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# MASTER MINDS

A quarter century ago,  
the book *Hackers* chronicled  
the coders, visionaries, and  
hygiene-challenged nerds who were  
hatching our digital world.  
Now the author circles back  
with these industry titans and  
tragic idealists—and checks in  
with the next generation.

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Wired > May 2010 > 0 8 0





# “IT’S FUNNY IN A WAY,”

says Bill Gates, relaxing in an armchair in his office. “When I was young, I didn’t know any old people. When we did the microprocessor revolution, there was nobody old, nobody. It’s weird how old this industry has become.”

The Microsoft cofounder and I, a couple of fiftysomething codgers, are following up on an interview I had with a tousle-headed Gates more than a quarter century ago. I was trying to capture what I thought was the red-hot core of the then-burgeoning computer revolution—the scarily obsessive, absurdly brainy, and endlessly inventive people known as hackers. Back then, Gates had just pulled off a deal to supply his DOS operating system to IBM. His name was not yet a household word; even Word was not yet a household word. I would interview Gates many times over the years, but that first conversation was special. I saw his passion for computers as a matter of historic import. Gates himself saw my reverence as an intriguing novelty. But by then I was convinced that I was documenting a movement that would affect everybody.

The book I was writing, *Hackers: Heroes of the Computer Revolution*, came out just over 25 years ago, in the waning days of 1984. My editor had urged me to be ambitious, and so I shot high, crafting a 450-page narrative in three parts, making the case that hackers—brilliant programmers who discovered worlds of possibility within the coded confines of a computer—were the key

players in a sweeping digital transformation.

I hadn’t expected to reach that conclusion. When I embarked on my project, I thought of hackers as little more than an interesting subculture. But as I researched them, I found that their playfulness, as well as their blithe disregard for what others said was impossible, led to the breakthroughs that would define the computing experience for millions of people. Early MIT hackers realized it was possible to use computers for what we now call word processing. (Their initial program was called *Expensive Typewriter*, appropriate since the one machine it ran on cost \$120,000.) They also invented the digital videogame. The rebel engineers of the Homebrew Computer Club in Silicon Valley were the first to take advantage of new low-cost chips to build personal computers. They may have begun as a fringe cohort, but hackers alchemized the hard math of Moore’s law into a relentless series of technological advances that changed the world and touched all of our lives. And most of them did it simply for the joy of pulling off an awesome trick.

But behind the inventiveness was something even more marvelous—all real hackers shared a set of values that has turned out to be a credo for the information age. I attempted to codify this unspoken ethos into a series of principles called the hacker ethic. Some of the notions now seem forehead-smackingly obvious but at the time were far from accepted (“You can create art and beauty on a computer”). Others spoke to the meritocratic possibilities of a digital age (“Hackers should be judged by their hacking, not bogus criteria such as degrees, age, race, or position”). Another axiom identified computers as instruments of insurrection, granting power to any individual with a keyboard and

sufficient brainpower (“Mistrust authority—promote decentralization”). But the precept I perceived as most central to hacker culture turned out to be the most controversial: “All information should be free.”

Stewart Brand, hacker godfather and *Whole Earth Catalog* founder, hacked even that statement. It happened at the first Hackers’ Conference, the week my book was published, during a session I moderated on the future of the hacker ethic. “On the one hand, information wants to be expensive, because it’s so valuable,” he said. “On the other hand, information wants to be free, because the cost of getting it out is getting lower and lower all the time. So you have these two fighting against each other.” His words neatly encapsulate the tension that has since defined the hacker movement—a sometimes pitched battle between geeky idealism and icy-hearted commerce.

Though *Hackers* initially landed with a bit of a thud (*The New York Times* called it “a monstrosity overblown magazine article”), it eventually found an audience greater than even my overheated expectations. Through chance encounters, email, and tweets, people are constantly telling me that reading the book inspired them in their careers. Thumbing through David Kushner’s *Masters of Doom*, I learned that reading *Hackers* as a geeky teenager reassured *Doom* creator John Carmack that he was not alone in the world. When I recently interviewed Ben Fried, Google’s chief information officer, he showed up with a dog-eared copy of the book for me to sign. “I wouldn’t be here today if I hadn’t read this,” he told me.

But it was the hackers themselves who inspired a generation of programmers, thinkers, and entrepreneurs—and not just fellow techies. Everyone who has ever used a computer has benefited. The Internet itself exists thanks to hacker ideals—its expansion was lubricated by a design that enabled free access. The word *hacker* entered the popular lexicon, although its meaning has changed: In the mid-’80s, following a rash of computer break-ins by teenagers with personal computers, true hackers stood by in horror as the general public began to equate the word—their word—with people who used computers not as instruments of innovation and creation but as tools of thievery and surveillance. The kind of hacker I wrote about was motivated by the desire to learn and build, not steal and destroy. On the positive side of the ledger, this friendly hacker

type has also become a cultural icon—the fuzzy, genial whiz kid who wields a keyboard to get Jack Bauer out of a jam, or the brainy billionaire in a T-shirt—even if today he’s more likely to be called a geek.

In the last chapters of *Hackers*, I focused on the threat of commercialism, which I feared would corrupt the hacker ethic. I didn’t anticipate that those ideals would remake the very nature of commerce. Yet the fact that the hacker ethic spread so widely—and mingled with mammon in so many ways—guaranteed that the movement, like any subculture that breaks into the mainstream, would change dramatically. So as *Hackers* was about to appear in a new edition (this spring, O’Reilly Media is releasing a reprint, including the first digital version), I set out to revisit both the individuals and the culture. Like the movie *Broken Flowers*, in which Bill Murray embarks on a road trip to search out his former girlfriends, I wanted to extract some meaning from seeing what had happened to my subjects over the years, hoping their experiences would provide new insights as to how hacking has changed the world—and vice versa.

I could visit only a small sample, but in their examples I found a reflection of how the tech world has developed over the past 25 years. While the hacker movement may have triumphed, not all of the people who created it enjoyed the same fate. Like Gates, some of my original subjects are now rich, famous, and powerful. They thrived in the movement’s transition from insular subculture to multibillion-dollar industry, even if it meant rejecting some of the core hacker tenets. Others, unwilling or unable to adapt to a world that had discovered and exploited their passion—or else just unlucky—toiled in obscurity and fought to stave off bitterness. I also found a third group: the present-day heirs to the hacker legacy, who grew up in a world where commerce and hacking were never seen as opposing values. They are bringing their worldview into fertile new territories and, in doing so, are molding the future of the movement.

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## REAL HACKERS DON'T TAKE

vacations. And by that standard, Bill Gates is no longer a real hacker.

Gates himself admits as much. “I believe in intensity, and I have to agree totally; by objective measures my intensity in my teens and twenties was more extreme,” he says. “In my twenties, I just worked. Now I go home for dinner. When you choose to get married and have kids, if you’re going to do it well you are going to give up some of the fanaticism.”

Indeed, looking back, Gates says that the key period of his hackerhood came even earlier. “The hardcore years, the most fanatical years, are 13 to 16,” he says. “So you were over the hill by the time you got to Harvard?” I ask.

“In terms of programming 24 hours a day? Oh yeah,” he says. “Certainly by the time I was 17 my software mind had been shaped.”

He still seemed plenty intense when I met him as a 27-year-old, brash but not given to making direct eye contact. For half of the interview, he stared at a computer screen, test-

**“People come up to me and say, ‘Omigod, I saw you on *Dancing With the Stars!*’” Steve Wozniak explains. “I have to say, ‘Well, I did computers, too.’”**

ing software with one of those newfangled mice. But he engaged fully with my questions, rattling off his highly opinionated take on some of the people he worked with—and against—in the early days of the PC. That intensity would inform his work and his company, helping him turn Microsoft into a software behemoth and himself into the richest human being on the planet (for quite a while, anyway). Gates' faith in hacking underscored everything he did, right down to his staffing decisions. "If you want to hire an engineer," he says, "look at the guy's code. That's all. If he hasn't written a lot of code, don't hire him."

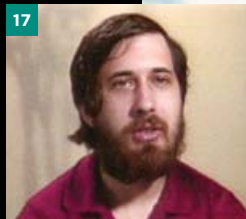
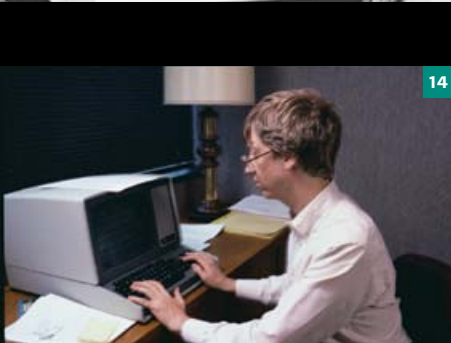
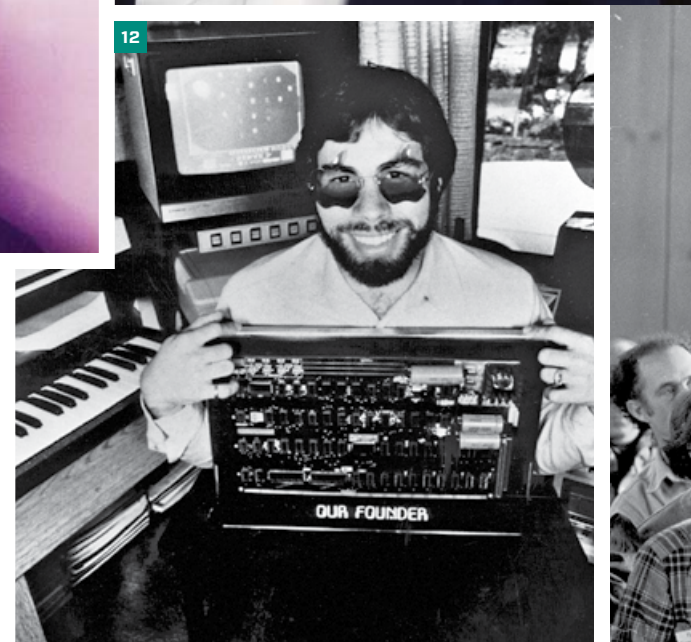
Gates occupies a special place in the history of hacking. Most consider him

one of the best coders ever. His first version of Basic, written so efficiently that it could run in the 4-KB memory space of the Altair, was a marvel. (Yes, that's 4 kilobytes, not mega, giga, or today's darling, tera.) When people picture a computer geek, they typically think of someone like the young Gates. And yet Gates, along with several other subjects of my book, went on to transcend his hacker roots. This group helped turn hacking from an obscure vocation into a global economic

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## DIGITAL REVOLUTIONARIES, THE EARLY YEARS

>> 1, 8, 14: Bill Gates, cofounder of Microsoft; 2, 13, 16: Lee Felsenstein, creator of the Osborne 1 computer; 3, 7: Richard Greenblatt, pioneering member of MIT's coder elite; 4, 17: Richard Stallman, leader of the GNU Project and founder of the Free Software Foundation; 5: Tim O'Reilly, computer book publisher; 6, 10: Andy Hertzfeld, designer of the first Macintosh OS; 9, 12: Steve Wozniak, developer of the Apple II computer; 11: Mark Zuckerberg, founder and CEO of Facebook; 15: Paul Graham, cocreator of Viaweb and cofounder of Y Combinator.

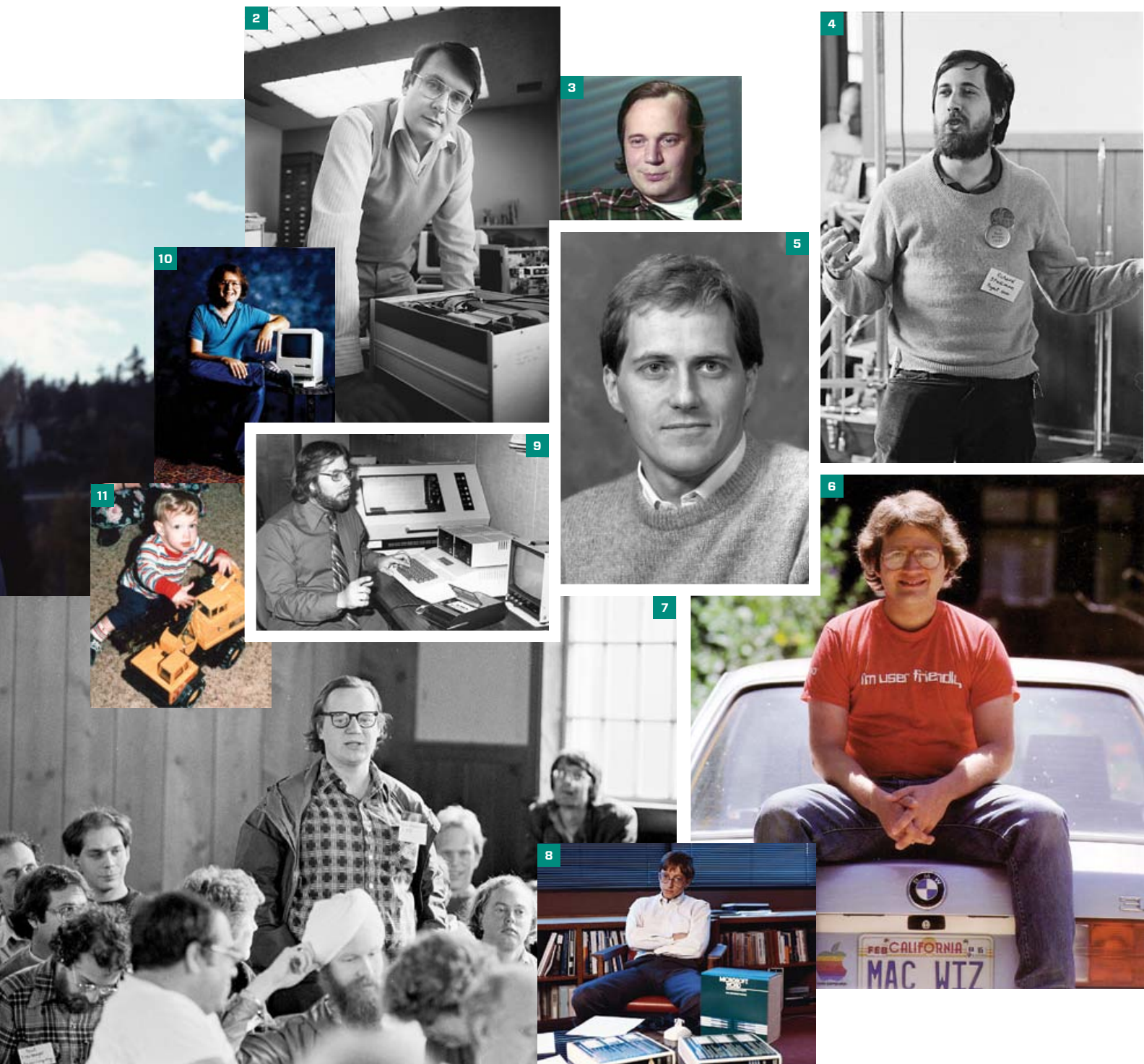


and cultural force and then reaped the rewards of that transition: money, influence, and even fame.

This wouldn't have happened if Gates had been just another hacker. Indeed, it was only by discarding key aspects of the hacker ethic that he was able to embrace computing's commercial potential and bring it to the masses. Pure hackers encouraged anyone to copy, examine, and improve any piece of code. But Gates insisted that software was no different from other intellectual

property and that copying a digital product was just as illegal as swiping a shirt from Kmart. In 1976, he wrote an open letter to computer hobbyists who copied his software, accusing them of theft. His missive was considered blasphemous by some hackers, who believed that Gates was polluting their avocation by introducing commercial restrictions that would stifle knowledge and creativity. Gates found these arguments ludicrous—this was a business, after all. "I raised the issue in the sense of, jeez, if people paid more for software, I'd be able to hire more people," he says more than 30 years later.

That conflict continues to rage. Gates puts the argument in perspective by



pointing out that centuries ago, European publishers printed American writers' works without compensation. "Benjamin Franklin was so ripped off—he could have written exactly what I wrote in that letter," he says. Today, journalists are trying to figure out how to sustain their business when their product can be copied and distributed so easily—it's the same dynamic. Gates seems to take some satisfaction in this turn of events. "Maybe magazine writers will still get paid 20 years from now," he says to me. "Or maybe you'll have to cut hair during the day and just write articles at night. Who knows?"

Gates had to stray from the hackers' rigid moral code to become a mainstream success. All Steve Wozniak had to do was don a pair of dancing shoes: While Woz is a hacker legend, best known for designing the original Apple computer, he has become an unlikely pop culture icon, turning up last year on *Dancing With the Stars*. When I met up with him, he had just reunited with the other contestants for the season finale. "I was dancing against Jerry Springer and Cloris Leachman," he says over chips and salsa at a Mexican restaurant in Fremont, California. His early elimination in no way dampened his spirits. Very little dampens Woz's spirits, even the fact that reality TV celebrity is overshadowing his genuine accomplishments in technology: "People come up to me and say, 'Omgod, I saw you on *Dancing With the Stars*!' I have to say, 'Well, I did computers, too.'"

Casual fans can be forgiven for overlooking Woz's tech cred. These days, he's more likely to get attention for his unique hobbies (Segway polo, anyone?) or love life (he had a sign-of-the-apocalypse romance with comedian Kathy Griffin, although he

Facebook CEO Mark Zuckerberg says that his company promotes hacker values.

2010, his greatest contribution is as a role model. His universal renown is a continuing reminder that brains and creativity can trump traditional notions of coolness. He's the nerd in the computer room whose stature—and happiness—far eclipses that of aging prom kings. And that's an inspiration for nerds everywhere.

Indeed, one of his protégés, Andy Hertzfeld, remains inspired by hacking. Hertzfeld wasn't a major figure in my book, but as one of Apple's early employees and a designer of the Macintosh operating system, he could have been. Today he's at Google, where his most visible contribution thus far is a feature that creates chronologies for Google News queries, so users can see how a story has developed over time. But hacking in your fifties isn't as easy as it is in your twenties. "When I was hacking on the Mac, I'd be working away and think an hour had passed;

**"Facebook didn't start with some grand theory but with a project hacked together in a couple of weeks," Mark Zuckerberg says. "Our whole culture is, we want to build something quickly."**

has since married a woman he met on a geek cruise) than for any new innovation. Snarky Web sites have mercilessly mocked Woz's celebrity-mag turns and frequent appearances in an Apple store's first-day lines as indications of sad irrelevance. But Woz shrugs off the ribbing. He recalls the instruction he gave to Griffin a few years ago: "Hey, you can embarrass me, you can abuse me, you can ridicule me as much as you want—if it makes people laugh it's worth it." When I profiled Woz in my book, he was a socially awkward and insecure millionaire. Now he is a confident and widely loved mascot for hacking culture at large.

From time to time, Woz still appears in the news as a force behind a startup with potentially groundbreaking technology. CL9 was going to devise superpowerful remote controls. Wheels of Woz promised to let users track their possessions through wireless technology. But the first never lived up to expectations, and the second never released a product. Now he works as chief scientist for a storage company called Fusion-io. "I'm doing a lot of sales-marketing work," he says. "But I'm also looking at technologies that might be competitive in the future."

But even Woz doesn't expect to create another Apple II. In

then I'd look up, and it had been four hours," Hertzfeld says. "Now when I think an hour has gone by, I look up and it's an hour."

It's not just the passage of years that has changed Hertzfeld's experience. He has also had to adapt his individualistic approach to serve the geek-industrial complex that is Google. On one hand, Google is a hacker mecca. It values engineers as its most important assets. "You are expected to work out of your passion," Hertzfeld says—definitely a hacker-friendly value. And the company supports open source software. But Hertzfeld can't duck the fact that Google is also a big company with rigid standards and processes for designing products, which makes the experience more formal and less fun. "My relationship to my work is that of an artist to his work," he says. | **CONTINUED ON PAGE 126**







## Master Minds

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And at Google, he adds, “I can’t exercise my creativity in a way that gives me joy, which is my basic approach.”

But while he has lost some personal control, he has gained an unprecedented ability to make a mark on the world. Someone at Google can affect the lives of millions with a few lines of code. And that makes for a different kind of thrill than Hertzfeld experienced during Apple’s early days, when the potential of every product was unknown and limitless. “There’s so much more leverage now to make a big impact,” he says. “This stuff is as mainstream as can be. Google, the iPhone—these move the culture more than the Beatles did in the ’60s. It’s shaping the human race.”

### THE IDEALISTS

Richard Greenblatt tells me he has a rant to deliver. Uh-oh. Greenblatt was the canonical hacker of MIT’s Project MAC—the forerunner to the school’s legendary AI Lab—in the early ’60s. In my book, I described how his fellow MIT hackers, appalled at his hygiene, used the term *milliblatts* to gauge olfactory unpleasantness. It wasn’t exactly flattering. Was he finally going to unload on me after all these years?

To my relief, Greenblatt is more concerned with what he views as the decrepit state of computing. He hates how the dominant coding languages, like HTML and C++, are being implemented. He misses LISP, the beloved language that he worked with back at MIT. “The world is screwed up,” he says before launching into a technical analysis of the current condition of programming that I can’t even hope to follow.

But coding is just the beginning. The real problem, Greenblatt says, is that business interests have intruded on a culture that was founded on the ideals of openness and creativity. In Greenblatt’s heyday, he and his friends shared code freely, devoting themselves purely to the goal of building better

products. “There’s a dynamic now that says, let’s format our Web page so people have to push the button a lot so that they’ll see lots of ads,” Greenblatt says. “Basically, the people who win are those who manage to make things the most inconvenient for you.”

Greenblatt is not one of those people. He belongs in a different group: the true believers, who still cling to their original motivations—the joy of discovery, the free exchange of ideas—even as their passion has grown into a multibillion-dollar industry. Despite their brilliance and importance, they never launched million-dollar products or became icons. They just kept hacking.

I am surrounded by similar idealists here at the 25th Hackers’ Conference, an annual gathering that celebrates the thrill of building something really cool. It has been a few years since I last attended, but it’s just as I remember it: 48 hours of hackers meeting deep into the night at a Northern California resort, discussing everything from economic theory to data storage. The crowd is somewhat long in the tooth, despite an overdue effort to bring in more attendees under age 30. The tech industry may be filled with young geniuses, but the old guys are still going at it, even if most of their efforts remain blithely obscure.

Greenblatt is a regular here, a link to the Mesopotamia of hacker culture: MIT. He arrived at the school just after the members of its Tech Model Railroad Club gained access to a rare interactive computer. Greenblatt became one of the best, a brilliant coder whose accomplishments include a sophisticated LISP compiler and one of the first autonomous computer chess programs. At MIT, he was known as a hacker’s hacker.

But unlike Gates, Wozniak, or Hertzfeld, Greenblatt’s work never went mainstream. In the 1980s, he started a company to build LISP machines. It didn’t pan out. He wasn’t much of a businessperson. These days, he describes himself as an independent researcher. He moved into his mother’s house in Cambridge, Massachusetts, to take care of her and has lived there alone since she died in 2005. “The main project I’ve been working on for 15 years is called thread memory, and it has something to do with English-language comprehension stuff,” he says. “It’s basic research. It’s not something that works today, but it’s something.”

When Greenblatt looks at the current state of hacking, he sees a fallen world. Even the word itself has lost its meaning.

“They stole our word,” he says, “and it’s irretrievably gone.”

Greenblatt is far from alone in his wistful invocation of the past. I first met Richard Stallman, a denizen of MIT’s AI Lab, in 1983. Even then he was bemoaning the sad decline of hacker culture and felt that the commercialization of software was a crime. When I spoke to him that year, as the computer industry was soaring, he looked me in the eye and said, “I don’t believe that software can be owned.” I called him “the last of the true hackers” and assumed the world would soon squash him.

Was I ever wrong. Stallman’s crusade for free software has continued to inform the ongoing struggles over intellectual property and won him a MacArthur Foundation “genius grant.” He founded the Free Software Foundation and wrote the GNU operating system, which garnered widespread adoption after Linus Torvalds wrote Linux to run with it; the combination is used in millions of devices. More important, perhaps, is that Stallman provided the intellectual framework that led to the open source movement, a critical element of modern software and the Internet itself. If the software world had saints, Stallman would have been beatified long ago.

Yet he is almost as famous for his unyielding personality. In 2002, Creative Commons evangelist Lawrence Lessig wrote, “I don’t know Stallman well. I know him well enough to know he is a hard man to like.” (And that was in the preface to Stallman’s own book.) Time has not softened him. In our original interview, Stallman said, “I’m the last survivor of a dead culture. And I don’t really belong in the world anymore. And in some ways I feel I ought to be dead.” Now, meeting over Chinese food, he reaffirms this. “I have certainly wished I had killed myself when I was born,” he says. “In terms of effect on the world, it’s very good that I’ve lived. And so I guess, if I could go back in time and prevent my birth, I wouldn’t do it. But I sure wish I hadn’t had so much pain.”

That pain came in part from loneliness, once a common complaint among the tiny and obsessive cadre of computer fans. (A 1980 commentary by Stanford psychologist Philip Zimbardo implied that hackers were antisocial losers who turned to computers to avoid human contact.) But as hacker culture has spread, so has its social acceptability. Today, computer geeks are seen not as losers but as moguls in the making. They tend

not to suffer the intense isolation that once plagued Stallman—thanks, ironically, to the commercialization he so bemoans.

As much now as 25 years ago, Stallman is a fundamentalist, a Hutterite of hackerism. His personal Web site is a grab bag of appeals for people to boycott various enemies of the cause, from Blu-ray to J. K. Rowling. He even feuds with his former allies, including Torvalds. (“He doesn’t want to defend users’ freedom,” Stallman says.) He has particular contempt for Apple, with its closed systems and digital rights software. He refers to their products using *Mad*-magazine-style puns. The music player is an iScrod. Its mobile device is an iGroan. The new tablet computer is the iBad. And he is an equal-opportunity kvetcher. When I tell him that *Hackers* will soon be available for the Kindle—which Stallman, predictably, calls a Swindle—his dour demeanor evaporates as he energetically encourages me to resist the e-reader’s onerous DRM. “You have to believe that freedom is important and you deserve it,” he says. Despite his disillusionment, the fire still burns within him.

Lee Felsenstein is keeping the flame alive as well. Felsenstein was the subversive moderator of the Homebrew Computer Club, the PC industry launchpad whose members—including Woz—were the target of Gates’ letter. A veteran of the Berkeley free speech protests, Felsenstein thought that putting cheap computers in the hands of “the people” would allow everyone to take information, manipulate it to better reflect the truth, and distribute it widely. He was right about the rise of the PC, but he says he’s still waiting for its democratizing effect. “Lincoln Steffens once commented, ‘I have seen the future, and it works,’” Felsenstein says. “But I’m with the guy who changed that to ‘I have seen the future, and it needs work.’” On a personal level, Felsenstein’s career has been checkered. He was celebrated for the Osborne 1 computer, but the company went bust. So did Interval Research, where Felsenstein worked for eight years. “If I wanted to, I could be bitter about it,” he says. “But I don’t want to.”

Instead, Felsenstein is putting the next generation of geeks on the path of the righteous. He recently helped establish a workspace in Mountain View, California, called the Hacker Dojo, which charges each of its 80 members \$100 a month for access to a fully stocked, 9,500-square-foot DIY shop with an in-house network. It’s one of sev-

eral “hacker spaces” across the country—outposts devoted to empowering formerly isolated and underequipped gearheads. “I am a sensei of the dojo,” he says, a wide grin on his face. “Felsenstein sensei.”

## THE NEXT GENERATION

Greenblatt, Stallman, and Felsenstein see hacking as a set of ideals. But Paul Graham sees it as a humming economic engine. The 45-year-old Internet guru, himself a fanatic engineer in his day, is a cofounder of Y Combinator, an incubator for Internet startups. Twice a year, his company runs *American Idol*-style contests to select 20 to 30 budding companies for seed funding and attendance at a 10-week boot camp, culminating in a Demo Day packed with angel investors, VCs, and acquisition-hungry corporations like Google and Yahoo.

How does Graham pick the most promising candidates? Easy. He looks for the hackers. “We’re pretty hackerly, so it’s easy to recognize a kindred spirit,” says Graham, who in 1995 cocreated Viaweb, the first Web-based application. “Hackers understand a system well enough to be in charge of it and make it do their bidding—and maybe make it do things that weren’t intended.” The best prospects, he says, are “world hackers,” people “who understand not only how to mess with computers but how to mess with everything.” Indeed, Graham says that today, every business is looking to hire or invest in firms run by hackers. “We tell founders presenting at Demo Day, ‘If you dress up too much, you will read to the investors as a stupid person.’ They’re coming to see the next Larry and Sergey, not some junior MBA type.”

Stallman would recoil in horror at Graham’s equating hacking with entrepreneurial effectiveness. But Graham has found that hacking’s values aren’t threatened by business—they have conquered business. Seat-of-the-pants problem-solving. Decentralized decisionmaking. Emphasizing quality of work over quality of wardrobe. These are all hacker ideals, and they have all infiltrated the working world.

A new generation of hackers has emerged, techies who see business not as an enemy but as the means for their ideas and innovations to find the broadest audience possible. Take Facebook founder and CEO Mark Zuckerberg, who has lured 400 million users to share their personal lives online. At 25, he has proven to be a master of the art of busi-

ness development—unabashedly opening his site to advertisers and marketers. Yet he clearly thinks of himself as a hacker: Last year he told the audience at an event for would-be Internet entrepreneurs, “We’ve got this whole ethos that we want to build a hacker culture.”

To find out what he meant by that, I visit him at Facebook headquarters, a large building on California Avenue in Palo Alto—the same street where in 1983 I rented a room to use as a base while researching *Hackers*. Surprisingly, Zuckerberg, best known for wearing North Face fleece, is sporting a tie. He explains that he is nearing the end of a year in which he promised his team that he would show up for work in neckwear every day. It turned out to be a good year for Facebook—despite the recession, the site more than doubled its user base and finally turned a profit. “Maybe it’s a charm,” he says of the tie. “But I think it mostly just chokes me.

Zuckerberg’s adopted style may not come from the golden age of hacking, but his work ethic does. “We didn’t start with some grand theory but with a project hacked together in a couple of weeks,” Zuckerberg says. “Our whole culture is, we want to build something quickly.” Every six to eight weeks, Facebook conducts “hackathons,” where people have one night to dream up and complete a project. “The idea is that you can build something really good in a night,” Zuckerberg says. “And that’s part of the personality of Facebook now. We have a big belief in moving fast, pushing boundaries, saying that it’s OK to break things. It’s definitely very core to my personality.”

In the ongoing competition for talent, Zuckerberg believes that the company with the best hackers wins. “One good hacker can be as good as 10 or 20 engineers, and we try to embrace that. We want to be the place where the best hackers want to work, because our culture is set up so they can build stuff quickly and do crazy stuff and be recognized for standout brilliance.”

Unlike the original hackers, Zuckerberg’s generation didn’t have to start from scratch to get control of their machines. “I never wanted to take apart my computer,” he says. As a budding hacker in the late ’90s, Zuckerberg tinkered with the higher-level languages, allowing him to concentrate on systems rather than machines.

For instance, when he played with his beloved Teenage Mutant Ninja Turtles,

Zuckerberg wouldn't act out wars with them, like most other kids. He would build societies and pretend the Turtles were interacting with one another. "I was just interested in how systems work," he says. Similarly, when he began playing with computers, he didn't hack motherboards or telephones but entire communities—manipulating system bugs to kick his friends off AOL Instant Messenger, for instance.

Like Gates, Zuckerberg is often accused of turning his back on hacker ideals, because he refuses to allow other sites to access the information that Facebook users contribute. But Zuckerberg says that the truth is just the opposite; his company piggybacks—and builds—on the free flow of information. "I never wanted to have information that other people didn't have," he says. "I just thought it should all be more available. From everything I read, that's a very core part of hacker culture. Like 'information wants to be free' and all that."

A previous generation of hackers—and I—worried that the world of commerce would choke innovation and stymie a burgeoning cultural movement. But hackerism

has survived and thrived, a testament to its flexibility. According to computer-book publisher Tim O'Reilly—who fosters hackerism through his Foo Camp "unconferences"—hacking culture will always find new outlets. Big business may stumble upon and commodify their breakthroughs, but hackers will simply move on to unexplored frontiers. "It's like that line in *Last Tango in Paris*," O'Reilly says, "where Marlon Brando says, 'It's over, and then it begins again.'"

The current frontier for hackers, O'Reilly says, is not the purely mathematical realm of 1s and 0s but actual stuff—taking the same tear-it-down-and-build-it-anew attitude that programmers once took to compilers and applying it to body parts and wind-energy-harnessing kites. (O'Reilly Media publishes *Make* magazine and runs the Maker Faire festivals, celebrations of the DIY spirit.) But even this area, he says, has begun the shift toward entrepreneurship. The pure hackers—the ones who do things for the sheer pleasure of it and are turned off by investors and spreadsheets—are looking elsewhere. O'Reilly says most of the action is in DIY biology—manipulating genetic code the way a previous gen-

eration of hackers manipulated computer code. "It's still in the fun stage," he says.

Just ask Bill Gates. If he were a teenager today, he says, he'd be hacking biology. "Creating artificial life with DNA synthesis. That's sort of the equivalent of machine-language programming," says Gates, whose work for the Bill & Melinda Gates Foundation has led him to develop his own expertise in disease and immunology. "If you want to change the world in some big way, that's where you should start—biological molecules." Which is why the hacker spirit will endure, he says, even in an era when computers are so ubiquitous and easy to control. "There are more opportunities now," he says. "But they're different opportunities. They need the same type of crazy fanaticism of youthful genius and naïveté that drove the PC industry—and can have the same impact on the human condition."

In other words, hackers will be the heroes of the next revolution, too. ■■■

Senior writer **STEVEN LEVY** ([steven\\_levy@wired.com](mailto:steven_levy@wired.com)) wrote about tablet computing in issue 18.04.

## COLOPHON

### Key findings that helped get this issue

**out:** Sasha the girl Scout dog; Lesbians Who Look Like Justin Bieber; mo' money, less problems; the elusive Plastica and its unsatisfactory replacement, Umbra; Morgellons Disease Research; Veranda is actually Verdana; there are more awesomely bad haircuts in a courtroom than in the Mission District; the many Easter eggs of *Lost*; East Oakland used to be called Jingtletown; scarcity is your friend, always!; In Water—"flowers with attitude"; the introduction of Hugo DeTorres to the world; ASME's discovery of Evan Ratliff's "Vanish" story; Minimoog awesome, Mellotron awesomer; Chris March on Meryl Streep (yes!); 3-D charts in Numbers; A Kiss of Shimmer Pearly Shimmer Lip Care; apostrophe-shaped coffee tables; White Lightning finding Kate's Mohawk at the Oscars; Cheryl Cole music videos; derelict satellite parts in low Earth orbit; Janet Jackson's *Rhythm Nation 1814* earrings; maybe Facebook isn't reason enough to buy a smartphone; the design department's wiki; the necessity of using *instant* oatmeal for baking cookies; Domo Sushi; Selleck Waterfall Sandwich; "Benny and the Jets" is not a live recording; Squaw Valley's mountain run; maybe Prius drivers should be worried about things other than the environment; Waaalt.com

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