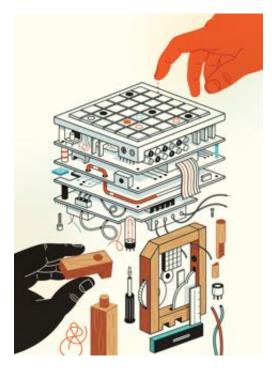I n January of 1903, the small Boston magazine *Handicraft* ran an essay by the Harvard professor Denman W. Ross, who argued that the American Arts and Crafts movement was in deep crisis. The movement was concerned with promoting good taste and self-fulfillment through the creation and the appreciation of beautiful objects; its more radical wing also sought to advance worker autonomy. The problem was that no one in America seemed to need its products. The solution, according to Ross, was to provide technical education to the critics and the consumers of art alike. This would stimulate demand for high-quality objects and encourage more workers to take up craftsmanship. The cause of the Arts and Crafts movement would be achieved, he maintained, only "when the philosopher goes to work and the working man becomes a philosopher."

Enthusiasts of the maker movement foresee a third industrial revolution. Illustration by Harry Campbell.

In a long rebuttal, Mary Dennett, who later became an important advocate for women's rights, pointed out that the roots of the problem were economic and moral. Reforming the school curriculum wouldn't do much to change the structural conditions that made craftsmanship impossible. The Arts and Crafts movement was spending far too much time on "rag-rugs, baskets, and . . . exhibitions of work chiefly by amateurs," rather than asking the most basic questions about inequality. "The employed craftsman can almost never use in his own home things similar to those he works on every day," she observed, because those things were simply unaffordable. Economics, not aesthetics, explained the movement's failures. "The modern man, who should be a craftsman, but who, in most cases, is compelled by force of circumstances to be a mill operative, has no freedom," she wrote earlier. "He must make what his machine is geared to make."

Dennett's tireless social activism bore fruit in other realms, but she lost this fight to aesthetes like Ross. As the historian Jackson Lears describes it in "No Place of Grace" (1981), the Arts and Crafts movement no longer represented a radical alternative to the alienated labor of the factories. Instead, it provided yet another therapeutic escape from it, turning into a "revivifying hobby for the affluent." Lears concluded, "The craft impulse has become dispersed in millions of do-it-yourself projects and basement workshops, where men and women have sought the wholeness, the autonomy, and the joy they cannot find on the job or in domestic drudgery."

Although the Arts and Crafts movement was dead by the First World War, the sentiment behind it lingered. It resurfaced in the counterculture of the nineteen-sixties, with its celebration of simplicity, its back-to-the-land sloganeering, and, especially, its endorsement of savvy consumerism as a form of political activism. The publisher and sage Stewart Brand was the chief proponent of such views. "The consumer has more power for good or ill than the voter," he announced in the pages of his "Whole Earth Catalog," which débuted in 1968 and was geared to communalists and others who sought to drop out of the mainstream.

Inspired by the technophilia of his intellectual hero Buckminster Fuller, Brand played a key role in celebrating the personal computer as the ultimate tool of emancipation. He convinced the consumers he celebrated that they were actually far more radical than the student rebels who were being beaten up by the police. At a recent conference, Brand drew a contrast between "what happened around Berkeley in the sixties and what happened around Stanford in the sixties," a contrast that captures the fate of activism in America more broadly:

"If you ask me what's wrong one more time, I'm going to tell you."

Around Berkeley, it was Free Speech Movement, "power to the people." Around Stanford, it was "Whole Earth Catalog," Steve Wozniak, Steve Jobs, people like that, and they were just power to people. They just wanted to power anybody who was interested, not "the people." Well, it turns out there is no, probably, "the people." So the political blind alley that Berkeley went down was interesting, we were all taking the same drugs, the same length of hair, but the stuff came out of the Stanford area, I think because it took a Buckminster Fuller access-to-tools angle on things.

To convince consumers that they were rebels, Brand first convinced them that they were "hackers," a slang term that was already in use in places like M.I.T. but that Brand went on to popularize and infuse with much wider meaning. In 1972, he published "Spacewar," a long and much read article in *Rolling Stone* about Stanford's Artificial Intelligence Laboratory. He distinguished the hackers from the planners, those rigid and unimaginative technocrats, noting that "when computers become available to everybody, the hackers take over." For Brand, hackers were "a mobile new-found elite." He seemed to have had a transcendental experience in that lab: "Those magnificent men with their flying machines, scouting a leading edge of technology which has an odd softness to it; outlaw country, where rules are not decree or routine so much as the starker demands of what's possible." Computers were the new drugs—without any of the side effects.

In a later edition of the "Whole Earth Catalog," Brand reminisced about its mid-seventies heyday,

when it recommended two products: the Vermont Castings Defiant woodstove and the Apple personal computer. The odd juxtaposition made sense to Brand. "Both cost a few hundred dollars, both were made by and for revolutionaries who wanted to de-institutionalize society and empower the individual." Yet, while the Defiant woodstove ran into trouble, Apple prospered—because it was in the business of manipulating information, not heat. With information now intruding into every field, Brand held, there was considerably more scope for hacking. And the country was ready for it. His subscribers were more likely to be office workers than factory workers; few were forced to be mill operatives, as in Dennett's day. But the transition to "cognitive capitalism" (as some labor theorists would put it) didn't make the workplace less alienating. Brand's remedy was hacking of a particular kind: "With over half of the American workforce now managing information for a living, any apparent drone drudging away on mainstream information chores might be recruited, via some handy outlaw techniques or tool, into the holy disorder of hackerdom. A hacker takes nothing as given, everything as worth creatively fiddling with, and the variety which proceeds from that enricheth the adaptivity, resilience, and delight of us all."

For all the talk of the "de-institutionalization of society" enabled by the personal computer, Brand was brutally honest about the kinds of emancipation that he had to offer. The way to join the holy disorder of hackerdom was by, say, playing Tetris—and, on weekends, going home and hacking rubber stamps, postcards, and whatever else one had ordered from the "Whole Earth Catalog."

Is Brand's hacking revolutionary, or counter-revolutionary? The plentiful recent books that preach hacking as a way of life—"Reality Hacking," "Hacking Your Education," "Hacking Happiness"—express devotion at least to the rhetoric of revolt. "Hacking Work," a business book published in 2010, announces that "you were born to hack" and suggests ways in which one could "hack" work to achieve "*morebetterfaster* results." As in most of these books, our hackers aren't smashing the system; they're fiddling with it so that they can get more work done. In this vision, it's up to individuals to accommodate themselves to the system rather than to try to reform it. The shrinking of political imagination that accompanies such attempts at doing more with less usually goes unremarked.

That hacking has come to mean two very different aspirations became evident when Barack Obama belittled Edward Snowden as "a twenty-nine-year-old hacker" only a few weeks after the White House endorsed the first National Day of Civic Hacking. In Britain, the Metropolitan Police might be busy finding hackers like Snowden, but in April it helped organize "Hack the Police!"—a so-called "hackathon," where software developers and designers were encouraged to bring their "unique talents to the fight against crime." In contrast to jabbering, feckless politicians, hackers offer hope for the most hopeless endeavors. "I'd like to see the spirit of hackerdom improve peace in the Middle East," the influential technology publisher and investor Tim O'Reilly proclaimed a couple of years ago.

Inevitably, hacking itself had to get hacked. When, in November, Brand was asked about who carries the flag of counterculture today, he pointed to the maker movement. The makers, Brand said, "take whatever we're not supposed to take the back off of, rip the back off and get our fingers in there and mess around. That's the old impulse of basically defying authority and of doing it your way." Makers, in other words, are the new hackers.

There are already plenty of intellectual entrepreneurs eager to capitalize on the new counterculture. Kevin Kelly—who used to work with Brand on his many magazines—has revived the "Whole Earth Catalog" tradition with his new catalogue-like publication, "Cool Tools." It features product tips for the true reality hacker—from "quick-refreshing underwear for travel" to the "luxurious, squirting WC seat" (thermostatically warmed, and yours for just eight hundred dollars). "A third industrial revolution is stirring—the Maker era," Kelly writes in the introduction to "Cool Tools." "The skills for this accelerated era lean toward the agile and decentralized. Therefore tools recommended here are aimed at small groups, decentralized communities, the do-it-yourselfer, and the self-educated. . . . These possibilities cataloged here will help makers become better makers." In his world, the main thing it takes to be a maker is a credit card.

The maker era might not be upon us yet, but the maker movement has arrived. Just who are these people? Like the Arts and Crafts movement—a mélange of back-to-the-land simplifiers, socialists, anarchists, and tweedy art connoisseurs—the makers are a diverse bunch. They include 3-D-printing enthusiasts who like making their own toys, instruments, and weapons; tinkerers and mechanics who like to customize household objects by outfitting them with sensors and Internet connectivity; and appreciators of craft who prefer to design their own objects and then have them manufactured on demand.

Each of these subgroups has its own history. What turns them into a movement is the intellectual infrastructure that allows makers to reflect on what it means to be a maker. Makers interested in honing their skills can take classes in well-equipped "makerspaces," where they can also design and manufacture their wares. Makers have their own widely read publication—the magazine *Make*—a cheerleader for "technology on your time." Then there are Maker Faires—exhibitions dedicated to the celebration of the D.I.Y. mind-set which were pioneered by *Make* and have quickly spread across the country and far beyond, including a Maker Faire Africa. And, as befits a contemporary movement, the makers want respect: a Maker's Bill of Rights has been drafted. Kelly isn't jesting when he identifies the rise of makers with a third industrial revolution: many promoters of the maker movement believe that personal manufacturing will undermine the clout of large corporations. It might even liberate labor in a way that the Arts and Crafts radicals hadn't anticipated, with office workers abandoning their jobs

in pursuit of meaningful self-employment amid sensors and 3-D printers. Meanwhile, the prospect of being able to print guns, drug paraphernalia, and other regulated objects appeals to libertarians.

A proper movement requires more than newsletters and magazines; it also needs manifestos. Chris Anderson, the *Wired* editor-in-chief who quit his job to become the C.E.O. of 3D Robotics, a company that develops personal drones, published one such manifesto, "Makers," in 2012. More recently, Mark Hatch, the C.E.O. of TechShop, a chain of makerspaces across the country, published "The Maker Movement Manifesto." Both books promise a revolution.

Anderson defines "making" so expansively that all of us seem to qualify, at least once a day. "If you love to plant, you're a garden Maker. Knitting and sewing, scrap-booking, beading, and cross-stitching—all Making." There's nothing in this book about mythmaking, but that surely qualifies as well. For someone who spent more than a decade at the helm of *Wired*, Anderson sounds surprisingly unhappy with the virtual turn that our lives have taken. He repeatedly blames screens and personal computers for our lack of contact with physical objects. "The digital natives are starting to hunger for life beyond the screen," he writes. "Making something that starts virtual but quickly becomes tactile and usable in the everyday world is satisfying in a way that pure pixels are not." Many aesthetes in the early Arts and Crafts debates complained about machines, rather than about the economic conditions under which they were used. Anderson, likewise, sees "pure pixels" as the source of discontent, as opposed to the uses to which those pixels are put (the boring spreadsheet, the senseless PowerPoint deck).

For Anderson, it's the democratization of invention—anyone can become an app mogul these days—that defines the past two decades of Internet history. Owing to the maker movement, he thinks, the same thing might happen to manufacturing: " 'Three guys with laptops' used to describe a Web startup. Now it describes a hardware company, too." Every inventor can become an entrepreneur. Indeed, he anticipates a Web-like future for the maker movement: "ever-accelerating entrepreneurship and innovation with ever-dropping barriers to entry."

The kind of Internet metaphysics that informs Anderson's account sees ingrained traits of technology where others might see a cascade of decisions made by businessmen and policymakers. (Would "the history of the Web" be the same if the National Science Foundation hadn't relinquished control of the Internet to the private sector in 1995?) This is why Anderson starts by confusing the history of the Web with the history of capitalism and ends by speculating about the future of the maker movement, which, on closer examination, is actually speculation on the future of capitalism. What Anderson envisages—more of the same but with greater diversity and competition—may come to pass. But to set the threshold for the third industrial revolution so low just because someone somewhere forgot to regulate A.T. & T. (or Google) seems rather unambitious.

In the absence of a savvy political strategy, the maker movement could have even weaker political and social impact than Anderson foresees. One worrying sign appeared in the fall of 2012, when MakerBot, a pioneer in open-source 3-D printing, embraced a controlled, closed model. Then MakerBot was acquired by Stratasys, a big, established manufacturer of 3-D printers—a company that is the opposite of what MakerBot once aspired to be. 3-D printing is raising challenges with respect to copyright and trademark law, and regulatory backlash is inevitable. Some corporations will target the many intermediaries involved in the process, from the manufacturers of 3-D printers to sites hosting the files that users download in order to print an object. Other companies are developing software that would prevent printers from creating components that could be used to assemble a gun. Such a mechanism might control the printing of other artifacts, like the ones that litigious, patent-holding corporations claim a property interest in.

Then there are the temptations facing the movement. Two years ago, DARPA—the research arm of the Department of Defense—announced a ten-million-dollar grant to promote the maker movement among high-school students. DARPA also gave three and a half million dollars to TechShop to establish new makerspaces that could help the agency with its "innovation agenda." As a senior DARPA official told *Bloomberg BusinessWeek*, "We are pretty in tune with the maker movement. We want to reach out to a much broader section of society, a much broader collection of brains." The Chinese government, too, seems to have embraced the makers with open arms. Authorities in Shanghai have announced plans to launch a hundred makerspaces, while the Communist Youth League has been active in recruiting visitors to Maker Faires—or Maker Carnivals, as they are known in China. One of the co-founders of MakerBot has left New York for Shenzhen. Makers, it appears, are not necessarily troublemakers.

Mark Hatch, for one, shows no concern that proximity to power might compromise his movement's revolutionary potential. "Now, with the tools available at a makerspace, anyone can change the world," he writes in "The Maker Movement Manifesto." "Every revolution needs an army. . . . My objective with this book is to *radicalize* you and get you to become a soldier in this army." How radical is Hatch's project? At the start of the acknowledgments that open the book, he thanks Autodesk, Ford, DARPA, the V.A., Lowe's, and G.E. His talk of becoming an army soldier may not be a metaphor.

TechShop charges a monthly membership fee, which provides access to facilities equipped with everything from oxyacetylene welders to the latest design software. TechShop's support staffers are called Dream Consultants, and the book is peppered with yarns about desperate souls—laid off, poor, depressed, sleeping in their cars right next to the makerspace—who have been transformed by the experience of making. (Describing a woman who became a vender on Etsy after visiting TechShop, Hatch writes, "An accidental entrepreneur was born. And what was Tina's background? She was a

labor organizer.") Like Anderson, Hatch emphasizes how we are all born makers but are everywhere in ready-made chains. We must abandon the virtual and embrace the physical—preferably at Hatch's TechShop.

Hatch and Anderson alike invoke Marx and argue that the success of the maker movement shows that the means of production can be made affordable to workers even under capitalism. Now that money can be raised on sites such as Kickstarter, even large-scale investors have become unnecessary. But both overlook one key development: in a world where everyone is an entrepreneur, it's hard work getting others excited about funding your project. Money goes to those who know how to attract attention.

Simply put, if you need to raise money on Kickstarter, it helps to have fifty thousand Twitter followers, not fifty. It helps enormously if Google puts your product on the first page of search results, and making sure it stays there might require an investment in search-engine optimization. Some would view this new kind of immaterial labor as "virtual craftsmanship"; others as vulgar hustling. The good news is that now you don't have to worry about getting fired; the bad news is that you have to worry about getting downgraded by Google.

Hatch assumes that online platforms are ruled by equality of opportunity. But they aren't. Inequality here is not just a matter of who owns and runs the means of physical production but also of who owns and runs the means of intellectual production—the so-called "attention economy" (or what the German writer Hans Magnus Enzensberger, in the early sixties, called the "consciousness industry"). All of this suggests that there's more politicking—and politics—to be done here than enthusiasts like Anderson or Hatch are willing to acknowledge.

A comparison to the world of original hackers—the folks that Brand profiled in his *Rolling Stone* article, not the "reality hackers" of later decades—may be illuminating. It's a comparison that the makers are fond of. The subtitle of Hatch's book, tellingly, is "Rules for Innovation in the New World of Crafters, Hackers, and Tinkerers." Anderson pays homage to the Homebrew Computer Club—a small hobbyist group that, starting in 1975, brought together computer enthusiasts from the Bay Area, including Steve Wozniak and Steve Jobs. For Anderson, such innovation is the prelude to a great business: when hobbyists cluster together to work on obscure technologies, someone eventually gets rich. But it's misleading to view the Homebrew Computer Club solely through the prism of innovation and entrepreneurship. It also had, at least at first, a political vision.

One of the leaders of the Homebrew Computer Club was Lee Felsenstein. A veteran of the Free Speech Movement in Berkeley, he wanted to build communication infrastructure that would allow citizens to swap information in a decentralized manner, bypassing the mistrusted traditional

media. In the early nineteen-seventies, he helped launch Community Memory—a handful of computer terminals installed in public spaces in Berkeley and San Francisco which allowed local residents to communicate anonymously. It was the first true "social media."

Felsenstein got his inspiration from reading Ivan Illich's "Tools for Conviviality," which called for devices and machines that would be easy to understand, learn, and repair, thus making experts and institutions unnecessary. "Convivial tools rule out certain levels of power, compulsion, and programming, which are precisely those features that now tend to make all governments look more or less alike," Illich wrote. He had little faith in traditional politics. Whereas Stewart Brand wanted citizens to replace politics with savvy shopping, Illich wanted to "retool" society so that traditional politics, with its penchant for endless talk, becomes unnecessary.

Felsenstein took Illich's advice to heart, not least because it resembled his own experience with ham radios, which were easy to understand and fiddle with. If the computer were to assist ordinary folks in their political struggles, the computer needed a ham-radio-like community of hobbyists. Such a club would help counter the power of I.B.M., then the dominant manufacturer of large and expensive computers, and make computers smaller, cheaper, and more useful in political struggles.

Then Steve Jobs showed up. Felsenstein's political project, of building computers that would undermine institutions and allow citizens to share information and organize, was recast as an aesthetic project of self-reliance and personal empowerment. For Jobs, who saw computers as "a bicycle for our minds," it was of only secondary importance whether one could peek inside or program them.

Jobs had his share of sins, but the naïveté of Illich and his followers shouldn't be underestimated. Seeking salvation through tools alone is no more viable as a political strategy than addressing the ills of capitalism by cultivating a public appreciation of arts and crafts. Society is always in flux, and the designer can't predict how various political, social, and economic systems will come to blunt, augment, or redirect the power of the tool that is being designed. Instead of deinstitutionalizing society, the radicals would have done better to advocate reinstitutionalizing it: pushing for political and legal reforms to secure the transparency and decentralization of power they associated with their favorite technology.

One thinker who saw through the naïveté of Illich, the Homebrewers, and the Whole Earthers was the libertarian socialist Murray Bookchin. Back in the late sixties, he published a fiery essay called "Towards a Liberatory Technology," arguing that technology is not an enemy of craftsmanship and personal freedom. Unlike Brand, though, Bookchin never thought that such liberation could occur just by getting more technology into everyone's hands; the nature of the political community mattered. In his book "The Ecology of Freedom" (1982), he couldn't hide his frustration with the "access-to-tools" mentality. Bookchin's critique of the counterculture's turn to tools parallels Dennett's critique of the

aesthetes' turn to education eighty years earlier. It didn't make sense to speak of "convivial tools," he argued, without taking a close look at the political and social structures in which they were embedded.

A reluctance to talk about institutions and political change doomed the Arts and Crafts movement, channelling the spirit of labor reform into consumerism and D.I.Y. tinkering. The same thing is happening to the movement's successors. Our tech imagination, to judge from catalogues like "Cool Tools," is at its zenith. (Never before have so many had access to thermostatically warmed toilet seats.) But our institutional imagination has stalled, and with it the democratizing potential of radical technologies. We carry personal computers in our pockets—nothing could be more decentralized than this!—but have surrendered control of our data, which is stored on centralized servers, far away from our pockets. The hackers won their fight against I.B.M.—only to lose it to Facebook and Google. And the spooks at the National Security Agency must be surprised to learn that gadgets were supposed to usher in the "de-institutionalization of society."

The lure of the technological sublime has ruined more than one social movement, and, in this respect, even Mary Dennett fared no better than Felsenstein. For all her sensitivity to questions of inequality, she also believed that, once "cheap electric power" is "at every village door," the "emancipation of the craftsman and the unchaining of art" would naturally follow. What electric company would disagree? ♦

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