The Robots of Resistance

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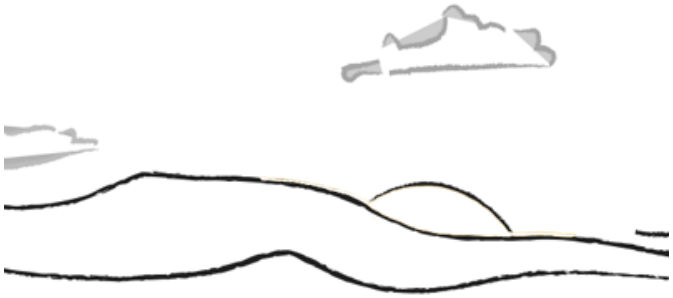


Why does new technology always seem to serve the rich and powerful?
Meet the MIT visionary who kept asking that question,
as long as he could get away with it.

SIMULTANEOUSLY IDENTIFY A PROBLEM & PROVIDE A SOLUTION: BORDER PATROLS

August 2005: Willcox Playa, Arizona. The air was hot and full of wind, the ground hard and full of cracks, and an aircraft of sorts was flying directly at Josh Levinger's chest.

It was, put mildly, irregular in composition. Its fuselage was a blue, five-gallon water cooler bottle. Its two three-liter ballast tanks once contained soda, and its aluminum propeller guard came from a bicycle. The engine originally belonged to a weed-whacker and the fabric wing overhead was designed for kite surfing. The machine's name was Freedom Flies, and almost every part of it was borrowed or homemade.

Of the four-man team testing the airworthiness of Freedom Flies, Josh Levinger, an MIT undergrad, was one of two principle players. The other, holding a radio controller, was the device's inventor, Chris Csikszentmihályi (pronounced CHEEK sent me HIGH), then an assistant professor at the MIT Media Lab.

As a concession to the heat, Chris had traded his usual collared shirt—three or four buttons always undone—for a cotton tee. Otherwise, he looked like he always did at the Lab: three-day stubble, close-cropped hair, the high forehead of a man pushing forty. Perhaps the only uncharacteristic thing about him at that moment, as Freedom Flies's propeller tunneled through the desert air, was that his tenor voice was silent. Had Chris been able to speak, or even form a coherent thought, he might reasonably have wondered whether he'd made a horrible mistake. Academia tends to frown upon injuring students.

Chris and Josh, together with two other friends—a mechanical engineer and a computer scientist—had been living out on Willcox Playa for days, launching the aircraft, crashing, repairing, launching, and crashing again. The scene, Chris later recalled, was "definitely four guys out on the desert." Their rented RV and a tent outside provided the only shade for miles. As often as they could, the gang grilled nopales—green prickly pear cactus leaves.

It was a basic way to live, and they were answering a basic human impulse: to send something into the sky that doesn't belong there. In fact, what was immediately remarkable about Freedom Flies's lumpy, un-aerodynamic bulk was the degree to which it did not resemble anything in nature that soars—bird, bat, or butterfly. Still, the irregularity of the design belied the seriousness of the endeavor: a response to drone activity along the U.S.-Mexico border. Freedom Flies may have looked like the fever dream of a junkyard attendant, but its field crew was on a mission, one with ramifications beyond the edges of Willcox Playa. The goal was to level an uneven playing field, and they had come to one of the flattest places on Earth to do it.

Now, as Freedom Flies reeled towards Josh, it resembled a pilotless version of a powered paraglider, with its rainbow parafoil unfurled overhead and engine body dangling below. The blur of the propeller formed a tan circle the size of a manhole cover. Josh's pupils constricted.

Takeoff was not supposed to go like this. Rather, the plan was as follows: Chris would pull the weed-whacker ripcord, starting the propeller and blasting backwards a column of air that would simultaneously fill the colorful parafoil tethered ten feet behind and initiate Freedom Flies's slow crawl forward. This motion would grow faster and faster until, rainbow wing now proudly inflated overhead, Freedom Flies's wheels would bounce once, twice, on the hard surface of the desert and then lose contact. At that point, Chris would take control—via a model airplane remote— sending radio signals to a tiny computer on the aircraft that would direct the mechanical motion of a pair of motorized winches, originally intended for a high-end sailboat. The winches would trim the lines leading to the kite overhead, promoting steady flight. Only then could the team take a breath, having made it through the risky part. They could switch Freedom Flies over to a GPS-guided autopilot mode and throw some fresh nopales on the grill. And the aircraft would hang in the Southwestern sky like an ugly Christmas ornament, casting fearful shadows or gleaming with hope, depending on the observer.

It didn't work out that way, however. The wind and the airflow from the prop wash together weren't enough to fill the fabric wing, so, like any kite on a windless day, Freedom Flies needed someone to pull it forward with a rope. Josh, the youngest, was volunteered. Chris said go. Josh ran. And the thing took off.

But a split-second later, Josh turned and saw it bearing down on him, propeller whirring like a kamikaze Cuisinart. He hit the deck and Freedom Flies passed just overhead. It struck the ground a few yards past his feet, skipped once, and lay still. He took a moment to treasure his continued existence. Then, he wondered what broke. Every crash entailed repairs, which meant trips to the nearest town and jury-rigging new parts out of old junk, which cost time. Six hours was typical.

Willcox Playa in August was not such a bad place to kill time, though, as long as you had friends, shade, and enough nopales. In spare moments during the day, Josh took out Freedom Flies's kite and let the wind drag him around. At night, he carried onto the black desert their infrared camera, borrowed from MIT, and watched the others glow in the dark. One evening one of Chris's friends tested the top speed of his Jetta, kicking up a clean line of dust across the playa. The setting belonged in a car commercial: fifty square miles of perfectly flat, dry lakebed, interrupted only by mirages of water and, in the blue distance, the Little Dragoon mountain range.

That surfeit of flat space was one reason why Chris had chosen the Arizona playa for Freedom Flies's proving ground. The other reason was milling about noisily a few hours south: a border militia meeting, of which Chris wanted a closer view—an aerial view, to be precise.

Six months before, Chris had conceived of Freedom Flies as a reaction to what he considered to be a disturbing technological trend at the U.S.-Mexico border. One private militia group, the American Border Patrol, had built a twenty-pound, wooden drone to watch for undocumented immigrants. They had been flying the Border Hawk, as they named it, consistently since 2004. Now, the government was following their example. The U.S. Border Patrol had been testing unmanned aircraft for use along the Mexico line since 2003, and as of summer 2005, it was preparing to launch its first Predator. The government's goal was to enforce the law. Chris's concern was that they would enforce it selectively—focusing on the immigrants trying to reach the U.S. but not on the "border extremists" within the U.S. trying to stop them.

Chris liked to build robots, and he loved to help an underdog. So, in contrast to the Border Patrol, he made Freedom Flies according to a countervailing set of priorities: to help migrants survive the desert and to monitor their encounters with militias.

Such an aircraft would need to stay aloft for a long time, which meant a gas engine. It would also have to carry a significant payload: a heavy infrared camera or drinking water. And it needed to be flashy, because sometimes a machine is more than a machine. Depending on the model and whom you ask, drone aircraft can represent progress or menace; security on the wing or death from above. Chris wanted his drone to appear as an outstretched hand to migrants, and an outstretched middle finger to those who would stand in their way.

Freedom Flies's flagrant rainbow-wing design fulfilled all of these requirements and more. Chris calculated that Freedom Flies could last six hours in the air and carry fifteen extra pounds of payload. It would only cost a few thousand dollars to build. That was important: Chris wanted anyone to be able to build his or her own Freedom Flies, and he made the plans and code available (https://github.com/jlev/freedomflies) for free.

In addition, the design of Freedom Flies satisfied a tougher set of constraints. Historically, military research had directed the development of drone aircraft, but Chris wanted a fresh technological start: a drone devoid of military DNA. That meant no parts designed for the Pentagon or its contractors. Hence all the household items.

Freedom Flies's ugly, fabric-wing, peace-loving, open-source design was, from Chris's perspective, the full package. It simultaneously identified a problem and provided an example of a solution—a leitmotif already discernible in his work at MIT that would echo louder and louder in the late 2000s.

But there was one thing it wasn't guaranteed to do. Fly.

After a series of test flights in Massachusetts, the most notable of which ended in power lines above the MIT football stadium, Chris and Josh broke Freedom Flies down into its parts, packed as many power tools as they could, and flew to Los Angeles. After an eight-hour drive in the RV, they were in the desert, launching, crashing, repairing, repeating.

Now, having fixed Freedom Flies once again after its attempt on Josh's life, the team readied for another trial. The sun was setting; the camera was rolling. Chris ripped the cord, the engine caught, and Josh ran for it. Freedom Flies finally blasted off, leaving the ground far behind. Whoops were audible.

Then the engine swung slightly to starboard. It returned left, then, sickeningly, rose much higher to the right. Chris, furiously toggling the radio controller, tried to check the motion, but not only was the pendulum swinging back left but rounding a corner as well, moving forward and adding another dimension into the equation. Facing skyward, Freedom Flies stalled for a moment, motionless, lost in the setting sun. Then, the inevitable happened: The weight swung backward and the propeller was no longer facing the horizon, but directly down. Someone let out an "Oh my God." When Freedom Flies hit, parts sprayed in all directions. The crunch was almost cartoonish, like a piano landing on a sidewalk.

Later that night, Chris cracked open a bottle of mezcal and began pouring shots, to be consumed with whole garlic cloves as a chaser. Josh was surprised to find him in such a celebratory mood. Freedom Flies was broken, perhaps for good. They had never even had the chance to use the GPS-guided autopilot system that Josh had programmed. And Freedom Flies would never cast its shadow over the militia at the border, which was half the reason for coming to Arizona. *Wasn't it?*

Chris knew better, because he understood the true purpose of Freedom Flies. It had stayed aloft for fourteen seconds, long enough to make a video of its brief flight, and that, if not the best-case scenario, was good enough. Although Freedom Flies looked and felt like an MIT engineering project, it was primarily a work of art, existing less to fly than to be *seen* flying, which the video would make possible. As Chris poured, Freedom-Flies-the-machine lay in pieces on a dead lakebed. Freedom-Flies-the-idea, meanwhile, was about to take off, and that fit in just fine with Chris's plan.

Despite holding a professorship at perhaps the world's premier engineering institute, Chris was no engineer, strictly speaking. His inventions were more about ideas and political dissent than pushing the limits of technical progress, prioritizing airtime in the media over, say, time spent flying through the air. And so there was some question about how long he, too, could stay aloft.

Freedom Flies. Credit: Josh Levinger

PRIORITIZE SYMBOLIC IMPACT OVER FUNCTIONALITY: PRESS ACCESS IN WARTIME

Chris's motivations weren't universally shared back home in Cambridge. From its inception, the MIT Media Lab, where he taught and worked, had prioritized functionality over concept. There, in the words of its co-founder, Nicholas Negroponte, students and faculty members strive not to "publish or perish" but to "demo or die"—that is, produce engineering projects that demonstrably function, at least once. Chris's approach with Freedom Flies was a deviation: By eschewing traditional drone technologies to take a principled stand, he'd favored a political message over functionality. It wasn't the first time he'd done so, either.

(Time for a disclosure: I work as a writer and video producer at a small MIT lab. I reported and wrote the vast majority of this piece well before my job at MIT began, and the relationship has not affected its tone or content.)

In 2001, several years before the rise and abrupt fall of Freedom Flies, Chris had been hired as a professor at the Media Lab on the strength of his previous projects, including a robotic, vinyl-scratching DJ. He started at MIT on September 7th. Four days later, such lighthearted fare was no longer an option.

Within weeks, Chris had drawn up the first designs for Afghan eXplorer, a waist-high, remote-controlled, solar-powered, satellite-enabled videoconference on four wheels, which journalists could theoretically send into a war zone half a world away. The project sounded

as though it had the potential to change reporting, and so reporters immediately latched on. “All I had was my website and ambition, and the *New York Times* wrote about it,” Chris said. “Which was pretty hilarious.”

That *New York Times* article read:

Last week he began to build the ”Afghan eXplorer,” a remote-controlled robot modeled on the Mars Pathfinder that he intends to send into Afghanistan in January . . . that will transmit live images and sounds from the foreign land.

”I thought, ‘Why not develop a technology that will allow me to get personal information from Afghanistan?’ ” he said. ”After the Pentagon clamps down a news hold, it’s as if Afghanistan is as remote as Mars.”’

As he continued to build the robot, more news outlets came calling, and Chris continued to push the topic of press censorship.

“The fact that none of the existing media can actually get me battlefield footage of the level that existed during Vietnam means that there’s been a huge failure in the system,” he told *USA Today*.

“Maj. Brad D. Lowell, spokesman for U.S. Central Command, which has jurisdiction over Afghanistan, wouldn’t comment on how the Pentagon might treat a creation such as the Afghan eXplorer,” The *Los Angeles Times* reported.

But all the attention was contingent on Afghan eXplorer being real: that Chris really intended to send droves of them to Afghanistan, and they would really function as remote-controlled journalists.

“Mr. Csikszentmihalyi, 33, insisted this was no hoax,” reported *The New York Times*.

“This is not a media virus,” Chris told Salon. “We’re doing this.”

But that wasn’t what he told me. “Afghan eXplorer hardly existed. That was definitely a media intervention,” Chris said. “There was a robot, and it worked on some level, but it was a pretty stupid idea.” The prototype never patrolled beyond greater Boston.

Yet Afghan eXplorer still fulfilled two distinct missions. The first was to target the issue Chris had been bringing up to any news outlet that would listen: press access in wartime. “I was talking to journalists, and basically the smarter journalists would say, ‘Do you really think this is the solution?,’ and I would say: ‘No! Journalism works. Clearly the solution is sending journalists to Afghanistan and allowing them to report where our tax dollars are

going, whether the government is taking care of our kids, who we are there to fight, whether we're choosing the right strategies, and to let, in a democracy, people know which politicians to vote for based on those problems.'"

The *Times* reporter, to his credit, seemed to be one example of a "smarter journalist," capable of recognizing the legerdemain in Chris's use of a robot to provoke discussion of press access. The last line of that article reads: "Everyone, it seems, is playing games, or something like games, these days."

But the act of "playing journalists," as Chris termed it, didn't bother him in the slightest—if anything, Afghan eXplorer empowered reporters to cover a taboo subject, he said. "What the journalists would say to me was, 'If I were to go to my editor and say that I wanted to write an article about Pentagon press censorship, my editor wouldn't let me write that article. But they will let me write an article about a technology to bypass Pentagon press censorship in Afghanistan.'" To get that topic into the news—from the BBC World Service to CNN—was a victory in itself.

The second mission was closer to home. In addition to journalism in wartime, Afghan-eXplorer-as-media-artifact questioned why, in Chris's view, so many engineers are producing incredible advances in robotics that primarily exist to kill people, and then, only as a side benefit, to help us.

Afghan eXplorer. Credit: Chris Csikszentmihályi

WHY DO NEW TECHNOLOGIES SO OFTEN SERVE THE POWERFUL FIRST: STOP WAR

A variant on that question had been troubling Chris since he dropped out of Reed College in 1988: *Why do new technologies so often serve the powerful first, and everyone else as an afterthought?*

Chris grew up “a university brat” in the Hyde Park neighborhood of the University of Chicago. His father, Mihály Csikszentmihályi, has been described as the world’s leading researcher in positive psychology, and is known to some as the “father of flow”—the field of psychology concerned with the feeling of intense concentration that is experienced by a tennis player “in the zone,” a jazz saxophonist in the midst of a solo, or a computer programmer “wired in” to her coding.

Chris was born in 1968, and when he was young, psychology was a field devoted to solving mental disorders. Mihály was something of a rebel: He focused not on what could go wrong with the mind, but what it was capable of when functioning optimally. “He’s really, in some ways very different from his other colleagues,” Chris said, “and had a lot of trouble establishing himself.”

Ultimately, like his father and his older brother, Mark, who teaches East Asian Languages and Cultures at the University of California, Berkeley, Chris would wind up a professor, but not before trying almost every alternative. “As this rebellious younger brother to my older brother,” he said, “I’ve tried to do everything opposite.”

Shortly after dropping out of Reed, Chris worked a series of temp jobs for a year, picking up some computer programming skills along the way, until he moved back to Chicago. The year was 1989, and Chris’s new skills were in high demand. He found work at Jay Doblin and Associates (now simply called Doblin), a boutique design consulting firm with Fortune-50 clients.

“While I was there, people were talking about the Media Lab a lot,” he said. “One of the first things I saw come out of the Media Lab was this kind of flexible, piezoelectronics that you could put in shoes that could allow people who walked a lot to recharge their cell phones.” His mind immediately went to Africa, to developing nations “where there might not be electricity but people walk a lot,” so this technology could “give them the beginnings of electronic communication.”

But his client company had other plans.

“In the end, I was showing this stuff to a shoe company that we worked for, a big shoe company, and they ended up putting lights in the back of sneakers,” he said.

Chris wanted to know why it was that such a promising technology had to serve the rich and powerful first. Why sneakers for the children of the wealthy over communications for the poor? “How does that process happen?—The unlimited potential, and the impoverished end use,” he said. “And so I ended up having to quit the job, it was so bothersome.”

He got some of the answer to his question soon afterward. Because he’d enjoyed aspects of the technical work he’d done at Doblin, he checked out some engineering programs. In the engineering classes he sat in, every example problem, he said, started with the words, “*Your client wants you to…*” Your client wants you to design a control system for an elevator. Your client wants you to write software for a bank.

“What I saw pretty quickly was the kind of examples they gave were *so* not what I was interested in. And that’s where I began to realize that engineering education itself starts this normalization process, whereby good ideas are going to have trouble getting out.” The more he researched it, he said, the more he “came to realize just how conservative, socially and politically, but maybe more importantly in every other sense of the word, the engineering education process is. The real hint was every example starts with, ‘Your client wants you to….’ And what that does is remove responsibility to some degree from the engineer.”

So Chris went in the exact opposite direction: art school, at UC San Diego.

It beckoned because, compared to solving problems without asking why, “Art is the opposite,” he said. Art doesn’t care what your client wants from you, because you don’t have a client. Better yet, “Art was flexible enough that I could act like an engineer and do engineering projects, but, ultimately I would be judged on the concept behind the technology. And there would be relatively little bounds of what kinds of technologies I would be allowed to make.”

Chris knew nothing about clay, pencils, or paintbrushes. But he knew a little about computers and servomotors and, because the first Gulf War had just ended, it was easy to obtain them. “My colleagues who were painters would buy acrylics, stuff like that. I had to go out to the suburbs to these surplus stores that sold electronics at a price an artist could afford. It was at least fifty percent military surplus. So I would be making some new piece using something that had come out of some weapons system while the first Iraq war was happening. At some point I just couldn’t ignore it.”

And, although many did, he said he also couldn’t ignore the looming threat of a bloody conflict in Yugoslavia. He recalled a surreal moment in 1992, as the Yugoslav wars were beginning, when, “like the invasion of Iraq, you know long before that it was going to happen, but you don’t know exactly when.” As he picked his way through bins of surplus military electronics, something clicked: There are machines galore devoted to starting and fighting wars, but there are none that can stop them. So he invented one.

Named Hunter Hunter, it was his first, crudest robot. Although it presented Chris with an immense engineering challenge at the time, the premise was simple: a swiveling gun on a tripod that, upon detecting the sound of gunfire, would immediately fire back at the sound. If you scattered Hunter Hunters in a place where war was about to break out, the reasoning went (provided you didn’t take that reasoning too far), no one would ever take the first shot.

Igor Vamos, who had attended Reed at the same time as Chris and was also studying art at UC San Diego with him, loved the project. “In a way it’s about the monsters we create in things like military funding,” Vamos said. “It’s a thing that’s responding without a brain.”

“My first real art piece, and the reactions were crazy,” Chris said. “All these men who came to the show were like ‘Wow, is that patented? Are you gonna start a business with this?’” He would tell them, uh, no: “This is supposed to be dystopic.”

Contemporary art encompasses everything from tiger sharks preserved in formaldehyde to black-and-white photos of glass flowers to giant sculptures of balloon animals. There are no rules, no valuations, almost by definition. But people try anyway to differentiate good art from bad, and if there’s anything resembling a rule or a ratings scale that allows one to take a shark and compare it to a room full of porcelain sunflower seeds, it’s the idea that the art should evoke something in its viewers. In a way, the contemporary artist sculpts reactions: How will this work affect the way people see the world?

Chris’s question was: Could engineers be induced to consider the impact of their work in the same way?

For decades, the issue had been vexing university Science, Technology and Society departments—the branch of liberal academics that deals with how culture affects the development of science and technology, and vice versa. The problem belonged to a broader line of thought first articulated by the French philosopher Jean Baudrillard, who argued that a technical object has not only a functional reason for existing—in his words, what it “denotes”—but it also comes loaded with additional associations—what it “connotes.”

For instance, take a ’57 Chevy, a tailfin-sporting model adored by collectors. “It’s supposed to get you to work and let you pick up your kids at school and help you take a picnic in the countryside,” Chris said. “That’s the functional, denotative side of the technology. But we all know that the ’57 Chevy is completely different from the Fiat 500″—despite serving the same functional purpose—and that difference reflects “the connotative side of the technology.”

A technology like the ’57 Chevy tends to connote the same kinds of things to most people: beautiful, old, fun. But some technologies don’t treat people equally. Take a surveillance camera, which comes with two connotations—security (good) and being watched (bad). The connotation you experience has everything to do with which side of the camera you’re on. In this respect, a surveillance camera has a lot in common with a gun. George Orwell had great respect for the power of the surveillance camera—so much so, in fact, that the ruling Party in *1984* required little else, technologically speaking, to crush dissent permanently. To Orwell, life under the gaze of ubiquitous cameras resembled “a boot stamping on a human face—forever.”

After art school, Chris and Vamos both ultimately found work as professors in the Integrated Electronic Arts Studios concentration at Rensselaer Polytechnic Institute in Troy, New York, the oldest technological university in the U.S. There, Chris tried to get his

students to apply the same process of art critique that had been so foundational for him in art school: considering the connotations of new technologies from multiple perspectives. Convincing engineering students to grapple with the meaning of their work in addition to its functionality was not easy. “I found that the engineering students would turn bright red often during that process,” Chris told me. “They would hear really smart, sophisticated interpretations of what they had just built from their classmates, and they would say, ‘No, no, no, that’s wrong.'”

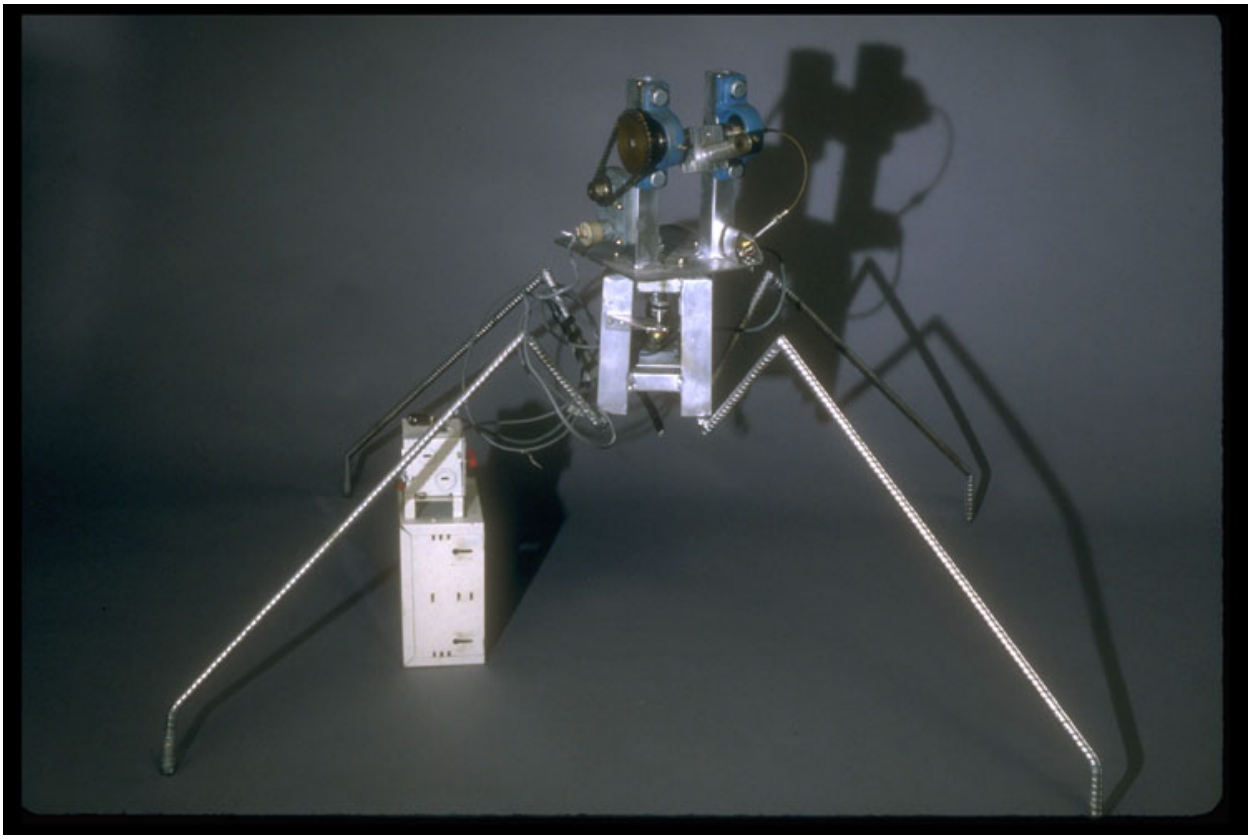
Chris was building something of his own at the time: In 1999, he unveiled his robotic DJ that mixed and scratched physical vinyl records. DJ I, Robot, as it was known, was playful at a surface level, yet also complex. A work of digital art, it also produced its own art in the form of analog musical recordings. The piece received favorable media coverage for its cleverness. But the discussion stopped there.

Meanwhile, Vamos was up to something. In May 1999, with a presidential race gaining steam, he and two friends launched the website gwbush.com. It was close to Bush’s campaign website in name but not in content: The doppelganger site prominently featured a doctored photo of the then-governor in a cowboy hat, snorting white powder through a straw. It quickly made the national news and probably would have faded from sight equally rapidly if it weren’t for the effect it had on the president-to-be. When asked about it at a press conference, Bush responded with a line that would haunt him: “There ought to be limits to freedom.”

Vamos became an associate professor at Rensselaer Polytechnic and, in 2003, was awarded a Guggenheim Fellowship. He continued pranking people in his spare time. During the 2000s, he and a partner from gwbush.com, who had together adopted the name “The Yes Men,” struck again and again, most often by pretending to be spokesmen of corporations (Dow Chemical, Shell Oil) and conservative organizations (the U.S. Chamber of Commerce). “We tell little lies in order to get at big truths,” Vamos told MSNBC’s Dylan Ratigan. (One such lie is Vamos’s name; as part of the Yes Men, he goes by Mike Bonanno. I’m not outing him: both names are available on Wikipedia and Rensselaer’s website.)

For his day job, Vamos would remain at Rensselaer, exploring environmental and social problems through his work as a multimedia artist.

Meanwhile, fresh off the success of DJ I, Robot, Chris found himself with a job offer from the MIT Media Lab.



Hunter Hunter. Credit: Chris Csikszentmihályi

HOW DO WE CHOOSE WHICH PROBLEMS TO SOLVE WITH TECHNOLOGY: ROBOTICS

When it was founded in 1985, the Media Lab's name was synonymous with its mission: to explore how new technologies, especially computers and their networks, affect the sharing of information. As time passed, however, the Lab's purview expanded to include anything that affects human experience, such as genetics and robotics. Through it all, the Lab has continued to produce media of a subtle yet profoundly powerful form.

Traditional media sources tend to answer the questions we know we have: "Did O. J. kill her? What's the best car to buy? Which candidate cares about the environment?" We ask these questions, but we don't always know *why* we're asking them. The same thing can happen on a technological level: "How do you design a better elevator?" Traditionally, the job of the engineer is to solve problems like that, not question them. But some new technologies cut deeper: solving problems on a functional level, but also raising the question of how we choose which problems to solve. *Why put lights in kids' shoes when that same technology could charge cell phones in rural Africa?* For a more recent example from the MIT Media Lab, take Clocky, a furry alarm clock that jumps off your bedside table and skitters around the room when it goes off. *Why do we design our alarm clocks with self-defeat, in the guise of the snooze button, built in?*

That is, the inventions that come out of the Media Lab prove again and again that we already have the technology to live differently, but we don't often take advantage of it. In this sense, the Media Lab is a factory not only of electronic gizmos, but also ideas that call

into question fundamental aspects of ourselves—our challenges, motivations, visions of the future. As these ideas spread from person to person, they become potent memes: The moment you encounter them, they change your world.

Still, no matter how heady a meme is, if it hopes to reach an audience it needs a distribution agent such as television, the Web, and newspapers—it needs "media." Traditional news channels, however, are not always willing or able to convey such information. In those cases, media has to be convinced, cajoled—manipulated—to carry the message in question. Usually, such convincing falls to university PR departments and their enthusiastic press releases. Chris thought he had a better way.

The area immediately outside Chris's office at the Media Lab, where his students worked, looked like something out of the set for a Terry Gilliam film. In one display, called the Junkyard Jumbotron, a conglomeration of nine computer screens of different sizes and aspects produced an ugly composite image. Coffee tables turned out to be glass touch-screen monitors. Most memorably, the entire space was littered with mannequin heads, limbs, and torsos. I've asked a number of people about them without ever receiving a satisfactory answer.

In fall 2010, I was talking with Chris in his office when he gestured to the wall behind me. A mock *New York Times* front page was framed there, dated November 12, 2008. The main headline read, prematurely, "Iraq War Ends." Below, the page heralded a new "Maximum Wage Law," and a headline proclaimed that Condoleezza Rice had apologized for a "W.M.D. Scare." Thomas Friedman announced his imminent retirement.

It was a fake—courtesy of the Yes Men—and it explained something about Chris. He didn't belong to his friend Vamos's prankster collective, but he certainly appreciated the power of their approach, and his own work nodded to their methods. Rather than disseminating his ideas by printing a fake issue of the *Times*, he could mislead his way into the real newspaper by claiming, for example, that Afghan eXplorer was "no hoax."

Like many other Media Lab offerings, Afghan eXplorer questioned basic assumptions about technology, such as the notion that killer robots are a good idea. But only by adding a little bit of Yes Men into his approach, proudly proclaiming that Afghanistan would soon be swarming with the 'bots, could Chris amplify its message.

"That project, I really enjoyed. In a way, it's like agitprop, it's a kind of media stunt, a media spectacle," Vamos said. "Regardless of whether the robot works, what it does is tell a story."

Skin. Credit: Chris Csikszentmihályi

TO LEVEL THE PLAYING FIELD, DESIGN AN EQUAL AND OPPOSITE TECHNOLOGY: INVERSION

That Afghan eXplorer told the exact story Chris intended was an achievement in itself, because history, in his reading of it, was replete with scientists and inventors who had tried and failed to anticipate the broader implications of their work. One legacy of special significance to Chris was that of Alberto Santos-Dumont, the Brazilian aviation pioneer and contemporary of the Wrights. When Chris brought up Dumont, he leaned forward in his chair. Dumont built early dirigibles and then airplanes, Chris said, and, "He said as he was doing this, that this was going to make the world so small that no one would ever have a war again.

"He ended up committing suicide in Rio," Chris said. "He had moved back to Brazil from Paris—he was an old guy and probably a little addled. And he heard the government bombing the suburbs on the outskirts of Rio, because there was a kind of incipient revolution, and the government was using airplanes to basically carpet-bomb the poor neighborhoods where the revolution was coming from. And he excused himself from breakfast or whatever it was, and went up to his room and hung himself from a tie."

Chris had contended with the connotations of the airplane himself in a 2004 art installation titled *Skin*, which consisted of a section of a Boeing 737 fuselage slicing at an angle through the white plaster walls and hardwood floor of a SoHo gallery space. In that exhibit's catalog, I found perhaps the closest thing to a manifesto that Chris ever put forward. "Technology

is, like government or economics, a human activity that needs to be organized and governed," he wrote. "Our culture treats technical matters as it did economics during the gold standard."

I got the sense that this argument might have come up over Thanksgiving dinner. When I'd asked Chris to compare his father's work with his own, he stressed his father's faith in the power of the scientific method to make the world a better place: "His belief was really sincere and still is." But Chris had his doubts. "I love science and I'm so happy that so many people are doing it really well," he said, but, "I think that there's a lot of fields where their work is used in ways that they don't recognize, and that they're often not taking a large enough voice in expressing how their work interacts with the rest of society."

In 2007, after gathering up the pieces of Freedom Flies from the desert floor, Chris would have one more robot in him. Called Roboat, it was a GPS-guided kayak equipped with a megaphone on an accordion-style riser that could, in theory, blare the words "*Restore Habeas Corpus*" towards any island-based prisons located, say, ninety miles south of Florida.

One thing Chris's robots of land, air, and sea had in common was that they were never likely to enter production. Afghan eXplorer's stated mission was impossible: Chris described "the chances of it surviving more than five minutes before it would get shot by either the Taliban or the U.S." as " like, zero"—and anyway, tipping it over onto its back would have scuttled it just as effectively. Freedom Flies made a difficult task more so by eschewing any military technology. "If I simply wanted to take photographs of the border patrol people, it would have been very easy to hire a plane," Chris said. Roboat, meanwhile, got scooped by filmmaker Michael Moore, who simply chartered a boat to Guantanamo. (Chris says when he saw the trailer for Moore's film, *Sicko*, "I was like, "Fuck him! Fuck *him*.")

Chris wanted his creations both to work in an engineering sense and to deliver finely honed artistic messages. "I really want to do both, and go as far along both paths as I can," he said. But eventually art had to win out, because, he added, "I'm a miserable engineer. I mean I essentially have zero formal training."

But that wasn't the case for his students. The Media Lab is composed of working groups of students that revolve around one or a few professors. Chris called his group Computing Culture, or CompCult, for short, and its ranks quickly filled with students who had legitimate engineering chops. One early student project, 2004's TXTmob, provided mass protesters and demonstrators with a platform for group text messaging. Despite its niche roots, it would have major mainstream ramifications. Evan Henshaw-Plath, the lead developer at the podcasting startup Odeo when it changed course and became Twitter, tweeted in 2013: "Odeo's idea for twitter came directly from TxtMob."

In addition to establishing CompCult's dotcom bona fides, Tad Hirsch, the student behind TXTmob, brought something else to the group. He gave a name to what Chris had been doing for years: inversion.

The idea behind inversion is disarmingly simple: whenever a technology threatens to prop up someone in a position of power, a good way to level the playing field is to design an equal and opposite technology. Afghan eXplorer and Chris's other robots inverted the tools of government oversight: Government drones watching over civilians became civilian drones watching over government agencies (and the occasional civilian militia). Inversion was a viable response to the question that had been nagging Chris since his youth: *Why do new technologies so often serve the powerful first, and everyone else as an afterthought?*

But since Chris's robots only achieved this inversion on a conceptual level, not in practice, it took another student to see the logical next step: to make inversion real.

Enter Ryan McKinley, a student who had followed Chris to MIT after being taught by him as a teaching assistant at UC San Diego. McKinley also happened to be a young programmer so promising that Silicon Graphics, the high-performance computer company, paid him to keep one of their machines in his dorm room, just to play with. If Chris could invert the tools of governmental scrutiny, McKinley would invert the very concept of a government watching its citizens.

Chris turned his gigantic computer screen towards me. Onscreen was the all-seeing eye from the back of the one-dollar bill, casting what looked like a beam of light onto planet Earth.

"This is the official Total Information Awareness logo," he said. "Which got them in a lot of trouble. Like, bad graphic design." The Total Information Awareness program was put in place in 2002 by DARPA (Defense Advanced Research Projects Agency, a branch of the Defense Department that is famously responsible for the idea of the Internet). The main idea of TIA was to tie together every possible source of information about as many people as possible, regardless of whether they were suspected of criminal activity.

"And this," Chris opened another window on his computer, "is what Ryan proposed." The very image of the TIA logo had been reversed: the world was now watching the all-seeing eye. "It was a simple inversion, but it had a good beat you could dance to," Chris said. "The argument was, if the government thinks that the way to get information about terrorists is to troll all of our data all the time, then let's just do that for the government."

McKinley named the project GIA, for Government Information Awareness. It catalogued everything anyone could find out about elected officials: their voting and campaign finance histories, attendance records, relationships to special interests, down to even their fraternity

allegiances and children's schools. Any government official at any level was fair game. At first, McKinley used web-crawling programs to extract this information from various databases, and to pull imagery off C-SPAN. But after priming the pump with that first stream of information, he opened the floodgates to the public: the site's content would be crowdsourced.

"Wikipedia was tiny at that point," Chris said, and the idea that a faceless online hive of users could provide useful, accurate information felt new and unfamiliar.

"It ended up being about six months of solid work," McKinley told me. "On the Fourth of July, 2003, the Media Lab issued a press release. The media had a huge response. On a cultural level, it was a big success."

Liberals and conservatives alike showed keen interest in the hidden lives of their elected officials, and McKinley appeared on *Fox and Friends* and in a video interview on The Drudge Report. Stories about GIA appeared in *The Washington Post*, CNN, *Wired, New Scientist*, and elsewhere. The site received so much traffic that its servers crashed.

"On a technical level, I was in over my head," McKinley said. "Literally, it was my first foray into writing web things. The server we went live on was a desktop computer sitting literally at my desk. Technically, it kind of fell apart at first."

GIA "ran in earnest for six months to a year," McKinley said, but it was too big for him to sustain—too much information to gather, too much to edit. It faded away in mid-2004. "Essentially the data becomes old really quickly. There was no great way to keep things clean," he said. "It went out with a whimper."

But to hear Chris tell it, GIA managed to infuriate some influential people at the Lab even as it evaporated. By looking at archived copies of the Media Lab's website on Archive.org, I was able to verify that in May 2005, the National Security Agency was added to a list of Media Lab sponsors with ongoing research contracts. Between September 10 and October 20, 2006, the NSA disappeared from that list.

Chris thought he knew why. Sponsors' representatives frequently dropped by the Lab, he explained. From the NSA, he said, "there was this woman, I think her first name was pretty consistently Penny, but her last name would change." Her issue was always the same, he said: How to find useful information in massive piles of data, the sort of dragnet approach to surveillance that GIA had inveighed against.

At one "particularly uneasy lunch," Chris recalled, Penny said: "'We just feel the Media Lab isn't dealing with our issues directly enough,'" and that Chris's attempts to turn surveillance back against the government made the NSA representatives particularly uncomfortable.

Chris told me this in 2010, and I wasn't able to verify his version of events. But the timeline fits: 2005 was the first year that news reports showed that the NSA was intercepting the communications of Americans. And, as Edward Snowden revealed in 2013, the agency would spend the next decade sifting through Borgesian numbers of phone calls and emails, looking for any pattern correlated with a threat.

I asked Josh Levinger if the NSA had really withdrawn its funding because of Chris. "I've heard that as one of the stories," he said. "I'm sure Chris would love it if it were true."

I would have loved it too, because it would have made this story easier to tell. Chris had introduced to me a troubling idea, that: "MIT has particularly strong white blood cells. It's not a person, it's not an intentional thing," he said, but "It can recognize concerns or projects or even people that are not in fitting with what will make it thrive the way it is. And those white blood cells are really, really, effective."

Strong evidence that the NSA departed because of Chris would have supported the idea that some at the Institute found his work threatening. Through his projects, Chris had indeed taken shots at academics who, he argued, were effectively building killer robots and contributing to domestic surveillance without fully considering the potential effects. But it wasn't clear that those shots had landed. Evidence of a response from those parties—or even the acknowledgement of Chris's attacks—was thin at best: rumors of an angry email here, a potential lost sponsor there.

By the late 2000s, Chris stopped producing robots—an inadvertent result of the success of GIA. McKinley's website had demonstrated that creating a brand new media outlet could do more than hijack traditional media, as Afghan eXplorer had. It could also affect the culture by performing its intended function—in this case, shedding light on government officials.

When Chris saw that GIA could not only deliver a message but also perform a denotative function in a way that his robots never could, together with two other MIT professors, Henry Jenkins and Mitch Resnick, he applied for and received funding from the John S. and James L. Knight Foundation, a major nonprofit funder for media ventures. The group they co-founded in 2007, the Center for Future Civic Media, would be dedicated to technological innovation for journalism and information sharing—a return to the original foundations of the Media Lab.

The Knight Foundation knew his work, Chris said, but in addition, "They had this old journalism phrase, that their job was to 'comfort the afflicted and afflict the comfortable,'"—a manifesto, it's worth mentioning, that is built on inversion. "I decided that part of the fun of the Center would be taking some of the ideas that we'd have at CompCult," Chris said, "and seeing what you could do to scale them."

In short order, students from C4, as the group became known (the abbreviation is also the name of a plastic explosive), produced a long list of projects, including SourceMap, a website that tracks the origins of materials in consumer products; and Between the Bars, a system that allows prisoners to operate blogs by sending out snail-mailed postcards.

One notable project was a trio of websites collectively termed extrAct, which attempted to monitor the practice of hydraulic fracturing, or "fracking."

A large natural gas boom had been taking place in Ohio, a state with some of the most lenient laws governing gas extraction in the U.S. Dismayed property owners were finding that even in suburban areas, wells could be sunk a mere 100 feet from homes. In late 2007, natural gas seeped through the ground into the water well of a house in Bainbridge, Ohio, a small town near Cleveland, and made its way into the basement. On December 15th, the bottom of the house exploded, lifting the entire frame off the ground. Its two residents, sleeping upstairs, miraculously avoided injury, though downstairs, windows shattered and doors were found twenty feet from their hinges. Ultimately, the Ohio Department of Natural Resources blamed the gas-contaminated well on nearby hydraulic fracturing, which uses high-pressure injection of water, sand, and chemicals to force natural gas out of the ground. The technique is common now, but was relatively new then.

That year, Chris started extrAct with Sarah Wylie, "a particularly, shockingly, bright student." The Ohio explosion "didn't get anywhere near as much press as you might imagine," Wylie told me. "It didn't make national press. It made it into local newspapers, but even local people weren't really aware of it after a couple of months."

In general, it was hard for locals to keep track of how gas wells were affecting their communities. "Even in relatively small towns and cities like Cleveland, news articles get lost in the shuffle," Wylie said. As a result, community organizers took it upon themselves to establish a record. Wylie and Chris both reported seeing local organizers carrying around thick binders full of news clippings related to natural gas extraction. Contaminated drinking water and exploding houses weren't the only issues at stake. So was the economics of gas. "The more I talked to her about what's going on with hydrofracking and extraction in general, the more I remembered traveling out to the Rockies as a kid, and how these ghost towns and boom-and-bust cycles were so devastating to communities," Chris told me.

ExtrAct was an umbrella term for three component websites:

* Newspositioning.com collected local news about gas drilling in one convenient place.

* Landmanreportcard.com provided user-generated information about landmen, the prosaically named but not-always-scrupulous people who approach private landowners on behalf of natural gas companies to buy up property and negotiate drilling rights. (Matt

Damon played one of these in 2012's *Promised Land*.)

* And wellwatch.org, which provided a place for people potentially affected by drilling to create a nationwide record of complaints—health issues, cattle or pet deaths, exploding homes, and so on.

Shortly after C4 was founded, internal shifts at MIT left Chris solely in charge of it. And at the same time, he was growing concerned about how extrAct was being received at the Institute.

Hydrocarbon companies were becoming a significant part of the funding picture at MIT, via a massive ongoing project established in 2006 called the MIT Energy Initiative, which had, in its first two years, attracted more than 250 million dollars in funding, much of it corporate in origin. The MIT Energy Initiative "is the biggest game in town right now," Chris said in early 2011. He proceeded to read off a list of founding members on his computer screen, names including BP; Shell; and Eni SpA, the Italian oil-and-gas giant, as well the names of sustaining members: Chevron; Lockheed Martin; Saudi Aramco; Siemens; and the drilling company, Schlumberger.

"It's antithetical to what we're doing," Chris said, noting that the MIT Energy Initiative "published a pretty big report that's the strongest scientific endorsement of natural gas drilling that's ever been published." I looked up the report. It was indeed heavily pro-gas.

Meanwhile, by 2008, extrAct was humming—not only drawing the expected media attention but, more importantly, serving as media in its own right, enabling users to either resist or strike more advantageous deals with the drilling companies approaching their communities.

Chris had come a long way from building robots. "Coming from art school, you don't really tend to think that you're going to have that big an impact in the world. It's pretty rare." Artists work "at the level of symbolic impact." GIA, and then the projects of C4, represented a move from the symbolism of Afghan eXplorer and Freedom Flies to more concrete results. Still, that didn't stop Chris from sneaking his messages into news coverage. If anything, the real-world functionality of GIA and Landman belied their inherent subversiveness—always questioning the problems we choose to solve with technology, always asking: *Why do new technologies so often serve the powerful first?*

In short, Chris and his students were creating useful, functional technologies while also directing their cultural effects as though they were works of art. As the full scope of what Chris was doing finally became apparent, I had a realization: Here was an artist at the top of his game, doing something no one had ever really done before. But no one knew about it, because the mechanisms that normally establish an artist's name didn't work in his case.

The press could only report on his individual art exhibits, robots, and websites, giving him the unfair reputation of a jack-of-all-trades, while his various endeavors were actually all part of a unified effort to spread messages about the politics of technology. He was unlikely to ever be fairly evaluated on his work, and he was pushing forward with it anyway.

Even as C4 looked increasingly like it would become Chris's most enduring legacy at MIT, it also signaled that his relationship with technology was changing. There was a growing sense in his work that if the democratic control of technology couldn't be achieved, perhaps technology itself could be harnessed to promote democracy.

This idea even trickled into his gallery shows. First Airborne, a 2007 installation, featured giant, helicopter-blade-shaped maple seedlings with pods the size of the most common bomb used by the U.S. military. Once again, Chris was speaking to how, through science and technology, we've applied the lessons of nature—in this case, aeronautics—for destruction. Part of that exhibit featured super-slow footage of maple seedlings spiraling through the air. To film them, Chris borrowed a special camera that was originally invented at MIT for ballistics testing.

The next time he borrowed the camera, it was to record grains of rice and bubbles of champagne drifting like snow onto his head and that of an African art curator, Gemma Rodrigues, as they kissed in an empty classroom. The video announced their forthcoming wedding in August 2008.

A life in Cambridge was starting to look like it could make sense. Technology still held so much potential for bloodshed and repression, but some of the same ideas could be turned around in service of beauty—and the powerless. And, thanks to the growing influence of C4, it was starting to look like Chris could, against all odds, make a difference from within the institution he'd set out to criticize. By 2009, C4's media ventures were only gaining altitude.

Then it was over. That year, Chris was denied tenure.

WHO IS EVALUATING THE IMPLICATIONS OF NEW TECHNOLOGY: TENURE

Tenure at an institution as elite as MIT is not by any means easy to come by. In 2010, Hazel Sive, then dean of the School of Science, told the MIT student newspaper, *The Tech*, that MIT required both excellence and visibility of its tenured faculty, and that an example of excellence "is that you are either the top investigator in your field, or one of the very tiny handful of top investigators in your field, in the world."

Patrick H. Winston, former head of the Artificial Intelligence Laboratory, gave a differing perspective. It's crucial "that a person will improve the reputation of the institution," he told *The Tech.*

It's impossible to know exactly what went wrong in Chris's case. A university tenure committee is a black box with only two possible outputs: yes and no. But the opacity of Chris' closed-door tenure proceedings didn't stop some of his peers and students from weighing in on what had transpired. First: Was his standing sufficiently excellent?

"The Ivy League and MIT have this particular idea that you've got to be in the top ten of your field. There was no doubt about that for Chris," said Natalie Jeremijenko, an associate professor of visual art at New York University and herself the subject of a June 2013 *New York Times Magazine* profile. "As someone who's sat on a lot of tenure committees," she said, "by any definition of the field, he was tenurable."

One strong outside endorsement of Chris's excellent standing, Jeremijenko added, was the fact that he had been asked to serve as a committee member for a 2003 National Academies report: *Beyond Productivity: Information Technology, Innovation, and Creativity*, which had sought to examine "the dynamic intersection of information technology with the world of arts and design." The National Academies, a combination of the National Academies of Sciences, Engineering, Medicine and the National Research Council, was founded by U.S. Congressional Charter and signed into existence by President Abraham Lincoln.

Put another way, the National Academies is "not an institution that prides itself on identifying the 'new new,'" Jeremijenko said. "It's actually about consolidating the diverse practices that needed to be consolidated." The fact that Chris was on the committee indicates that he was considered a leader in his field well before his tenure hearing. "Find any other MIT professor who's been co-author on a National Academies report prior to being tenured, right? There's very few, if any, others."

In other words, it would be hard to find faculty members who had been tapped for a National Academies-level report before being *granted* tenure. For it to happen before being *denied* tenure was nigh unheard of. And Chris had served on this report committee before he'd even done his most noteworthy work.

But Josh Levinger said he wasn't surprised by the tenure committee's decision. "I also wish that Chris had gotten tenure. His voice is important, but, I think, looking at it objectively, it's not so hard to believe that he didn't get it," he said. "If he went up as an artist, he didn't have a lot of gallery shows to prove that that's where he was making his contribution to the field. And if he went up as an engineer, he didn't have any papers, really. Or books. Because he was in between, he wasn't judged satisfactory by either."

I could understand that viewpoint—in fact, such complaints are common in tenure cases. Chris's early work at MIT was art, but it was easy to see how an engineer could view it as pure vaporware: technology that is promised but fails to ever materialize. To borrow from the Media Lab's demo-or-die credo, he would demo his early work, and it would function on a basic level. But then it seemed to die anyway, at least from an engineering perspective.

But that could not be said about his later work. Companies and organizations that spun out of C4 during Chris's directorship and continue to run include Newspositioning.org; Between the Bars; SourceMap; The Public Laboratory for Open Technology and Science, a home for open-source environmental tech; and Crónicas de Heroes, which tracks good deeds done in drug war-torn Juarez. Perhaps most importantly, C4 itself survives today under new leadership and continues to produce original, challenging projects.

"I think Chris's standing is still very unique," said Ute Meta Bauer, Founding Director of the Program in Art, Culture, and Technology at MIT's School of Architecture. "Not too many artists are able to really evaluate the implications that new technological developments will have in the long run. And even in the short run."

Chris said it didn't come as a shock when he was called into an administrative office and told the bad news. "I think most of my students weren't at all surprised, and had probably been to some degree expecting it," he said. From the moment he started work on Afghan eXplorer "that was a decision that I would not really ever get tenure," he said, an opinion that he had been voicing in public since 2001. Several years before the tenure decision, "I had actually been pulled aside by a senior faculty supporter," he said, "who gave me strong advice that I shouldn't keep saying that I would never get tenure." He laughed. "She said it doesn't look good. People want to know that you want to get tenure."

But, the truth, at least as Chris recalled after the fact, was that he never really wanted it. Senior professors, he said, would privately tell him to wait to make waves until after receiving tenure. "But, I would routinely say back to that person, 'How often do you see that happen?' It's very rare," he said, because tenure not only filters out undesirables, but also "erodes people to some degree as well. If you spend eight years, seven or eight years at MIT acting a particular way in order to get something, that has an effect on you, regardless of whether you want it to or not."

Still, despite Chris's reluctance to succumb to what he perceived to be a normalizing force, C4's multimillion-dollar Knight Foundation grant had allowed him to hope to stay at MIT, which affected his attitude, he said—to his dismay. "By the last few years I genuinely was on the treadmill," he said. "By the end, I was definitely talking less about how I wasn't going to get tenure. I was to some degree internalizing the process, I'll say.

“To be honest, I expected that bringing in five million over four years would help my chance of tenure, but yeah. Didn’t.”

For whatever reason, his tenure application failed. And if none of his students were surprised, that didn’t mean they weren’t disappointed.

“I don’t think there’s any other faculty member who would have helped me develop extrAct or collaborated so generously with a graduate student to do work that’s really socially relevant and timely,” Wylie said. “He asked a lot of, I think, troubling questions that were very important to be asked, and I think it’s a real shame that MIT is losing that.”

“I definitely think CompCult had an effect on the Media Lab,” said Ayah Bdeir, one of Chris’s early students and the creator of RandomSearch, a bodysuit that records every touch of a TSA pat-down. Bdeir, now the founder/CEO of littleBits, an educational electronics company, was named one of Fast Company’s 100 most creative people in business in 2013. As Chris’s work and that of his students gained in prominence, she said, when students from other groups at the Media Lab would present projects that weren’t particularly political, “they would apologize that it didn’t have any meaning. Students were trying to push themselves to be analytical, and conscientious, and conscious of things that were happening in a way they weren’t before.”

RootIO. Credit: Chris Csikszentmihályi

AFFLICT THE COMFORTABLE AND COMFORT THE AFFLICTED: CELL PHONES AS RADIOS

I first interviewed Chris in 2010 and 2011, and the last time I talked to him during that period, he was packing his MIT office into cardboard boxes. Chris wasn't quite famous enough then to merit a long profile, editors told me, or it wasn't clear enough that foul play was involved in his tenure denial. Chris's and my correspondence lapsed, and I stewed over his story.

Then, when this article finally found a home here at The Big Roundtable, I looked up Chris for an update, and discovered something astounding. These days, he commutes from LA, where he lives with Gemma and their 19-month daughter, to Uganda, where he runs a startup called RootIO.

The events that led to RootIO's conception began in early 2010, when a devastating earthquake struck Haiti. Chris was involved in the development of a TXTmob-esque SMS platform for rapid response. His team quickly discovered that, because most phone systems were down, FM radio was playing a huge role in the coordination of the relief effort. It was a godsend, but it was also inefficient because it was "too big," he said—"there are many people, and only one name can be read at a time."

An idea began to form: Could there be radio not for a whole city, but for a neighborhood or a village? Something more interactive than an FM station, kind of like Craigslist, but without requiring literacy?

The thought stuck with Chris as he moved on from MIT. He guest-lectured for a semester at The New School in New York (where he had his students design technologies for the Occupy movement), then flew with his wife to Pasadena, California, where he headed the Media Design Matters program at the Art Center College of Design.

Their first collaborator was UNICEF, which has a longstanding relationship with Art Center, and Chris soon found himself in Uganda with a horde of graduate students working on design solutions for such issues as women's access to technology and the dialogue around nutrition. "So I went ahead and I started talking to people there, the premier independent news organization called Uganda Radio Network." But there was a problem. Chris approached a group of farmers living within viewing distance of a radio tower that broadcast a number of agriculture-related shows, and asked if they tuned in. Their answer surprised him: the programming didn't really apply to them because it was more tailored to the cotton farm seven kilometers away, and they didn't grow cotton.

That was the problem with radio there—the needs of one area didn't matter to the next. To complicate matters, Uganda is, according to a 2013 study by Harvard University's Institute for Economic Research, the most ethnically diverse country in the world, with forty different indigenous ethnic groups and as many distinct languages. As a result, Chris said, broad swaths of the country "are not being served particularly well by any media."

Regular radio was too big: A traditional FM signal covered too many small areas with too-different languages and economies. But what about localized, low-power, pirate-style radio transmitters? Something clicked.

And so, with the technical help of Ugandan CTO Jude Mukundane, RootIO was born—winning funding, once again, from the Knight Foundation, in January 2013. Events moved quickly after that. By August, Gemma had given birth to the couple's first child, and Chris had resigned his professorship to focus on RootIO full time. (As of publication, Chris and

Gemma have both accepted professorships at the Madeira Interactive Technologies Institute, on the island of Madeira off the coast of Portugal. He will continue to run RootIO from there.)

Now, RootIO is in the process of rolling out its product: a network of micro radio stations, each consisting of little more than a smartphone, a transmitter, a solar panel and battery. In even the remotest parts of Uganda, Chris says, that's enough to give hourly news reports, emergency weather updates, and the current market price of a particular grain, all in the local dialect.

A DJ could be anyone: an executive in Kampala, a coffee exporter, or a veterinarian at a rural university—in fact, one of the syndicated shows RootIO hopes to run is a version of NPR's *Car Talk*, but with a veterinarian and farm animals instead of Click and Clack and jalopies. Listeners can record ads on the phone, "So if I'm a dressmaker in a small town, I can record an ad for my radio station just by calling a number and then leaving a message —'I've got some dresses ready'," Chris said.

I have to ask him: Will RootIO be used for good? Some of Uganda's print media is known for making vitriolic, hate-filled, anti-gay attacks. What makes Chris think such a user-friendly radio platform wouldn't be coopted? After all, didn't Alberto Santos-Dumont believe that the airplane would end all wars? Couldn't RootIO serve as a megaphone for the wrong people?

The anti-gay propaganda is "something that we're following a lot," he said. But RootIO is trying to arrive with "some form of tolerance and communication built in."

Put another way, RootIO brought something out of Chris that no one expected: optimism.

Trace Chris's thinking back far enough, and you come to a concept he experienced as a recent college dropout: the flexible piezoelectronics that could be installed in shoes, theoretically allowing people who traveled on foot to recharge their cell phones. "Perfect for Africa," Chris had said, "perfect for developing nations where there might not be electricity, but people walk a lot." Instead, that technology went into light-up sneakers in America. And so, for years, Chris attacked, via "inversion," the kinds of people who would choose to build flashy sneakers instead of cell phone chargers.

Now he's just improving electronic communication in Africa himself. That isn't to imply that he believes the threat of undemocratic technology is gone. Especially in expensive-to-develop realms like artificial intelligence and robotics, when the powerful get first crack at new technologies, they only become more powerful. A common reflexive reaction to such a totalitarian threat is Luddism: the abandonment of technology. Ted Kaczynski lies

somewhere down that road. Chris, a builder of robots, was never a Luddite. Rather, through his devices of dissent, he called out and antagonized those who were making technology undemocratic.

As an old-time journalist might have put it, he spent a decade afflicting the comfortable. Now he is comforting the afflicted.