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Culture, Technology, and the Cult of Tech in the 1970s

TIMOTHY MOY

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Oh, what a time it was. A time of hope, of excitement, and most of all, of triumph. It was a time when young visionaries searched their hearts and found the future. Wide-eyed, they remade the world as millions of Americans joined the song. It was the Seventies.

The Seventies? The *nineteen* seventies? The Seventies of Watergate, Ford, and Carter? Of malaise, stagflation, and polyester leisure suits? Those Seventies?

Yes. Although the Seventies were a cynical age for many Americans, it was a heady time for one segment of the nation: creators of new technology. During the 1970s, technologists and their handiwork successfully created a new culture for the relationship between Americans and their technology, carved out a new cultural space for American technologists, and set the nation on a social and economic trajectory that would run through the end of the century.

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SNAPSHOT, 1970

By 1970, Americans who thought deeply about technology did so with great anxiety. Typical of American intellectuals during this period, Lewis Mumford journeyed from technological enthusiasm in the 1930s to technological despondency in the 1970s. Before World War II, Mumford's *Technics and Civilization* (1934) had depicted a "neotechnic" future rich in freedom and meaning, propelled by hydroelectric power and enlightened by Bakelite and aluminum.[1] By 1970, his *Pentagon of Power* described human civilization as enslaved by "megamachines"—heartless and inexorable conglomerations of technology and power that labored only for the benefit of authoritarian elites.

For Mumford, cold-war military-industrial complexes had turned technology from liberator to enslaver; it was now a tool of insanity. "I have been driven," he wrote, "by the wholesale miscarriages of megatechnics, to deal with the collective obsessions and compulsions that have misdirected our energies, and undermined our capacity to live full and spiritually satisfying lives."[2] And the future held little promise. The United States and Soviet Union, "through their dynamic expansion, their insensate rivalry, their psychotic compulsiveness," were gradually drawing the entire world into their ghastly embrace. "Ultimately," Mumford feared, "these two systems must either destroy each other or coalesce with other similar megamachines on a planetary basis. In terms of further human development, the second possibility, alas! seems hardly more promising than the first."[3] Mumford was not alone in his concern. Even the ever-optimistic Buckminster Fuller, who remained steadfast in his faith that technology would eradicate human suffering, asked in the title of a 1969 book whether technology would lead to *Utopia or Oblivion*.[4]

For the masses who decided not to brave the tomes of Mumford, Fuller, or other critics like Jacques Ellul, the prospects of an increasingly technological world likewise provided little comfort. The misery of the Vietnam War had given the lie to any equation between technological superiority and national security. Even NASA's space program, the technological darling of the 1960s, was showing signs of wear by 1970; the television ratings for the *Apollo 13* mission in April of that year had been disappointing until an in-flight explosion aborted the moon landing and nearly killed the three astronauts aboard. The heroic story of the astronauts' survival was then quickly wiped from the front page by the shootings at Kent State University.

On an everyday level, technology was important but uncelebrated. The most prominent technological interface in the home—television—was well on its way to transforming American society, culture, and politics, but in ways that had fallen pathetically short of the hopes of a generation earlier. Rather than bringing a Harvard education into every living room, television had, most Americans and commentators agreed, evolved into an idiot box, a signpost not to a wondrous land of imagination but to a vast wasteland of intellectual and cultural debility. Nevertheless, such hard feelings did not

prevent the average American household from partaking of over six hours of viewing per day for most of the decade.[5]

But not everyone had given up. Some intellectuals, sympathetic to the anti-technocratic critiques of the Sixties but unwilling to share their fatalism, turned the argument back on itself and looked to technology for escape from its own drear tyranny. Although technology gave the military, corporations, and other large systems of production a harder fist with which to work their will, "soft technologies" might provide individuals and small communities the means to recover their humanity in their homes and pastures. Small-scale, decentralized technology was more appropriate to "the purification of human character," according to popular British economist E. F. Schumacher, whose *Small Is Beautiful: Economics As If People Mattered* set the tone for much of this discussion.[6]

But even appropriate technologists needed a hardware store, and Stewart Brand's *Whole Earth Catalog* (1968) intended to fill the bill. Promoting "a groovy spiritual and material culture in which one's state of being was to be expressed in higher states of consciousness and well-selected tools" (as later described by Langdon Winner), *Whole Earth* followers turned to inexpensive and low-tech windmills, water pumps, spinning wheels, latrines, and solar cookers to engineer infrastructure for small, self-sustaining communities—imagine the Amish empowered by Sears Roebuck.[7] It was antiestablishment but not antitechnology; rather, it was a vision that appealed to technology, precisely and cleverly applied, to put power (literally) back into the hands of the people.

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GEEK EMPOWERMENT

Such was the cultural environment for technologists at the beginning of the 1970s. By the end of the decade, these cultural imperatives would combine with emerging technical and economic opportunities to allow a relatively small group of young technology geeks (or "techies") to transform Americans' relationship with their technology. This is a story that is simultaneously well known and incomplete; the cliché of unbathed teenagers launching multibillion dollar start-ups in their parents' garages in Silicon Valley is by now a fixture in popular culture. But what is less well known is how the imperative for technological self-empowerment shaped the desires and activities of techies during the 1970s and how the technological systems they developed have influenced American culture since.

In truth, techies had always been captivated by the vision of high technology self-empowerment. After all, Buck Rogers and Commander Cody were at their niftiest not when they were piloting spaceships but when they were zooming around with jet packs strapped to their backs. William P. Lear (1902–1978), an earlier twentieth-century geek, spent much of his professional life putting technology into individual hands. Lear developed the first commercially viable automobile radio in the 1920s (thus introducing mobility to a then-static technology; his design eventually became the signature product of Motorola, short for "Motor Victrola"); he then designed miniature autopilots during World War II. After the war, Lear developed small, private jet aircraft (forming Learjet in 1962). Also in the early 1960s, he invented the 8-track tape player, designed to bring personal portability to recorded music; in the later 1960s, he contracted with Ford, General Motors, and Chrysler to make 8-track players a popular option (though later the butt of endless jokes) in American cars. At the end of his life, Lear was working on nonpolluting engines, teleportation devices, and time machines.[8]

Techies in the 1970s had similar tastes but were emboldened with the political and social vision of transformative, appropriate technology. By then, the social and cultural options opened up by counterculture critique combined with new technological possibilities to allow, within small circles, a kind of technological utopianism not prevalent since the beginning of the twentieth century.[9] So, while 1950s techies had boosters and salesmen such as Lear, 1970s techies had gurus.

Ted Nelson was (and remains) the archetype of the San Francisco Bay Area technology guru of the 1970s. The son of actress Celeste Holm, Nelson majored in philosophy in college and earned an MA in sociology at Harvard in the 1960s. While a graduate student, he took a computer course and became entranced by the prospect that emerging computer technology might reinvigorate the humanities, particularly by opening up new literary possibilities. He tried and failed to develop what we would now recognize as an early word processor (he called it a "writing system"). In addition to allowing users to compose, store, and edit their writing, the system would also enable writers to compare versions side-by-side, track changes, and backtrack through earlier versions. Typically for him, Nelson never finished writing the software and had to take an incomplete in the course.[10]

While working on this project, Nelson also became frustrated with the

arcane expertise necessary to operate software and imagined an even larger literary system that could be navigated easily by non-techies. Such a system would store and index enormous amounts of information (both technical and humanistic) and permit non-experts to engage it by whatever nonhierarchical pathways they wished. "Zippered lists" would link concepts in one piece of text to similar concepts in all others, thus allowing readers (and writers) to roam through an infinitely tunneled landscape of information. He called the format "hypertext."[11]

After graduate school, Nelson wrote what has become a cult favorite—actually, two: *Computer Lib/Dream Machines.*[12] Self-published in 1974, the two books were virtually joined at the hip; after finishing one, you flipped the entire volume over and upside down and started the other. Stylistically, the books were clearly patterned after Brand's *Whole Earth Catalog*, with large, busy pages crammed with boxed text, free-standing quotations, hand-drawn illustrations, and rapidly changing typefaces.

The message of the books echoed Mumford, but as a call to arms rather than a lament: Computers are recasting politics, society, and culture, and it is up to the people to wrest control of this transformation from the corporate, militarized, technical priesthood.

> I would like to alert the reader, in no uncertain terms, that the time has come to be openly attentive and critical in observing and dealing with computer systems; and to transform criticism into action. If systems are bad, annoying and demeaning, these matters should be brought to the attention of the perpetrators. . . . [J]ust as the atmospheric pollution fostered by GM has become a matter for citizen concern and attack through legitimate channels of protest, so too should the procedural pollution of inconsiderate computer systems become a matter for the same kinds of concern. The reader should realize he can criticize and demand; THE PUBLIC DOES NOT HAVE TO TAKE WHAT'S BEING DISHED OUT.[13]

The key to empowering people, Nelson argued, was computer liberation. All people had to become familiar, comfortable, and even friendly with computers. Computers are more than useful machines; they are the creative vehicles by which we can manifest a democratic future. "They are toys, they are tools, they are glorious abstractions," Nelson enthused, but cautioned, "If you are interested in democracy and its future, you'd better understand computers."[14]

What was the goal of computer empowerment? Nothing less than a round-the-clock exploration of art and knowledge, open to all and controlled by none. In *Dream Machines*, Nelson described a supremely democratic "docuverse" that made all the world's literary material available to everyone for both consumption and production. He envisioned a universal, instantaneous, hypertext publishing network in which reader-writers could contribute their own literary products—new works, glosses, commentaries, marginalia—at will and with complete integration into the docuverse.[15] He named the system Xanadu, after the location of Kubla Khan's fabulous palace in Coleridge's poem—though Nelson's system perhaps bears greater resemblance to Charles Foster Kane's never-finished monument to himself.[16]

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TINKERING

Not all geeks are visionaries, of course. Many techies are motivated less by a grandiose vision of technotopia than by the simpler joy of playing with tech toys and the desire to impress others of like tastes.

Such were the regulars in groups like the Homebrew Computer Club, the famous electronics and computer hobbyists club in the San Francisco Bay Area during the middle 1970s. If asked at the time, most Homebrewers undoubtedly would have been able to spin out visions of technological utopia; read enough science fiction and you are bound to absorb the ethos. But that was not what really motivated them.

For example, the center of attention in Homebrew meetings during the middle years of the 1970s was the MITS Altair 8800, first released in 1975 and available by mail order from Albuquerque, New Mexico. Generally regarded as the first personal computer (PC), the Altair is completely unrecognizable as a usable machine today. In addition to its internal electronics, the entire system consisted of a case and a series of toggle switches and light bulbs on the front panel—no keyboard, no screen, no disk drive. Programs had to be entered as individual binary numbers by flipping the switches on the front; the only evidence that the program had done its job was a change in which bulbs were lit. And best of all, after it arrived in the mail, you had to break out your screwdriver, pliers—and, more than likely, your ohm meter and soldering iron—and put it together yourself.[17]

It was a machine only a dedicated hobbyist could love, or even use. But it

cost less than four hundred dollars, making it accessible to anyone with the expertise and devotion to tackle it. And I do mean devotion: One elated Homebrewer, Steve Dompier of Berkeley, recounted for his fellows, completely without sarcasm, how his Altair had arrived "in the mail at 10 AM, and 30 hours later it was up and running with only one bug in the memory!"[18] It only took him another six hours to track down the memory failure; one of the circuit boards was damaged, so he had to repair it.[19] But after thirty-six sleepless hours of toil, *he had his own computer.*

What could the Altair do? With no long-term storage and only 256 bytes of memory (and those are bytes, not megabytes or kilobytes), it could essentially do nothing useful; after several minutes of tediously flipping the binary switches, your Altair might successfully add, subtract, or sort a short list of numbers—things you could do more easily by hand or in your head.

But it was a computer, and it was yours. And countless Homebrew meetings were devoted to developing and exchanging trouble-shooting tips, faster algorithms, and software code for new Altair tricks. At one meeting, Dompier had his Altair perform a music recital. A few weeks earlier, he had been playing with his computer while listening to a nearby radio and had accidentally discovered that his Altair was putting out radio interference; different pitches of squeals and hisses emanated from the radio depending on what the computer was doing. For most of us, the lesson would have been to move the radio away from the computer, but not for a Homebrewer. "Well, what do ya know," Dompier enthused, "my first peripheral device!"[20] Theoretically, the interference meant that he could use the radio to allow his Altair to speak, or rather sing. He quickly (he says it took eight hours) wrote a program to turn data into musical tones that would come across as squeals of interference on a radio. He then worked out the data codes (in base 8) for the Beatles' "Fool on the Hill," programmed the song into his Altair, and bundled it all off (including the radio) to the next Homebrew meeting. The recital was a smashing success; however, he warned that "during the demanded encore, the machine did break into its own rendition of 'Daisy,' apparently genetically inherited."[21] If you have to ask why it would be important to get a computer to sing "Daisy" (or "A Bicycle Built for Two"), you are clearly not in the right state of mind.[22] Naturally, Dompier shared the hundreds of lines of data for both songs.

Personal computing would have remained a hobbyist's passion were it not for the gradual infusion of computer-liberation culture. It was an easy match. As a group, Homebrewers had a generally antiestablishment streak.

Steve Wozniak, one half of the founding duo of Apple Computer, initially became widely known within Homebrew as a maker of "blue boxes"—small electronic devices that emitted push-button telephone tones and permitted making free phone calls, breaking into existing conversations, and other phone phreaking.[23] Nelson's computer-liberation vision enjoyed a harmonic resonance.

The resonance was evident in some of the hobbyist magazines from the period. The community favorite, and one of the few such magazines to survive to the present, was *Dr. Dobb's Journal of Computer Calisthenics and Orthodontia.* Unlike its glossy and upscale competitors, like *Creative Computing* or *Byte* magazine, *Dr. Dobb's Journal* prided itself on its antiestablishment individualism. Its debut issue, in January 1976, made clear that the magazine existed solely for the edification of true hobbyists; it warned advertisers, for example, that the editors "reserve the right to refuse any advertising from companies which we feel fall short of our rather picky standards for ethical behavior and responsiveness to consumers. Also, any such commercial advertiser is herewith informed that we will not hesitate to publish harsh criticisms of their products or services, if we feel such criticisms are valid."[24]

Most of the magazine was unreadable (at least by humans). The majority of each of the early issues consisted of page after page of program listings, often in machine language, disseminating new sorting algorithms and computer language interpreters. Early on, most of the articles were devoted to tricks and tips for the Altair. But behind it all was the inviolable principle that software (like all knowledge) was power and should therefore be free. The magazine existed as "a sharing experience, intended to disseminate FREE software."[25] The only proper exchange of money among *Dr. Dobb's Journal* readers, the editors cautioned, was to charge for the cost of reproduction (software media like cassette tapes or punched paper tape), which was simply "the cost of sharing."

It is no surprise, therefore, that the computer partnership between Steve Wozniak and Steve Jobs began at Homebrew. Although they had met through a mutual friend a few years earlier, their interest in making computers together stemmed from Homebrew meetings in early 1975, the height of Altair mania.[26] Wozniak, a hobbyist at heart, was transfixed by the possibilities of owning his own computer. Jobs, four years younger than Wozniak and impatient with the "nit-picking technical debates" among Homebrewers, was a devotee of suburban Bay Area Marxism and disciple of computer liberation.[27] With visions of putting computing power into individual hands and living

rooms, and confident (mistakenly, at least at first) that there was a latent market that could put it there, Jobs cajoled Wozniak into marketing a computer kit that would rival the Altair.[28] They marketed the kit under the name Apple Computer in 1976.

The original Apple, however, was still little more than a hobbyist's toy; like the Altair, it required far too much expertise in electronics to be useful to everyday folks. To bring about true computer liberation, Jobs realized that Apple needed a machine that would appeal far beyond the hobbyist community. The machine had to be a household appliance, not an electronics engineer's pet project. It would need a keyboard, a color television-like monitor, and long-term storage.[29] It also needed a self-contained case but not a hard metal box with toggle switches and lights like the Altair and its competitors. If it were going to be a friendly household appliance, it had to look and feel like one. So, after studying the European-styled toasters and mixers in the kitchen department at Macy's in San Francisco, Jobs decided that he wanted a smooth, curved, plastic case for the Apple II. The result was an elegant and inviting design that would thereafter become the artifactual signature of Apple computers.[30]

The rest, of course, is legend. To bring the vision to the waiting world, Jobs realized that Apple desperately needed real money and business expertise. Consequently, he courted Mike Markkula, a thirty-four-year-old former Silicon Valley engineer who had become a venture capitalist after hitting big with his stock options at Intel. Markkula became Apple's first major investor in 1976 after being swept off his feet in Jobs's parents' garage—not by Jobs, but by a working Apple computer kit; it "was what I had wanted since I left high school," he would later say.[31]

Markkula brought in Mike Scott, who was even more of a geek. Thirty-two years old, unmarried, and infamous for his obesity and fondness for wearing overtight T-shirts, Scott also was a Silicon Valley engineer and had worked with Markkula in earlier jobs. He became Apple's first CEO in 1977.[32]

Together, the two Steves and the two Mikes (as they became known) formed the core of the new Apple. Markkula and Jobs were the principal choreographers of the Apple II's debut in 1977 at the first West Coast Computer Faire in San Francisco. The now-storied Faire, which was organized largely by Homebrew members, had an atmosphere that was a cross between a trade show and a *Star Trek* convention; the silent "e" in "Faire" was instantly familiar to the techie aficionados of "Dungeons & Dragons" and the Bay Area Renaissance

Faire. Markkula also helped the two Steves land the Silicon Valley marketing firm of Regis McKenna to market the Apple II and inject into the campaign a vision of computer liberation for the masses. The machine's debut print ad was a two-page spread depicting a husband sitting at the kitchen table with his Apple II and a cup of coffee, his wife chopping vegetables in the background and looking over her shoulder at him with a smile. The text on the opposite page opened with the banner, "The home computer that's ready to work, play and grow with you." The copy promised, "You don't even need to know a RAM from a ROM to use and enjoy Apple II. . . . You can begin running your Apple II the first evening, entering your own instructions and watching them work, even if you've had no previous computer experience."[33]

But why own one? You could, according to the ad, use it to help your children do schoolwork, organize household finances or recipes, or "chart your biorhythms." But the ad proclaimed that "the biggest benefit—no matter *how* you use Apple II—is that you and your family increase familiarity with the computer itself." The computer-enhanced future was here, and you needed to be part of it.[34]

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IN SEARCH OF THE KILLER APP

In reality, the machines themselves—the Apple II and its immediate competitors, like the Commodore PET and Tandy's TRS-80—never convinced the public of their worth. Here is where the technological self-empowerment vision faltered: owning your own computer, though nirvana for the electronics hobbyist, simply did not mean much to anyone else, even if it was easy to use. Computer liberation empowered people to do what? Chart their own biorhythms?

In fact, the only clear value added in owning your own computer was to be able to play video games without lugging pocketfuls of quarters down to the arcade at the mall. The first games available for home computers were direct ports from coin-operated arcade machines; the original Apple II ad encouraged people to play "Pong" as the first step on the way to computer liberation.[35] Versions of "Tank" and "Breakout" (a game that Jobs and Wozniak had created for Atari a few years earlier in which you aim a paddle and a bouncing ball to destroy a wall of bricks) soon followed. Being able to play

at home was empowerment of a sort, but it could get a little lonely. It was also the shape of things to come.

But games, even good games, were not enough to create a market. Besides, Atari and others quickly stepped into the market with stand-alone console game systems that hooked up to your television and cost a fraction of an Apple II. The real reason that the home-computer prospect turned into the PC revolution was because of the most boring of computer uses: spreadsheet calculations and word processing. In 1978, Dan Bricklin and Bob Frankson, two Harvard business students, produced VisiCalc for the Apple II. It was a spreadsheet program (*Visible Calculator*) and turned out to be the first killer application of the new industry. At about the same time, a forty-something programmer and computer hobbyist named Seymour Rubenstein founded MicroPro in order to sell WordMaster, a word processing program. WordMaster's successor, WordStar, quickly dominated the market when it launched in 1979.[36]

Suddenly, the machines made sense. Now, for a few thousand dollars, a business could replace its expensive financial analysis service with an Apple II and VisiCalc and have a dedicated machine on-site. And with a program like WordStar, large and small companies could realize enormous savings in staff and typing services. With this sort of software, the PC became much more than a toy; it now had the prospect of becoming a valuable, even indispensable, business tool. Apple's revenues climbed from eight hundred thousand dollars in 1977 to forty-eight million dollars by the end of 1979.[37]

By 1980, the waters of the PC market looked inviting after all, and more-established business technology corporations like IBM jumped in. If the Altair and Apple II started the technological revolution in the 1970s, the IBM PC completed it in the 1980s. Contrary to popular myth, the blue suits at Armonk were not oblivious to the tremors underfoot; in fact, aggressive market research had convinced them by the summer of 1980 that the market was real. But they also realized that almost every facet of IBM corporate culture impeded its entry into the new industry. At the time, Big Blue made most of its money on traditional office machines (like typewriters) and on leasing (not selling) large, mainframe computers; most of the profit from the computer business came from IBM's service contracts, and its greatest corporate asset was its nearly invulnerable contract network and direct sales force.[38] Selling tiny computers (and probably through retailers, no less) would undercut all of that. Recall that a fundamental motivator of computer-liberation culture had been to rail against everything that IBM represented.

In addition, IBM's production process was deeply vertically integrated, another emblem of its Steel Age roots: all the components of IBM computers, from the semiconductors to the plastic keyboards, were manufactured in-house. This desire to make everything themselves contributed to IBM's lengthy technology development cycle, which typically took three years from design to production—a hopelessly long time in this new, mercurial industry.[39]

In a story that has become a model for how to manage technological innovation at a hidebound corporation, IBM developed the PC by "boutiquing" it—creating a small, special taskforce (Codename: Project Chess) headquartered not in Armonk but in Boca Raton, Florida, and granting the taskforce special authority to work outside of IBM's traditional R&D and business models. For twelve months, the taskforce used off-the-shelf and subcontracted components; the processor came from Intel (securing Intel's dominance of the market for two decades), the power supplies from Zenith, and the printers from Epson.[40]

Although no one realized it at the time, the most momentous component that IBM outsourced for the PC was the operating system software. Even though it was one of the largest software companies in the world at the time, IBM had no experience writing software for small, stand-alone computers. In keeping with the renegade ethos within Project Chess, it therefore seemed an obvious decision to find an external supplier of the operating system.

Bill Gates thereby walked into the henhouse through the front door. When IBM came calling in 1980, Gates's company, Micro-soft (they dropped the hyphen later), was one of dozens of tiny software start-ups. Gates's geek credentials were strong but unremarkable. The son of a wealthy legal family in Seattle, Washington, Gates had become a computer hobbyist in childhood. At the age of twelve, he and a friend (later Microsoft co-founder, Paul Allen) had written a class-scheduling program for their private school that had the undocumented feature of placing Gates and Allen in classes with the best-looking girls.[41] Gates later went to Harvard with the vague expectation of a career in law but, like so many others in this story, became captivated by the MITS Altair in 1975. He therefore left Harvard a few months later (never to return), and he and Allen trekked to the MITS offices in Albuquerque, New Mexico, to explore the possibility of starting a company to write software for the Altair. Gates and Allen founded Microsoft in Albuquerque in 1975 and developed a reputation among hobbyists as one of many skilled writers of hobby software for the tiny machine.[42]

geeks was a notorious open letter he wrote to the computer-hobbyist community in 1976. Sensing the importance (and riches) that could come from setting technical software standards in the nascent industry, Gates was constantly frustrated with the hobbyist liberation ethic of copying and sharing software; the piracy made it impossible for Microsoft (or anyone) to establish proprietary standards.

His lament was characteristically efficient and imperious: "As the majority of hobbyists must be aware, most of you steal your software. Hardware must be paid for, but software is something to share."[43] But "sharing" was destroying any financial incentive to invest in development and had reduced Gates's own income on Altair software to a wage of about two dollars per hour. "Most directly," he charged, "the thing you do is theft." He urged everyone to pay for all the software they used and to hunt down and ostracize hobby-club members who were software pirates.

Most hobbyists misread the omen and dismissed Gates's letter as an annoying but meaningless rant. *Dr. Dobb's Journal*, in an editorial entitled "Copyright Mania: It's Mine, It's Mine, and You Can't Play with It," described Gates's concern as an "incredible teapot tempest" and suggested that software writers needed to realize that rules that apply to business and industrial customers need not apply to hobbyists. Hobbyists, after all, are not in it for the money.[44]

Gates moved Microsoft to Seattle in 1979, and by 1980 the company had established a sufficient reputation for operating systems to interest IBM for Project Chess; it did not hurt that IBM president John Opel knew Gates's mother (they were both serving on the national board of United Way).[45] Gates quickly understood what IBM needed and promised that he could provide it. He then bought the rights to a preexisting operating system, called QDOS (which stood for Quick and Dirty Operating System), from a local software company for fifty thousand dollars, which was a lot of money for Microsoft at the time. After a few small modifications, Gates renamed it Microsoft DOS, or MS-DOS (claiming that "DOS" now stood for the nonsensical Disk Operating System).[46] But it worked, and it was available, so IBM bought it. Or rather, at Gates's shrewd insistence, they leased it, so that a copy of MS-DOS was licensed with every IBM PC sold, with royalties (and the market dominance to set industrial standards) going back to Microsoft. As is well known, the deal was the first step in making Bill Gates the richest man on Earth.

IBM's machine was in production the following summer. With Big Blue's imprimatur on the box, demand from the business world quickly exceeded IBM's expectations. A few days after the IBM PC's launch in August 1981, the company needed to quadruple production. The machine made $43 million in its first year; by the end of 1984, along with IBM's allied products, it had netted over $4 billion.[47] By the mid-1980s, the IBM PC (or at least its Intel-Microsoft core) was the industry standard.

It is worth noting, however, that in launching its (temporarily) successful bid to take over the burgeoning PC industry, the marketing team at IBM felt compelled to sing Apple's version of the technological self-empowerment song. IBM's market research indicated that the public considered it an efficient and capable but cold and heartless organization. Jim D'Arezzo, the advertising administrator for the IBM PC development project, realized that the IBM PC would somehow have to be friendlier than the Apple, the machine that had defined warm and fuzzy technology. After several failed ad campaign concepts—including using the Muppets, Marcel Marceau, and Beverly Sills—IBM's advertising firm settled on the Tramp—the industrious, hapless, but ultimately victorious everyman portrayed by Charlie Chaplin.[48] The choice was perfect, if achingly ironic. Most consumers must have forgotten Chaplin's leftist political controversies, or the Tramp's most famous scene in *Modern Times* (in which he was literally swallowed by a monstrous industrial machine), for the image of the vulnerable, sympathetic urchin becoming empowered by the friendly and helpful machine allowed IBM to ride the bourgeois version of computer liberation that Jobs had created at Apple. A few years later, in explaining how the IBM PC had vanquished the market, *Time* magazine suggested that "[t]he Tramp, with his ever present red rose, has given IBM a human face."[49]

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NERDS AND HEROES

The larger results of these techie efforts, unsurprisingly, would not be clear for another decade or so. The explosive transformation of the technology of American work and leisure would come in the later 1980s and 1990s, as computers replaced not only typewriters but also entire categories of labor, and the Internet transformed computer technology into a communications

was largely in place by the end of the century.

Socially and economically, the greatest consequence was the increasing importance of software. As the processes for designing and producing hardware stabilized quickly in the early 1980s (especially with the supremacy of the IBM PC), the greatest financial opportunities moved to the realm of software; the shift surprised everyone, even apostles of Ted Nelson. Steve Jobs had simply wanted to transform the computer from a big calculator into a cool home appliance. Instead, it became much more than that—it became a medium. And like the printing press, radio, and television before it, after the hardware was pretty much settled, what made the personal computer indispensable was the information it could carry.

Ironically, the transformation of the computer from appliance to medium came not from computer liberation renegades but from their antithesis: the Department of Defense (DoD). The DoD's Advanced Research Projects Agency had been exploring ways to allow researchers to exchange computer files and information over networks since the 1960s. The DoD's network, originally called the ARPAnet, had become popular at many universities by the late 1970s for allowing communication between their large mainframe computers. As they became more prevalent, PCs were able to plug into the same architecture, renamed the Internet, by the early 1980s; through the end of the twentieth century, they would do so by the tens of millions.[50]

Cultural transformation followed the social and economic. For example, the Eighties and Nineties saw a new role for the techie in popular culture. Earlier in the twentieth century, scientifically and technologically empowered characters in fiction usually took the form of villains. Continuing the images of Drs. Faust and Frankenstein, scientists and engineers had commonly been some combination of mad, tyrannical, or monstrous. Movies, plays, and stories centering on scientists intent on destroying the world were moderately popular after World War I and became commonplace after Hiroshima.[51] Dr. Strangelove, Professor Groeteschele (Walther Matthau's Kissingerian monster in *Fail-Safe*), and Dr. Octopus (nemesis of Spiderman), though brilliant and powerful, were not the characters you went to in time of need; and they never, ever, got the girl.

Only slightly better, techies were sometimes played for pathetic laughs. The professor stranded on *Gilligan's Island* could build a nuclear reactor out of some palm fronds and coconuts but was mysteriously unable to fix a three-foot hole in a boat. As late as the 1980s, geeks remained bumblers and

weirdos in teen movies, even when they supposedly had their day in 1984's *Revenge of the Nerds*.

There was one early exception. Peter Parker was a teenage geek—socially and sexually isolated, devoted to his science classes, picked on by jocks—until the bite of a radioactive spider transmuted him into the Amazing Spiderman in 1962. Spiderman quickly became the darling of teen geeks everywhere, as well as the anchor of Marvel Comics' domination of the industry. But even here, it was not Parker's geekdom but rather the accidental and unexplained power of radioactivity that made him a hero.

This is what changed in the 1980s and 1990s. In science-fiction novels like William Gibson's *Neuromancer* (1984) and Neal Stephenson's *Snow Crash* (1992), cyberpunk heroes save the day precisely because of their technological prowess. Often set largely within computer-generated environments (Gibson coined the term "cyberspace"), cyberpunk novels allowed geek characters who were undistinguished in the "meat" (real) world to become superheroes in the virtual world. In the meat world, the protagonist of Gibson's *Neuromancer* is imprisoned within a crippled body; in cyberspace, he is a savior.

The geek hero emerged from the niche of science-fiction novels with the blockbuster movie *The Matrix* in 1999. The movie and its sequels feature a group of computer hackers who wage a war for human freedom against a tyrannical computer system. In meat-based reality, the characters are a desperate and ragtag band of human survivors. But in the virtual world, they are fetish-clad bad asses who wield a spectacular arsenal of martial arts skills and automatic weapons. Neo, the central character, ultimately finds that he is able to use the Matrix's mind-machine interface to bend the laws of nature within cyberspace and turn himself into a god—computer liberation–cum geek apotheosis.

It is easy to exaggerate the cultural importance of this geek transformation. It is true, for example, that the greatest appeal of *The Matrix* was its cinematic style, especially the slow-motion "bullet time" camera orbits and the balletic martial-arts sequences that became signatures for the movies; the celebration of techie power in the story line was a secondary draw at best. It is also true that academics probably paid more attention to cyberpunk literature than did geeks themselves; although they started showing up on course syllabi, *Neuromancer* and *Snow Crash* never reached beyond their niche markets. Nevertheless, the geek hero became a broadly recognizable role in American popular culture during the 1980s and 1990s—a development

the 1970s.

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CONCLUSION: GEEKING ALONE WITH THE DESIGNER SELF

Aside from raising the cultural stock of geeks themselves, however, it is not clear that the technological infrastructure of computer liberation has helped realize its cultural goals. In many ways, the social trend for computer technology has paralleled the developments of other technologies that bring greater choice to increasingly disconnected individuals. The evolution from broadcast television to cable television to VCR to TiVo has empowered individuals to tailor their television consumption more precisely (in content, scheduling, and so on) and therefore has segmented this dimension of mass culture along overwhelmingly complex lines. Similarly, the effects of computer self-empowerment have shown ever more clearly that the journey from self-empowerment to isolation can be a short one.

On the one hand, there can be little doubt that technological changes during the 1970s contributed to the oft-lamented decline in social capital in the United States in the decades that followed. For the computer empowered, both working in the office and playing at home have been increasingly typified by sitting at a computer and interacting with other humans through the thin pipe of electron exchange. People on the Internet know only thin slices of one another and may therefore develop only tenuous and haphazard political, social, and cultural bonds with the world.[52] Fun as it may be, sitting at your home computer playing "Everquest Online" with ten thousand of your closest friends is simply not a promising environment for social and cultural exchange.

On the other hand, the thinness of computer identity opens up new kinds of cultural possibilities. People can be whatever they want to be in cyberspace. In e-mail groups, chat rooms, and especially online games, participants can design their personas without regard to the constraints of physics or biology. Passing as a different ethnicity, gender, or even species can be as easy (and low risk) as a mouse click.

This is the world that geeks began building in the 1970s. In an era of po-

litical disappointment and cultural malaise, they saw the possibilities of a new and empowered future and had the wherewithal to make it with their hands.

Notes

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11. Ibid.; Martin Campbell-Kelly, and William Aspray, *Computer: A History of the Information Machine* (New York: Basic Books, 1996), 239.
12. Ted Nelson, *Computer Lib/Dream Machines*, rev. ed. (Redmond, WA: Microsoft Press, 1987).
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16. Xanadu remains, in Wolf's words, "the longest-running vaporware story in the history of the computer industry." Nevertheless, Nelson, who regards the World Wide Web as an impotent shadow of Xanadu, remains optimistic.
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22. "Open the pod bay doors, HAL."
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25. Ibid., 2. Emphasis in original.
26. Campbell-Kelly and Aspray, *Computer*, 245–246; Malone, *Infinite Loop*, 26, 53–57.
27. Campbell-Kelly and Aspray, *Computer*, 246.
28. Ibid.; Malone, *Infinite Loop*, 62–70.
29. Campbell-Kelly and Aspray, *Computer*, 246.
30. Malone, *Infinite Loop*, 120–123.
31. Ibid., 113.
32. Ibid., 120.
33. Apple II's launch print ad is available at http://www.kelleyad.com/Histry.htm, and the complete text is at http://www.faqs.org/faqs/apple2/faq/part14/. See also Campbell-Kelly and Aspray, *Computer*, 248.
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