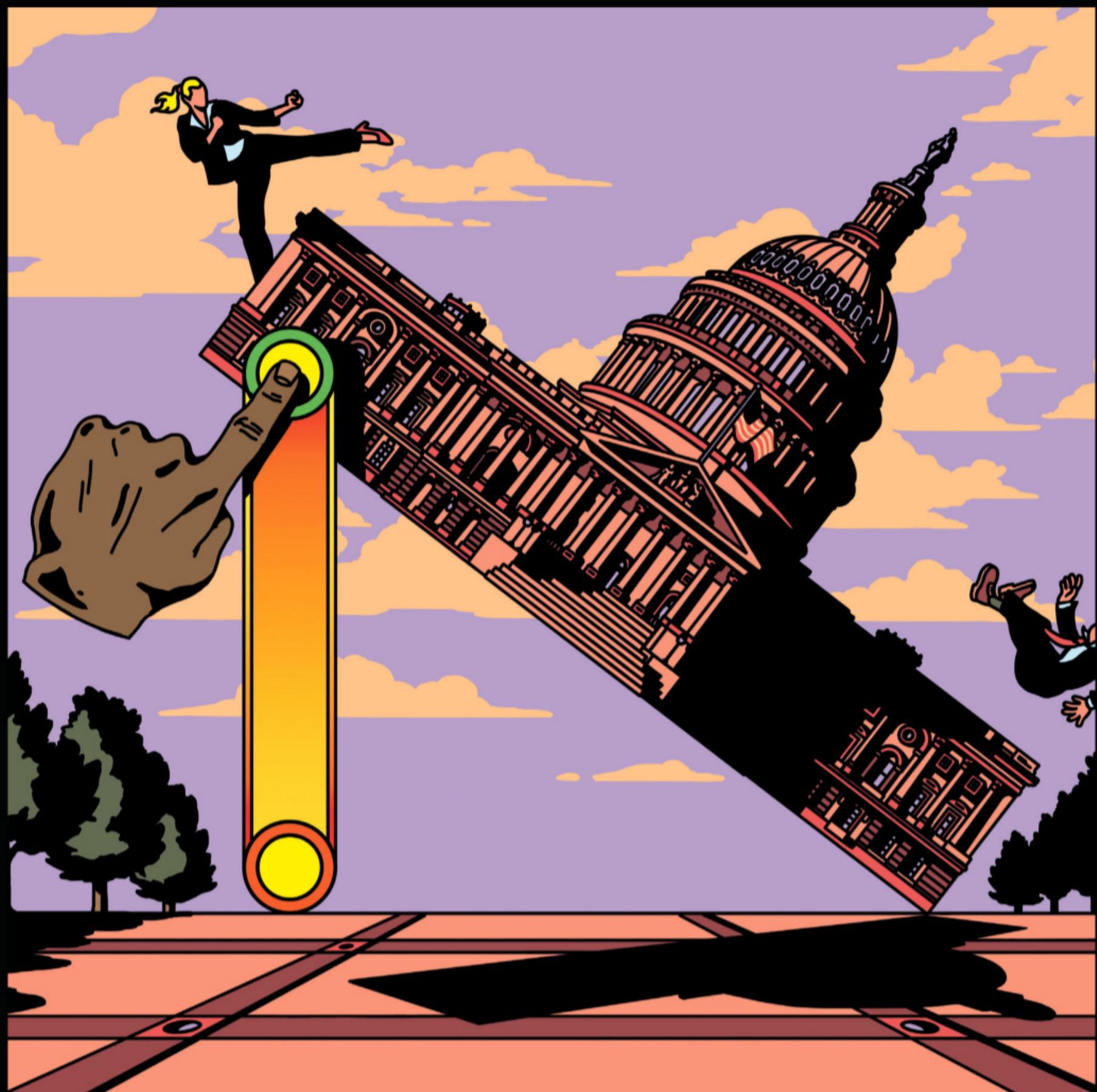
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