6 People Problems

It may seem like ideas about education and digital technology stem from many different authors and thinkers, but digging deep reveals that most such ideas come from a single small group of elites who have been imagining and misunderstanding the interplay between technology and social issues since the 1950s. Understanding the deep connections these people have to each other can help us push back against too-simple, dysfunctional thinking about technology.

Computer systems are proxies for the people who made them. Because there has historically been very little diversity among the people who make computer systems, there are beliefs embedded in the design and concept of technological systems that we would be better off rethinking and revising. To see the consequences of this insular thinking, consider a story about tech gone wrong:

It was a clear day in late July 2016, and David Boggs thought it was perfect weather for flying. Boggs had just gotten a new toy: a drone, equipped with the latest in streaming-video technology. He was eager to test it out, so when his friends came over, he pulled out the drone and showed them what it could do.

The drone flew up, down, and around the yard. Boggs and his friends cheered it on as they watched the flight footage on an iPad. Their small Kentucky town, in Bullitt County, just outside Louisville, looked different from the air. The neat one- and two-story houses were reduced to the size of dollhouses. As the drone flew higher, the peaked roofs of the town subdivisions turned to gray rectangles. The wooded area near Boggs's house looked like a green river sweeping through the neighborhood. The fields looked vast.

Boggs directed the drone west across Highway 61 and then turned north, intending to take footage of a buddy's house. There was a loud bang: the drone lost altitude rapidly and went still on the ground.

The Merideth kids had been playing outside when they heard a loud droning noise. Drones work like helicopters, but they sound

different. A helicopter has a loud thumping noise similar to a bass drum. A drone gives off a high-pitched keening noise, as if a very small child is yelling "EEEEEEEEEE!!!!!!" at the top of her lungs without stopping. A NASA study found that the noise of a flying drone is far more annoying than noise from a vehicle on the ground.[1] The Merideth kids heard the noise and ran to and told their dad, Willie. Everyone was confused. Was it a predator drone? Were the kids in danger? The noise continued, making it hard to think. Willie Merideth grabbed his shotgun, loaded it with birdshot, and fired at the flying target. The drone veered crazily and crashed out of sight in a nearby park. The noise stopped.

Boggs and his friends drove to the crash site shown on the iPad. They saw Merideth in his front yard, agitated. Everyone realized what had happened. Boggs was pissed. He had paid $2,500 for the drone, and his neighbor just *shot* it out of the sky? Merideth was also pissed. What was his neighbor doing, spying on his family from the air? Wasn't this a free country, where citizens have a right to privacy in their own homes? The situation escalated. Merideth pointed his shotgun at Boggs and his drone crew. Boggs called the police. The officers arrived, and they didn't know what to do—there was nothing on the books about how to mediate a dispute between citizens over a flying robot. It wasn't out-of-season hunting, because the drone wasn't an animal. It wasn't willful destruction of another person's property, because Merideth was on his own property when he shot down the drone.

Eventually, the officers decided to arrest Merideth because he was the one with the gun. At the station, they charged him with first-degree endangerment for shooting into the air and criminal mischief. His wife posted his $2,500 bail, and he was home shortly thereafter. A few months later, a judge dismissed the charges, ruling that Merideth was within his rights to shoot a robot that had hovered over his property inappropriately, invading his privacy.[2]

I have a different take on the situation. I want to ask the drone designers and marketers: *What did you think was going to happen?* America is a heavily armed country. You make a flying spy robot that emits an annoying noise, and you make virtually no rules or establish any guidance or social norms about using the robot or its video camera. Did you think about what possibly could go wrong?

This naïveté about the inevitable problems that arise when people use new gadgets shows up again and again in tech culture. Invariably, there are negative social consequences. Microsoft developers created a Twitter bot, Tay, that was intended to "learn" from its direct interactions with other Twitter users. Twitter users quickly demonstrated why Twitter has a reputation as a platform rife with abuse and harassment by directing a tidal wave of filth at Tay. The bot "learned" to spout white supremacist hate speech. Developers, surprised, shut it down.[3]

Another time, developers wanted to demonstrate the kindness of strangers by creating a GPS-enabled doll, hitchBOT, that was supposed to hitch rides all over the country. The idea was that you'd pick up hitchBOT, take it to your next destination, and leave it for someone else to pick up. In this way, hitchBOT would journey all over the country and have nice experiences with nice people who like to help others with technology. HitchBOT made it as far as Philadelphia, where the doll was dismembered and left in a dark alley.[4]

Blind optimism about technology and an abundant lack of caution about how new technologies will be used are the hallmarks of technochauvinism.

The story of how tech creators ended up with a reckless disregard for public safety and the public good starts with my favorite tech titan, Marvin Minsky. Minsky, a Harvard and Andover and Princeton grad, was an MIT professor and is usually considered the father of artificial intelligence. Look behind the scenes at the creation of virtually any high-profile tech project between 1945 and 2016, and you'll find Minsky (or his work) somewhere in the cast of characters.

Minsky's lab at Massachusetts Institute of Technology (MIT) is where hackers were born. It was terribly informal. Minsky's first recruits came from an MIT student group called the Tech Model Railroad Club (TMRC), whose members were building their own relay computers to power their model trains. The TMRC members were absolutely crazy about tinkering with machines. MIT had one of the few mainframe computers in the world at the time, in the late 1950s, and the TMRC members regularly snuck into the mainframe room after hours to play with it and run homemade programs.

Some professors might have disciplined students for breaking in and illicitly using university resources. Minsky hired them. "These

were weird people," he recalled in an oral history.[5] "They had an annual contest to see who could ride every New York subway in the shortest time. It takes something like thirty-six hours. People would log these things very carefully and would study the schedules and plan their whole trip. These people were nuts." It was a productive kind of nuts for computer science, however. This obsessive attention to detail and insatiable desire to build things turned out to be exactly the right characteristics needed to write computer programs and build hardware. Minsky's lab flourished.

His recruiting method was unorthodox. Because Minsky was Minsky—the kind of person who always had a graduate student or a visitor living upstairs, who if you sat in his living room for long enough a politician or a science fiction writer or a famous physicist would drop by to chat—he never had to actively recruit. "Somebody would send a message or a letter to say: 'I'm interested in this,' and I'd say: 'Well, why don't you come here and see how you like working here?'" Minsky recalled. "The person would come for a week or two, we'd pay them enough to live on, and then they'd go away if they didn't hit it off. I don't remember ever making a decision to tell someone to go away. It's really very bizarre, but this was a self-energizing community. These hackers had their own language. They could get things done in three days that would take a month. If somebody appeared who had the talent, the magic touch, they would fit in." The TMRC and Minsky's lab were later immortalized in Stewart Brand's *The Media Lab* and Steven Levy's *Hackers: The Heroes of the Computer Revolution*, in addition to many other publications.[6] The hacker ethic is also what inspired Mark Zuckerberg's first Facebook motto: "Move fast and break things." Minsky was part of Zuckerberg's curriculum at Harvard.

Minsky and a collaborator, John McCarthy, organized the very first conference on artificial intelligence, at the Dartmouth Math Department in 1956. The two went on to found the Artificial Intelligence Lab at MIT, which evolved into the MIT Media Lab, which remains a global epicenter for creative uses of technology and has generated ideas for everyone from George Lucas to Steve Jobs to Alan Alda to Penn and Teller. (The MIT Media Lab was also kind enough to employ me for a software project devoted to Minsky's theories.)

Minsky's career was marked by good fortune at every turn. Most scientists today have to hustle for funding in an ever-shrinking grant environment. Minsky was of the generation that had money flowing out of the taps. He said in an oral history:

> Until the 1980's, I never wrote a proposal. I just was always in the environment where there would be somebody like Jerry Wiesner of MIT.
>
> John McCarthy and I had started working on artificial intelligence in about 1958, or 1959, when we both came to MIT. We had a couple of students working on it. Jerry Wiesner came by once and said, how are you doing? We said, we're doing fine, but it would be nice if we could support three or four more graduate students. He said, well, go over and see Henry Zimmerman and say I said that he should give you a lab. Two days later we had this little lab of three or four rooms, and a large pile of money that IBM had given to MIT for the advancement of computer science and nobody knew what to do with it. So they gave it to us.

A large pile of money, some endlessly creative mathematicians with speculative ideas about what might be possible in the future: this was how the field of artificial intelligence began. Eventually, Minsky's small, elite circle of individuals came to dominate the technological conversation in academia, industry, and even Hollywood.

When science fiction author Arthur C. Clarke worked with Stanley Kubrick to develop *2001: A Space Odyssey*, he turned to his friend Minsky for advice on how to imagine an artificial superintelligence on a spaceship that tries to save the world and ends up destroying the crew. Minsky delivered. Together, they created HAL 9000, a computer that even today embodies all of the promise and terror of what machines might do. Most people remember HAL's single, glowing red "eye." That ominous eye is almost identical to an eyeball (actually, a display unit) on ENIAC, which is considered the world's first programmable, general-purpose digital computer. John von Neumann, who came up with one of the core concepts of computer storage that led to ENIAC, was one of Minsky's mentors.

Minsky's literary taste ran almost exclusively to science fiction. He wrote his own, and he was also friends with Isaac Asimov and other prominent science fiction writers. Sometimes in the friendships, the

lines between science fiction and reality became blurred. Minsky talked about some of their wacky projects in an interview:

> One of the things I was interested in was Arthur Clarke's idea of a space elevator. I must have spent about six months working with some scientists at Livermore who were thinking about designing such things. It's possible, in principle, to build a kind of pulley—a belt—made of carbon fiber, some incredibly strong piece of wire and have this go up from earth to something higher than a synchronous satellite and down again. So you could have a pulley that would haul things into space, and Arthur Clarke had worked out the theory of that. He called it a fountain.

To recap: Clarke, a science fiction writer, imagined an elevator fountain that goes to outer space. The writer convinced his scientist friend Minsky (in whose house he lived occasionally) that the space elevator would be a good idea. Minsky convinced some of his friends at the Lawrence Livermore National Laboratory, a defense contracting site that is today funded by the National Nuclear Security Administration and the Department of Energy, to explore the idea of making a gigantic outer space dumbwaiter. And these eminent scientists worked on the dumbwaiter to outer space for an *entire six months*.

Everybody in tech knew Minsky, and everyone relied on him. Steve Jobs famously got the idea for a computer with a mouse and a GUI from Alan Kay and his team at Xerox PARC. When Jobs left Apple in 1985 and John Sculley took over, Kay told Sculley they needed to go out and find sources of new technology. They weren't going to be able to turn to PARC for Apple's next big move, Kay said. "That led to us spending a lot of time on the East Coast, at the Media Lab in MIT, where we worked with people like Marvin Minsky and Seymour Papert," Sculley said in a 2016 interview.[7] "A lot of that technology we ended up putting into a concept video Alan and I produced, called 'Knowledge Navigator.' That predicted that computers were going to become our personal assistants, which is what's happening right now," with voice assistant technology like Apple's Siri, Amazon's Alexa, and Microsoft's Cortana.

All these assistants are given female names and default identities by tech executives and developers—no accident. "I think that probably reflects what some men think about women—that they're

not fully human beings," said social anthropologist Kathleen Richardson, the author of *An Anthropology of Robots and AI: Annihilation Anxiety and Machines* in a 2015 interview with LiveScience. "What's necessary about them can be replicated, but when it comes to more sophisticated robots, they have to be male."[8]

Minsky's world view is even behind the scenes in the founding of Internet search, which most of us use every day. As PhD students at Stanford, Larry Page and Sergei Brin invented PageRank, the revolutionary search algorithm that led to the two founding Google. Larry Page is the son of Carl Victor Page Sr., an artificial intelligence professor at Michigan who would have read Minsky extensively and interacted with him at AI conferences. Larry Page's PhD advisor at Stanford was Terry Winograd, who counts Minsky as a professional mentor. Winograd's PhD advisor at MIT was Seymour Papert—Minsky's longtime collaborator and business partner. A number of Google executives, like Raymond Kurzweil, are Minsky's former graduate students.

Minsky was a Gladwellian connector. As far back as the 1950s, there were only a handful of places in the whole country of millions of people where computing machines were—and Marvin Minsky was in all of these places, hanging around, doing math, and building things and tinkering and hanging out.

Minsky-style creative chaos is fun and delightful and inspirational. It's also dangerous. Minsky and his generation did not have the same attitudes toward safety that we know are important today. There was a kind of casual disregard for radiation safety, for example. Once, a computer scientist and former Minsky graduate student named Danny Hillis showed up to Minsky's house with a radiation detector in his pocket. (Hillis, a supercomputer inventor, now runs the Long Now Foundation with *Whole Earth Catalog* founder Stewart Brand; the foundation is devoted to building a mechanical clock that will run for ten thousand years in a cave on a Texas ranch owned by Amazon founder Jeff Bezos.) The radiation detector started going crazy. Hillis, who had lived with the family for a time, poked around the house to find the source of the radiation. The alarm seemed loudest next to a closet. Hillis opened it and found the closet stuffed full of chemicals. He removed each one, but nothing was the source. Then, he found a secret panel in the back of the closet. Intrigued, he popped it open and found a human skeleton.

Hillis ran upstairs to tell Minsky and his wife Gloria Rudisch about the find. They were more excited than surprised. “Is that where that is?” Rudisch said. “We’ve been looking for that thing for years.” It was a skeleton that she had used in medical school. It also wasn’t the source of the radiation, however.

Eventually, Hillis excavated more stuff out of the closet and found a lens from an old spy camera that Minsky had gotten at a surplus store. Lenses of that vintage were sometimes treated with radioactive elements to increase the index of refraction. “It was dangerously radioactive,” Hillis recalled. “I got it out of the house.”[9] When it came to tinkering, many makers of Minsky’s generation felt that conventional rules didn’t apply to them. For example, Minsky liked to tell a story about some friends of his who built an intercontinental ballistic missile (ICBM) in the backyard of a house that once belonged to architect Buckminster Fuller.

This attitude, that creating mattered more than convention (or laws), was what people of Minsky’s generation passed on to their students. It shows up later in the behavior of tech CEOs like Travis Kalanick, who in 2017 was ousted from his top position at Uber for (among other things) creating a culture of sexual harassment. Kalanick also had the attitude that laws didn’t matter. He launched Uber in cities worldwide in defiance of local taxi and limousine regulations, created a program called Greyball to help Uber computationally evade sting operations by law enforcement, was captured on camera verbally abusing an Uber driver, and looked the other way when Uber drivers raped passengers.[10] According to a blog post by former Uber engineer Susan Fowler, Kalanick’s tech managers were almost cartoonishly incompetent at dealing with the harassment complaints Fowler lodged. Fowler was routinely passed over for promotion and was sexually propositioned by male coworkers. Uber’s HR team should have recognized that Fowler was facing a textbook case of gender bias in the workplace. Instead, they put her on probation and told her it was her fault.

Disregard for social convention goes back farther than Minsky, back to computing pioneer Alan Turing, who, like Minsky, did his graduate work at Princeton. Turing was hopeless at social interaction. Turing’s biographer—Jack Copeland, director of the Turing Archive for the History of Computing—writes that Turing preferred to work in isolation: “Reading his scientific papers, it is

almost as though the rest of the world—the busy community of human minds working away on the same or related problems—simply did not exist."[11] Unlike the character portrayed by actor Benedict Cumberbatch in the Turing biopic *The Imitation Game*, the real Turing was slovenly in appearance. He wore shabby clothing, his fingernails were always dirty, and his hair stuck out at wild angles. Copeland writes:

> Once you got to know him Turing was fun—cheerful, lively, stimulating, comic, brimming with boyish enthusiasm. His raucous crow-like laugh pealed out boisterously. But he was also a loner. "Turing was always by himself," said codebreaker Jerry Roberts: "He didn't seem to talk to people a lot, although with his own circle he was sociable enough." Like everyone else Turing craved affection and company, but he never seemed to quite fit in anywhere. He was bothered by his own social strangeness—although, like his hair, it was a force of nature he could do little about. Occasionally he could be very rude. If he thought that someone wasn't listening to him with sufficient attention he would simply walk away. Turing was the sort of man who, usually unintentionally, ruffled people's feathers—especially pompous people, people in authority, and scientific poseurs. He was moody too. His assistant at the National Physical Laboratory, Jim Wilkinson, recalled with amusement that there were days when it was best just to keep out of Turing's way. Beneath the cranky, craggy, irreverent exterior there was an unworldly innocence though, as well as sensitivity and modesty.

Notice the phrase "once you got to know him." That's what you say about someone who's unpleasant or unbearable, but there is some reason that you have to look past the person's awfulness. In Turing's case, most people pardoned his behavior because he was mathematically brilliant.

This looking beyond superficial features like physical appearance is one of the wonderful things about the social culture of mathematics. However, it's also a drawback when that same disdain for social conventions leads to a valorization of mathematical ability over social fabric. Disciplines like math, engineering, and computer science pardon a whole host of antisocial behaviors because the

perpetrators are geniuses. This attitude forms the philosophical basis of technochauvinism, in which efficient code is prioritized above human interactions.

Tech also inherited mathematicians' worship of the cult of genius. This cult of genius has led to much mythologizing; it also enforces the boundaries of the industry and camouflages a range of structural discrimination. Math is obsessed with pedigrees. There is a popular online math genealogy project that's a crowdsourced list of mathematicians and their "ancestors" and "descendants," organized according to who got their PhD where and under whom. Minsky's intellectual "ancestry" can be traced in an unbroken line all the way back to Gottfried Leibniz in 1693. To understand why this matters, we need to walk through the development of the modern-day computer.

The earliest computing machine, as you probably recall from elementary school math class, was the abacus. The abacus is a base-ten counting device, because humans have ten fingers and ten toes. The abacus, commonly seen today as a set of ten beads strung on wires, was what people used for calculation for centuries.

The next major development in mathematical technology was the astrolabe, used for celestial navigation at sea. Then came a variety of clocks: water-powered, spring-powered, and mechanical. Although these were all important and ingenious inventions, the major innovation in terms of computer design came in 1673 when Gottfried Leibniz, a German lawyer and mathematician, built a device called a *step reckoner*. The step reckoner had a set of revolving gears that moved via a crank. Once you passed nine on a gear, that gear reset to zero and the adjacent gear incremented by one. Each gear was a "step" representing an increment of ten. This design was used to build calculating machines for the next 275 years.[12]

Leibniz had no time for mere arithmetic; he had more important math to do. After he invented his machine, he famously said: "It is beneath the dignity of excellent men to waste their time in calculation when any peasant could do the work just as accurately with the aid of a machine."

When Joseph Marie Jacquard released the punch-card loom in 1801, it got mathematicians thinking differently about machines that might help calculate. Jacquard's loom ran on binary logic: a hole in

the card meant binary one; no hole meant binary zero. The machine wove its intricate patterns based on whether there was a hole or not.

It took a few decades for people to figure out the details, but finally there was a breakthrough in in 1822, when English scientist Charles Babbage began work on what he called a *difference engine*. This machine could proximate polynomials, meaning it allowed mathematicians to describe the relationship among several variables, such as range and air pressure. The difference engine was also designed to compute logarithmic and trigonometric functions, which are unpleasant to calculate by hand. Babbage worked on building the difference engine for years, eventually using twenty-five thousand components that together weighed fifteen tons, but he never got it to work. However, in 1837, Babbage published another, better idea: an *analytical engine*. This was a design for a machine that could interpret a programming language with conditional branching and loops; it had features recognizable from today's computers, like the ability to perform arithmetic and process logic and add memory. Ada Lovelace, generally considered the first computer programmer, wrote programs for this hypothetical machine. Unfortunately, the analytical engine was so far ahead of its time that it didn't work either. Scientists assembled it from Babbage's designs in 1991 and discovered that it would have worked—if there were important other components, like electricity.

The next milestone toward the development of the modern computer happened when English mathematician and philosopher George Boole proposed Boolean algebra in 1854. Based on work by Leibniz, Boolean algebra is a logic-based system in which there are only two numbers, 0 and 1. Calculations are achieved via two operators: AND or OR.

As the nineteenth century progressed, mechanical adding machines became more sophisticated. William Seward Burroughs (grandfather of beat novelist William S. Burroughs) made a fortune from a mechanical adding machine he patented in 1888. After Thomas Edison released his first light bulb in 1878, electricity became widely available and revolutionized every kind of machinery. New electromechanical advances meant that anyone could do addition and subtraction and multiplication and division on an adding machine. However, it required pressing a lot of buttons

repeatedly, and it was laborious. Human computers were still essential to the project of higher mathematics.

A *human computer* was a person, a kind of clerk, who was hired to perform calculations. Human computers were the people who did the math in order to write books of mathematical tables. These books of tables were essential to statisticians and astronomers and navigators and bankers and ballistics experts, all of whom relied on complex calculations for everyday use. If you needed to multiply or divide very large numbers or raise a number to the power of *x* or extract the *nth* root of a large number, it was laborious and burdensome to do such a calculation on the fly. It was easier to look up the result in a precalculated table. The system worked beautifully for years; the Egyptian mathematician Ptolemy was known to use mathematical tables in the second century AD, and in 1758, French astronomers calculated the return of Halley's Comet using only humans and mathematical lookup tables.

As the Industrial Revolution progressed, the limited supply of human computers became a significant obstacle to progress. One major vexation for nineteenth-century mathematicians was the fact that the available workforce was severely limited. Today, if you wanted to hire someone to perform calculations, you could hire across the gender spectrum. In the nineteenth century, you were limited to hiring men. Few women had enough mathematical education to perform the necessary calculations; of this small set, even fewer were supported in seeking employment outside the home. In the nineteenth century, most women weren't allowed to vote in the United States. The Seneca Falls Convention, a touchstone for the beginning of the women's rights movement, didn't happen until 1848. The Nineteenth Amendment didn't pass until 1920. Plenty of men were allies in the women's suffrage movement, but mathematicians were not known for their political activism. In *The Suffragents: How Women Used Men to Get the Vote*, my colleague Brooke Kroeger chronicles the many men who worked for women's equality. Of these men, several were professors—of history, literature, philosophy. None of them were professors of mathematics, however.[13]

The nineteenth century was also the time of America's great shame, slavery. Black men and women could have worked as human computers, could have been productive members of the workforce,

except that they were enslaved as forced labor. Slaves were not allowed educational opportunities; they were beaten and raped and killed. Throughout the nineteenth century, people of color were forcibly excluded from higher education opportunities and thus from the workforce of the intellectual elites. Slavery didn't end until late in the century: Abraham Lincoln issued the Emancipation Proclamation in 1863, followed by the Thirteenth Amendment in 1865. Access to education didn't improve for decades afterward, and many people would argue that we still have far to go to provide fair, equal, and integrated education in this country.

Whether they realized it consciously or not, nineteenth-century mathematicians and other scientists had a choice. One option was to enact social change (emancipation, universal suffrage, breaking down class barriers) and develop the existing workforce by allowing all the people who weren't elite white men greater access to education and train these workers for jobs. Another option was to settle for the status quo and build machines that could do the work.

They built machines.

To be fair, they were always going to build the machines. That's where their interests lay and where the development of their field was heading, and indeed the entire world was caught up in the fervor to develop new machines that took advantage of steam power, electricity, and other marvelous advances. Perhaps it seems unfair to also expect them to be economists (no matter how closely linked the fields) and civil rights activists (a phrase that had not even been coined then). I had to use mathematical lookup tables in high school trigonometry class; it was truly onerous, and I agree completely with the labor-saving value of using machines for complex, mundane calculations. However, the importance of this history is that it demonstrates just how deep this particular strain of white, male bias in tech goes. When faced with the option of bringing more, different people into the workforce, nineteenth-century mathematicians and engineers chose instead to build machines that replaced people—at enormous profit.

Fast forward to Minsky's era, and we see how the new discipline of computer science inherited the biases of the mathematical community. As wonderfully creative as Minsky and his cohort were, they also solidified the culture of tech as a billionaire boys' club.

Math, physics, and the other "hard" sciences have never been hospitable to women and people of color; tech followed this lead.

A story that physicist Stephen Wolfram tells about Minsky illuminates one of the ways the subtle assumptions about gender played out in their cohort:

> The Marvin that I knew was a wonderful mixture of serious and quirky. About almost any subject he'd have something to say, most often quite unusual. Sometimes it'd be really interesting; sometimes it'd just be unusual. I'm reminded of a time in the early 1980s when I was visiting Boston and subletting an apartment from Marvin's daughter Margaret (who was in Japan at the time). Margaret had a large and elaborate collection of plants, and one day I noticed that some of them had developed nasty-looking spots on their leaves.
>
> Being no expert on such things (and without the web to look anything up!), I called Marvin to ask what to do. What ensued was a long discussion about the possibility of developing microrobots that could chase mealybugs away. Fascinating though it was, at the end of it I still had to ask, "But what should I actually do about Margaret's plants?" Marvin replied, "Oh, I guess you'd better talk to my wife."[14]

It's a cute conversation to imagine: two preeminent scientists discussing nanobots to destroy mealybugs. However, I'm also struck by the fact that neither of them knew how to care for a houseplant. Instead, care-taking responsibilities were delegated to Minsky's wife and daughter. Both women are quite accomplished: Minsky's wife, Gloria Rudisch, was a successful pediatrician, and his daughter, Margaret, has a PhD from MIT and has run software companies. However, the women were *also* expected to know how to care for growing things, a kind of invisible labor, whereas the men weren't.

Because humans have a long and successful history of dealing with plant problems, this conversation suggests a certain learned helplessness in these scientists. It wasn't hard to diagnose houseplants "without the web" in the 1980s. You could go to the local florist with a description of the spots. You could go to the local hardware store to discuss your plant problems. You could telephone the local agricultural extension office. At any of these places, there would be a community member with the appropriate horticultural

knowledge. People know how to deal with plant problems; civilization is practically synonymous with horticulture. Mealybugs can be destroyed by putting a few drops of dish soap into a spray bottle of water and squirting the infested plant. Deploying bots on houseplants is a fun idea, but it's simply unnecessary.

I get it; it's more fun to talk about wacky ideas than gender politics. This was true then and is still the case. Unfortunately, wacky ideas have dominated the public dialogue in tech to the point that important conversations about social issues have been drowned out or dismissed for years. Some of the ideas that come out of Silicon Valley include buying islands in New Zealand to prep for doomsday; *seasteading*, or building islands out of discarded shipping containers to create a new paradise without government or taxes; freezing cadavers so that the deceased's consciousness can be uploaded into a future robot body; creating oversized dirigibles; inventing a meal-replacement powder named after dystopian sci-fi movie *Soylent Green*; or making cars that fly. These ideas are certainly creative, and it's important to make space in life for dreamers—but it's equally important not to take insane ideas seriously. We should be cautious. Just because someone has made a mathematical breakthrough or made a lot of money, that doesn't mean we should listen to them when they suggest aliens are real or suggest that in the future it will be possible to reanimate people, so we should keep smart people's brains in large freezers like the ones used for frozen vegetables at Costco. (Minsky was on the scientific advisory board of Alcor Cryonics, a foundation for wealthy "transhumanist" true believers who maintain a freezer in Arizona for dead bodies and brains. The foundation's multi-million-dollar trust is designed to keep the power on for decades.)[15]

Reading about Silicon Valley billionaires' desires to live to age two hundred or talk with little green men, it's tempting to ask: Were you high when you thought of that? Often, the answer is yes. Steve Jobs dropped acid in the early 1970s after he dropped out of Reed College. Doug Engelbart, the NASA- and ARPA-funded researcher who performed the 1968 "mother of all demos" that showed for the first time all the hardware and software elements of modern computing, dropped acid at the International Foundation for Advanced Study, the legal home for academic inquiry into LSD that lasted until 1967.

Operating the camera for Engelbart's demo was Stewart Brand, the *Whole Earth Catalog* founder who helped organize LSD guru Ken Kesey's infamous acid tests, massive drug-fueled cross-country bacchanals that were chronicled in Tom Wolfe's book *The Electric Kool-Aid Acid Test*. Brand was the most important connector between Minsky's world of scientists and the counterculture. "We are as gods and might as well get good at it," Brand wrote as the first line of the *Whole Earth Catalog* in 1968.[16] That publication was a major source of inspiration for almost all the early Internet pioneers, from Steve Jobs to tech-publishing titan Tim O'Reilly. When developers created early Internet message boards, they were trying to recreate the freewheeling commentary and recommendation culture that flourished in the back pages of the *Whole Earth Catalog*, where readers wrote in to share requests, tools, and tips on communal living. As Fred Turner writes in *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*, Brand was everywhere in the background of early Internet development. Space colonies? Brand was speculating about them in the 1970s in his magazine *CQ*, the next iteration of the *Whole Earth Catalog* and the precursor to *Wired*, the influential technology-culture magazine that Brand also founded. Turner writes: "For the readers of *CQ,* space colonies served as a rhetorical prototype. They allowed former New Communalists to transfer their longings for a communal home to the same large-scale technologies that characterized the cold war technocracy they had sought to undermine. Fantasies of a shared, transcendent consciousness gave way to dreams of technologically enabled collaboration in friction-free space. Within a decade, these fantasies would reappear in the rhetoric of cyberspace and the electronic frontier, and as they did, they would help structure public perceptions of computer networking technology."[17]

Minsky and Brand were close friends, and Brand's book *The Media Lab* featured Minsky as a prime character. Brand's ambition, curiosity, and passion for tech fit neatly with Minsky's iconoclastic band of hackers. Looking back on the *Whole Earth* project, Brand wrote: "At a time when the New Left was calling for grass-roots political (i.e., referred) power, Whole Earth eschewed politics and pushed grassroots direct power tools and skills. At a time when New Age hippies were deploring the intellectual world of arid

abstractions, Whole Earth pushed science, intellectual endeavor, and new technology as well as old. As a result, when the most empowering tool of the century came along[,] personal computers (resisted by the New Left and despised by the New Age)[,] Whole Earth was in the thick of the development from the beginning."[18]

Brand, an Exeter and Stanford grad whose father was an MIT engineer, looked to personal computers as the new frontier for a bright, new, Utopian future.[19] He started the very first online community in 1985, the Whole Earth eLectronic Link (WELL), which is where tech developed its current political default attitude, libertarianism. Paulina Borsook chronicles the libertarian takeover of tech in *Cyberselfish: A Critical Romp through the Terribly Libertarian Culture of High Tech*. A virulent form of philosophical technolibertarianism lurks at the heart of the online communities that are most radically invested in what they call "free speech" and radical individuality. This sentiment used to thrive on message boards; in 2017, it lives on the red-pill forums of Reddit and on the dark web. Borsook writes: "It bespeaks a lack of human connection and a discomfort with the core of what many of us consider it means to be human. It's an inability to reconcile the demands of being individual with the demands of participating in society, which coincides beautifully with a preference for, and glorification of, being the solo commander of one's computer in lieu of any other economically viable behavior. Computers are so much more rule-based, controllable, fixable, and comprehensible than any human will ever be."[20] This is Turing's social awkwardness, politicized and magnified.

The transition from hippie ideology to the antigovernment ideology of cyberspace activists is visible in "A Declaration of the Independence of Cyberspace," published in 1996 by former Grateful Dead lyricist John Perry Barlow. "Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind," Barlow writes. "On behalf of the future, I ask you of the past to leave us alone … You have no sovereignty where we gather. We have no elected government, nor are we likely to have one."[21] Barlow started the libertarian Electronic Frontier Foundation, which today defends hackers, because of debates he had on the WELL.

Then came Peter Thiel. Thiel, another libertarian Stanford grad—who founded PayPal, was an early investor in Facebook, and founded the CIA-backed big data firm Palantir—is frank about his hostility toward gender equality and government. In a 2009 *Cato Unbound* essay, Thiel writes, "Since 1920, the vast increase in welfare beneficiaries and the extension of the franchise to women—two constituencies that are notoriously tough for libertarians—have rendered the notion of 'capitalist democracy' into an oxymoron." Like Barlow, Thiel conceives of cyberspace as a stateless country: "Because there are no truly free places left in our world, I suspect that the mode for escape must involve some sort of new and hitherto untried process that leads us to some undiscovered country; and for this reason I have focused my efforts on new technologies that may create a new space for freedom."[22] Thiel was a supporter of and advisor to Donald Trump's presidential campaign and funded a lawsuit that took down *Gawker*. In the book *Move Fast and Break Things*, Annenberg Innovation Lab director emeritus Jonathan Taplin explores the way that Thiel's influence has spread throughout Silicon Valley via his "Paypal Mafia," other venture capitalists and executives who have adopted his anarcho-capitalist philosophy.[23]

The question of why wealthy people like Thiel are taken seriously about seasteading or aliens has been addressed by cognitive scientists. Paul Slovic, an expert in risk assessment, writes that we have cognitive fallacies related to expertise. We tend to assume that when people are experts at one thing, their expertise extends to other areas as well.[24] This is why people assume that because Turing was right about math, he was also right in his assessments of how society works. Especially in our time of highly specialized labor, this can be problematic. Being good with computers is not the same as being good with people. We shouldn't rush to be governed by computational systems designed by people who don't care about or understand the cultural systems in which we are all embedded.

The way that white male bias interacts with the genius myth inside STEM fields is even more pernicious. Even today, women and people of color are rarely considered math or tech geniuses. In 2015, Princeton professor S. J. Leslie and collaborators looked at *ability beliefs*, or how scholars prioritize genius and brilliance versus empathy and hard work in different academic fields. They write:

"Across the academic spectrum, women are underrepresented in fields whose practitioners believe that raw, innate talent is the main requirement for success, because women are stereotyped as not possessing such talent. This hypothesis extends to African Americans' underrepresentation as well, as this group is subject to similar stereotypes."[25]

The negative effects of gender stereotypes associated with math are found throughout STEM disciplines. The cultures in STEM fields "impose a set of masculinized norms and expectations that limit approaches to scientific inquiry," write scholars Shane Bench, Heather Lench, and collaborators in a 2015 article. "Disciplinary norms in STEM fields dictate that scientists are decisive, methodical, objective, unemotional, competitive, and assertive—characteristics associated with men and masculinity ... Because STEM fields are stereotypically associated with men and masculinity, women perceive them as antithetical to themselves as female and that they do not belong in those contexts ... the more women perceived an environment (i.e., a computer science classroom) as masculine, the less they reported being interested in joining the field."[26]

The dynamic that Bench et al describe seems to be in effect at Minsky's alma mater, the Harvard math department. "Current and former students and faculty—male and female—say the department's dearth of female faculty and graduate students creates a discouraging environment for women undergraduates," writes Hannah Natanson in a 2017 *Harvard Crimson* article. "Women in the department are often told to take easier classes than their male peers; and, in a department dominated by men, everyday faculty-to-student and peer-to-peer interactions leave women feeling conspicuous and uncomfortable."[27] The Harvard math department does not have a single female senior faculty member. The department did appoint a woman to full professor, the highest rank in the department—but not until 2009. She left for Princeton not long afterward. Since then, three women have been offered tenured professorships. All three declined.

Bench et al. also explore how "positivity bias" contributes to the gender gap in STEM fields. In the study, they gave men and women the same math test and asked them how they thought they performed. When the researchers graded the tests and looked at the

students' estimates of their scores, they found that men consistently thought they scored higher than they actually did. "This greater overestimation of performance in men accounted for their greater intent to pursue math fields compared to women," the scholars wrote. "The findings suggest that gender gaps in STEM fields are not necessarily the result of women underestimating their abilities, but rather may be due to men overestimating their abilities."

To recap: we have a small, elite group of men who tend to overestimate their mathematical abilities, who have systematically excluded women and people of color in favor of machines for centuries, who tend to want to make science fiction real, who have little regard for social convention, who don't believe that social norms or rules apply to them, who have unused piles of government money sitting around, and who have adopted the ideological rhetoric of far-right libertarian anarcho-capitalists.

What could possibly go wrong?

Notes

1. Christian and Cabell, *Initial Investigation into the Psychoacoustic Properties of Small Unmanned Aerial System Noise*.
2. Martinez, "'Drone Slayer' Claims Victory in Court."
3. Vincent, "Twitter Taught Microsoft's AI Chatbot to Be a Racist Asshole in Less than a Day."
4. Plautz, "Hitchhiking Robot Decapitated in Philadelphia."
5. Unless otherwise indicated, quotes from Minsky in this section are taken from Minsky, "Web of Stories Interview."
6. Brand, *The Media Lab*; Levy, *Hackers*.
7. Dormehl, "Why John Sculley Doesn't Wear an Apple Watch (and Regrets Booting Steve Jobs)."
8. Lewis, "Rise of the Fembots"; LaFrance, "Why Do So Many Digital Assistants Have Feminine Names?"

9. Hillis, “Radioactive Skeleton in Marvin Minsky’s Closet.”

10. Alba, “Chicago Uber Driver Charged with Sexual Abuse of Passenger”; Fowler, “Reflecting on One Very, Very Strange Year at Uber”; Isaac, “How Uber Deceives the Authorities Worldwide.”

11. Copeland, “Summing Up Alan Turing.”

12. “The Leibniz Step Reckoner and Curta Calculators—CHM Revolution.”

13. Kroeger, *The Suffragents*; Shetterly, *Hidden Figures*; Grier, *When Computers Were Human*.

14. Wolfram, “Farewell, Marvin Minsky (1927–2016).”

15. Alcor Life Extension Foundation, “Official Alcor Statement Concerning Marvin Minsky.”

16. Brand, “We Are As Gods.”

17. Turner, *From Counterculture to Cyberculture*.

18. Brand, “We Are As Gods.”

19. Hafner, *The Well*.

20. Borsook, *Cyberselfish*, 15.

21. Barlow, “A Declaration of the Independence of Cyberspace.”

22. Thiel, “The Education of a Libertarian.”

23. Taplin, *Move Fast and Break Things*.

24. Slovic, *The Perception of Risk*; Slovic and Slovic, *Numbers and Nerves*; Kahan et al., “Culture and Identity-Protective Cognition.”

25. Leslie et al., “Expectations of Brilliance Underlie Gender Distributions across Academic Disciplines,” 262.

26. Bench et al., “Gender Gaps in Overestimation of Math Performance,” 158. Also see Feltman, “Men (on the Internet) Don’t Believe Sexism Is a Problem in Science, Even When They

See Evidence”; Williams, “The 5 Biases Pushing Women Out of STEM”; Turban, Freeman, and Waber, “A Study Used Sensors to Show That Men and Women Are Treated Differently at Work”; Moss-Racusin, Molenda, and Cramer, “Can Evidence Impact Attitudes?”; Cohoon, Wu, and Chao, “Sexism: Toxic to Women’s Persistence in CSE Doctoral Programs.”

27. Natanson, “A Sort of Everyday Struggle.”