

## **Professional work for nothing: Software commercialization and “An Open Letter to Hobbyists”**

### **Bio:**

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### **Running Header:**

Professional Work For Nothing

### **Abstract**

In 1975, Bill Gates published “An Open Letter to Hobbyists” in response to unauthorized duplication of Microsoft software. The letter appeared in numerous hobby magazines and club newsletters, sparking a dialogue among contemporary hobbyist readers, many of whom had not yet seriously considered the ethical and economic dimensions of commercial software. In the 1980s, histories of personal computing published in the popular press preserved a memory of the Open Letter that was later taken up by advocates of the free and open source software movement. As the Open Letter traveled through each of these discursive contexts, it enabled enthusiasts and entrepreneurs alike to think about the problems of ownership, authorship, labor, and value brought about by software commercialization.

### **Introduction**

Popular accounts of 1970s computing conventionally portray the technical culture of microcomputing as a populist movement aimed at wresting computing away from large, entrenched institutions and making it affordable and accessible for the everyday user.<sup>1</sup> The success of this insurgency is evidenced by the commercial achievements of a group of microcomputer companies emerging from a lively hobbyist community in Silicon Valley during the middle of the decade. One of the key events in this narrative is the circulation and reception of Bill Gates’ 1975 “An Open Letter to Hobbyists.” By re-constructing the

historical context of the Open Letter, tracing its survival in the computing folklore of the 1980s, and critiquing its adoption by free and open source software advocates during the 1990s, this paper examines the changing significance of commercial software and software development during for the first two decades of personal computing. Along the way, the diverse interpretations of the Open Letter reveal subtle, shifting distinctions in the colloquial meanings of “hacker” and “hobbyist” during the 1970s and 1980s.

### The Publication and Circulation of “An Open Letter to Hobbyists”

By 1976, a hobby computing culture was developing rapidly throughout the United States. The accessibility of microcomputer kits like the Altair 8800 by Micro Instrumentation and Telemetry Systems (MITS) brought computing into reach for hobbyists experienced in similarly technical pursuits, such as amateur radio. In a small number of places, hobby computing developed in tandem with a local microcomputer industry. The pursuits of microcomputer companies like Apple, Cromemco, IMSAI, and Processor Technology were well-documented by the publishers of hobbyist magazines and computer club newsletters. But the image of hobbyists in garages with soldering irons and circuit boards describes just one side of the early microcomputing ecology. With a dearth of quality software, microcomputers of the mid-1970s could be frustrating and inscrutable machines.

Even to a seasoned computer professional, the microcomputer suggested a thrilling possibility: one-to-one interactive computing, a machine of one’s own—a *personal* computer. Before realizing this potential, however, microcomputing faced several software challenges. Although the Altair’s design was quickly becoming a de facto standard among enthusiasts,<sup>2</sup> microcomputer software development was stymied by a lack of tools for writing, debugging, and compiling new programs. Furthermore, unlike hardware, there were no proven economic models for the production and pricing of software. Aspiring programmers faced a number of difficult pragmatic and ontological questions about the status of software in society if they hoped to commercialize their work. Was software to be sold through hardware makers or could there be an independent software market? Were programmers more like authors or engineers? When a customer buys software, what should they expect to receive? And to what extent are programmers responsible for maintaining a piece of commercial software after it is sold?

The sale of Microsoft’s Altair BASIC by MITS represented an early attempt to create a commercial marketplace for microcomputer software and most hobbyists considered their

prices much too high. The pricing strategy was a failure but by making this mistake in public, the two companies provoked a discussion about the place of software in the emerging microcomputer industry. Gates' Open Letter centers on the problems of commercialized software and, therefore, its publication, circulation, and reception offer a useful set of temporal moments and material artifacts for observing this discourse taking shape. Great software was required for the hobbyist vision of interactive microcomputing to come to fruition. If the commercialization of Altair BASIC was a misstep, how should great software be produced?

### *The Slow Diffusion of Interactive Computing During the 1970s*

A critical transition in the history of computing is the shift from batch processing to interactive computing.<sup>3</sup> In institutional contexts, interactive computing diffused through the production of timesharing systems such as the Incompatible Timesharing System (ITS) at the Massachusetts Institute of Technology (MIT). On a timesharing system, multiple users simultaneously accessed a single machine through remote video terminals. As the users issued commands to the system, an underlying process apportioned the computer's resources to different users in small chunks, producing an unusually responsive environment for real-time, one-on-one interaction. In the ideal case, a timesharing system gave multiple users the illusion of having exclusive access to a machine all their own.

For early timesharing users, the experience of interactive computing was transformative. In addition to interactive computing, timesharing also enabled users to share files and communicate with one another through their terminals. As the cost of minicomputers fell during the 1970s, interactive computing became more widely accessible as universities could finally afford to provide access to curious students and local community members. The growth of university computer labs facilitated an expansion of a computing culture that prized real-time interaction.<sup>4</sup>

Interactive computing was not as readily available to the typical computer hobbyist as it was to those with access to university computing facilities. Hobbyists could read about experimental timesharing systems in books like Ted Nelson's *Computer Lib*, but they could not experience them directly.<sup>5</sup> And yet, in spite this lack of access, a popular computing culture nevertheless emerged outside of academia. In an interview from 1985, Steve Wozniak of Apple Computer fondly remembered hanging posters of computers on his bedroom walls as a teenager.<sup>6</sup> These fan practices were supported by a rich literature of hobbyist magazines and science fiction that provided countless opportunities to imagine an individualized

computing experience. Hobby publications such as *73*, a monthly ham radio magazine, included recurring columns featuring news and information about computing research and the nascent computer industry.<sup>7</sup> When hobby computer kits like the Altair 8800 became available in the early 1970s, they were received by a large and growing community of technical hobbyists who were, by and large, without access to any computer.

Not all computer enthusiasts were equally excited by the microcomputer. Indeed, a user with ready access to a minicomputer running an operating system like UNIX with its rich library of built-in tools may have been underwhelmed by the capabilities of the typical home-built micro.<sup>8</sup> For computer enthusiasts without access to a university lab, however, the availability of a home computer was thrilling. Microcomputer software would simply have to catch up.

### *Microcomputer Software Development*

Development tools are a class of software applications that assist users with editing, debugging, and compiling computer programs. Building a working hobby computer from a kit was difficult, but for hobbyists reared on amateur radio, overcoming technical challenges was part of the fun. Without any software development tools, however, programming the newly built home computer could be unreasonably tedious. Development tools were essential for bringing the technical pleasures of hardware hacking to the realm of software.

Microcomputer kits like the popular MITS Altair 8800 typically did not include additional peripherals such as a video display, keyboard, or storage medium such as a paper tape reader. Housed in a blue steel case, the user interface of the Altair was limited to one row of red LED lights and a bank of on/off switches. While the users of timesharing systems sat at glowing video terminals and entered commands using a familiar QWERTY keyboard, Altair users entered commands by arranging the bank of switches to represent a binary number to which the microprocessor would respond. If the program ran successfully, they would carefully read the output one numeral at a time from the row of red lights above the switches. When the power was shut off, the machine's memory would be lost and the program forgotten. Needless to say, it was easy to make a mistake.

Programming in machine code was not without its merits, of course. As painstaking as it may have been, the experience brought hobbyists into close contact with the microprocessor's digital logic. Without a "high level" symbolic programming language like FORTRAN, LISP, or BASIC, hobbyists needed to express their ideas in the limited vocabulary wired into the circuits of the microprocessor. To prepare the program for

execution on the Altair, for example, programmers used a table of mnemonic “opcodes” and machine language instructions to translate their program into a list of binary numbers. Eight of the switches on the face of the Altair corresponded to the eight digits that could be read at a time by the 8080 microprocessor. The “on” position indicated a “1” and the “off” position, a “0.” Though considerably less efficient than programming with the development tools available to the typical university student, this interface forced the programmer to “speak” the same language as the microprocessor.

The Altair 8800 was not the first, nor the only, microcomputer available in 1975, but it was the year’s biggest commercial success. Following a cover story in *Popular Electronics*, MITS was overwhelmed by orders for the Altair kit and shortly developed a reputation for slow shipping and poor customer service.<sup>9</sup> Further, those who received their kits were likely to become frustrated by the arduous programming experience. To satisfy the needs of this newfound customer base, MITS soon announced Altair systems bundled with printers, disk drives, tape readers, and keyboards. But, as they announced on the cover of their first company newsletter, the most important new accessory was not hardware at all but Altair BASIC, a software development tool written by a new company called “Micro-Soft.”<sup>10</sup>

#### *Microsoft, Altair and BASIC*

During the second half of the 1970s, BASIC became a *lingua franca* for microcomputer programming.<sup>11</sup> BASIC code was distributed through the pages of computer magazines, club newsletters, and friendly workbooks such as David Ahl’s *BASIC Computer Games*.<sup>12</sup> The popular embrace of BASIC reflected the pedagogical origins of the language. When researchers at Dartmouth implemented BASIC in 1964, they enabled students and faculty from across the university to make use of the new campus-wide timesharing system.<sup>13</sup> A simple syntax and limited instruction set made BASIC an excellent language for teaching and learning. Unlike the cryptic mnemonics used by machine language programmers, BASIC commands were common English words like “PRINT,” “IF,” and “STOP.” With a working implementation of BASIC, the Altair 8800 could finally offer an interactive computing experience in the home.

A well-worn tale in microcomputing lore describes Microsoft founders Paul Allen and Bill Gates seeing the Altair 8800 for the first time on the cover of *Popular Electronics* and bluffing their way into business with parent company MITS.<sup>14</sup> The two young men were excited about the Altair's potential but recognized that it had few practical applications so long as users were limited to programming in machine language.<sup>15</sup> Gates telephoned the

MIT's offices and convinced Roberts that he and Allen had built a working BASIC interpreter for the Altair. Roberts agreed to meet with them and Allen and Gates immediately set about writing the interpreter using Harvard University computing facilities.<sup>16</sup>

It is crucial to note the distinction between the design of a programming language and a particular implementation. The BASIC language is as distinct from Microsoft's implementation of Altair BASIC as the English language is distinct from the parts of your brain that interpret the meaning of this sentence. While BASIC is an abstract set of symbols and a syntax for combining them, Altair BASIC was a long sequence of 8080 machine language instructions that, once loaded into the Altair's memory, could automatically translate between human-friendly BASIC commands and machine-friendly binary instructions. With the help of Marty Davidoff, one of Gates' classmates at Harvard, the first version of Altair BASIC was finished in approximately two months.<sup>17</sup> Allen flew to Albuquerque where he pitched the software project at MIT's headquarters and Roberts agreed to license Altair BASIC from the two young men.<sup>18</sup>

By March 1975, MIT was selling Altair BASIC through its mail-order service. The software cost \$75 when purchased along with a compatible hardware product, but the price rose to \$500 for standalone orders.<sup>19</sup> For comparison, a barebones Altair 8800 kit cost \$439.<sup>20</sup> While the pricing was clearly designed to encourage Altair owners to purchase peripheral hardware, it effectively penalized early Altair customers for purchasing the computer kit before BASIC was announced. Nonetheless, the Altair continued to be commercially successful and Gates moved to Albuquerque, New Mexico to continue developing Altair BASIC.<sup>21</sup>

As the producers of the Altair 8800, MIT briefly acted as a hub for hobby computing in the US. Their employees maintained a library of Altair software and coordinated the formation of Altair user groups in various cities throughout the country. One of their persistent challenges was to communicate *why* a potential customer should purchase an Altair—what could they do with it? Toward this end, a group of MIT employees—including Gates—toured the country during the summer of 1975 in a van dubbed the “MIT-mobile” giving Altair demonstrations in motel rooms and at computer hobbyist club meetings.<sup>22</sup> At some point during this road trip, a roll of punched paper tape containing an unpolished version of Altair BASIC was stolen or lost. Around the same time, MIT noticed that the sales of Altair BASIC continued to grow more slowly than the sales of Altair hardware, a paradoxical situation considering the degree to which the accessibility and utility of the Altair depended on a working BASIC interpreter. From their contact with the tight-knit hobbyist

groups, MITS hypothesized that some of their customers must have been pooling resources and duplicating a single authorized copy of Altair BASIC rather than purchasing multiple copies directly from MITS.

It should come as no surprise that hobbyists opted to share copies of Altair BASIC. The prices set by MITS were, from the hobbyist perspective, unreasonably high. In October 1975, MITS released three new versions of Altair BASIC, differentiated by special language features and priced between \$150 and \$350. These new prices did little to curb the growing perception among hobbyists that MITS was exploiting its dominant position in the microcomputer marketplace. As Freiburger and Swaine observed in 1984, members of the computing counter-culture in Silicon Valley had begun to imagine themselves as perennial underdogs in the computing industry.<sup>23</sup> In spite of the bare fact that MITS was itself a hobbyist enterprise, the high price of Altair BASIC could be interpreted as evidence that MITS and Microsoft were outsiders to the hobby community, just as square and buttoned up as IBM.<sup>24</sup>

*Publication and circulation of “An Open Letter to Hobbyists”*

Within MITS, a nagging belief began to take hold that the sales of Altair BASIC were being undercut by unauthorized copying. In August 1975, David Bunnell, editor of the MITS corporate newsletter, ran a short note emphasizing the cost of producing Altair BASIC and lightly admonished readers who did not pay for their software.<sup>25</sup> As the summer turned into the fall, his tone became more caustic and Bunnell referred to the violation of “consumer ethics” by customers who chose to “rip off” Altair BASIC.<sup>26</sup> Perhaps in the hope that a personal appeal from the software's author would be more effective at reaching hobbyist readers than a monthly chastisement, Gates decided to compose “An Open Letter to Hobbyists” sometime between November and December of 1975.

Gates began his letter with a lament and a provocation. “Without good software and an owner who understands programming, a hobby computer is wasted,” he wrote, “Will quality software be written for the hobby market?”<sup>27</sup> Although the letter was written with a frankly juvenile tone (Gates was only 20 years old at the time), it asked a fundamentally earnest question: was it possible to establish a sustainable software industry to serve the hobbyist computer market? The success of the Altair indicated that hobbyists were willing and able to pay a sustainable price for hobby computer hardware but perhaps the same was not true for software. After all, Microsoft was, as Gates made sure to note, the only company dedicated exclusively to producing hobbyist computer software.<sup>28</sup>

Gates handed the Open Letter over to Bunnell who distributed it to an unknown number of computer clubs and hobbyist publications. The December 1975 issue of *Computer Notes* included contact information for a dozen “local user groups,” a subset of Bunnell’s complete mailing list.<sup>29</sup> Although there are listings for clubs in Texas, Oklahoma, Minnesota, Illinois, New Jersey, Georgia, and Northern and Southern California, not all of the clubs published a newsletter.<sup>30</sup> The most widely-circulated image of the letter is reproduced from the pages of the Homebrew Computer Club newsletter, but it was also printed in the February 1976 issue of *Computer Notes*. Within weeks, responses to the Letter began to appear in a variety of publications, from club newsletters to academic journals. The microcomputer business may have been booming, but the future of the nascent software industry was still unclear.

#### Reception of “An Open Letter to Hobbyists”

The Open Letter was mailed to dozens of clubs and magazines and the questions it raised laid the foundation for a longer debate regarding the commercialization of microcomputer software. As microcomputer kits grew increasingly stable, the demand for new software would only grow larger but the role of software production the emerging microcomputer industry remained uncertain. In hobbyist circles, programmers were driven by the social and technical pleasures of solving a tricky puzzle, demonstrating a new bit of hardware, and competing with one other. Gates’ letter unsettled this idyll by asking readers to consider its limits. Were there types of software that would not or could not be written within the incentive structures of an informal gift economy? If the pricing structure for Altair BASIC was unsatisfactory, how else might development tools for microcomputer be supported?

Most clubs did not keep minutes of their meetings, so the full extent to which the Letter was a topic of face-to-face discussion among hobbyist organizations is unknown, but several formal responses to the Letter survive in the pages of club newsletter and hobby magazines. In addition to these written arguments, enthusiasts in the Bay Area collectively crafted a response in code by programming a freely-available alternative BASIC. Later, in the historiography of the early 80s, the Open Letter offered a useful metonym for the perceived clash of cultures between those who imagined a new economy for software and those who treated computers programs like any other commercial product to be bought and sold.

#### *Hobbyist Reception and Response to the Open Letter*

The notion of “software piracy” was not novel in the mid-1970s and the moral



ambiguity of freely sharing software that was being sold for money elsewhere was not lost on hobbyists of the period.<sup>31</sup> The archival record shows that some hobbyists maintained an ideological opposition to the commercialization of microcomputer software, while others felt ambivalent. Within the context of a collegial computer club, duplicating a few spools of paper tape seemed like a harmless transgression; roughly equivalent to taping an LP.<sup>32</sup> For the ambivalent, Gates' Letter assigned a new moral calculus to the exchange of software. His letter emphasized the months of work that went into producing Altair BASIC and estimated that he and Allen were paid just \$2 per hour.<sup>33</sup> This willingness to speak plainly about compensation invited readers to consider the market value of their own labor as microcomputer programmers.

Responses, amendments, and rebuttals to the Open Letter appeared in a variety of computing publications: MITS' *Computer Notes*; the Homebrew Computer Club newsletter; *BYTE* magazine; *Interface*, a publication of the Southern California Computer Society; *SIGPLAN Notices*, a publication of the Association of Computing Machinery (ACM); and several other hobby computing venues. Gates himself published a follow-up in the April issue of *Computer Notes*, remarking on his surprise at the outsized impact of the Open Letter.<sup>34</sup> Nearly all of the respondents were insulted by Gates' accusation that they were "thieves" who stole software.<sup>35</sup> In spite of this offense, and perhaps sensitive to Gates' age, the authors of response letters tended to offer either constructive criticism to the young entrepreneurs, or general comments on the state of the hobby software industry.

Mike Hayes of Applied Electronics and a member of the Homebrew Computer Club did not object to the commercialization of Altair BASIC out of hand. His letter focused instead on the Microsoft business model. First, he suggested that Gates and Allen may have been exploited by their business partners, "I'm sure that if I were MITS, I'd be chuckling all the way to the bank... your marvelous software has allowed them to sell a computer which, without it, none would have touched."<sup>36</sup> Second, he offered advice for the sale of future software. "You underpriced your product," he said, referring not to the high consumer price of Altair BASIC but to the licensing arrangement between Microsoft and MITS. "If you want monetary reward for your software creations," he continued, "think a little harder about your market and how you are going to sell it." Hayes' advice was harsh but encouraging. Altair BASIC was a good start but they would have to try a different tack to make a sustainable business out of hobby software.

Robert Wada, a "concerned hobbyist," gave even more detailed business advice in a letter to *Byte* magazine.<sup>37</sup> For Wada, the Open Letter "very clearly explained" the central

problem facing aspiring software developers—high production costs and low returns—and sparked a torrent of creative thinking. He carefully prefaced his recommendations for the future development of the software market with a defense of hobby entrepreneurship.

“Profit,” he ventured, “is not a four letter word[.] It is no more evil than indirect addressing or fig newtons [sic].”

The core of Wada’s solution to the challenge of sustainable commercial software development was to pursue economies of scale. If hardware vendors could increase the number of households with microcomputers, then software developers could sell enough copies of their programs to recoup their initial investment. Expanding the market for microcomputers was accompanied by a secondary problem, however. In the mid-1970s, compiled software was stored on a variety of media—rolls of punched paper tape, audio cassettes, and, in a small number of cases, floppy diskettes—none of which could be affordably mass produced. Wada’s suggestion was that hobbyists should adopt the long-playing vinyl record (LP) as a storage medium. The hobby software industry, he reasoned, could take advantage of the facilities that were already in place for the mass production and distribution of musical LPs.

Finally, Wada’s letter concluded with a call for computer clubs to do more outreach to the general public. “Once people see what we are doing with a few K of memory, a couple of LEDs, and a lot of sweat,” he enthused, “it won’t be long before they too are ‘hooked.’”<sup>38</sup> As a model, Wada proposed that clubs connect with their local public broadcast stations and start half-hour television shows dedicated to microcomputing. In an ideal future, he reasoned, software could be transmitted within the television signal, eliminating the need for distribution media altogether.

Wada’s letter to *Byte* took for granted that software could be bought and sold. Art Childs, editor of *Interface*, took a step back from this assumption and wondered if the abstract, semi-material nature of software was simply incompatible with commercialization altogether. Although he refused to directly address Gates “because of the letter’s overall tone,” but he did take seriously the Gates’ central provocation: “how are those who write software for the home computing market to be compensated for their efforts?”<sup>39</sup> In response, Childs expanded this single question into a string of prescient observations about the uncertain ethics of copying: “Should it be illegal (or unethical or immoral) to give your friend the Basic Interpreter you purchased? And if so, exactly what action on your part would constitute an illegal (or unethical) act?”<sup>40</sup> Published just months before the Copyright Act of 1976, these questions anticipated the challenges that digital media would soon pose to

traditional notions of authorship and ownership.<sup>41</sup>

Childs concluded that computer programs are essentially intangible and belong “naturally” in the public domain.<sup>42</sup> Developers who attempted to commoditize their code would therefore find themselves in a hopeless battle to protect their code. Anyone trying to sell software, he warned, was doomed to spending “hard-earning time and money pursuing copyright offenders.”<sup>43</sup> Instead of selling directly to consumers, Childs suggested that hardware makers would soon differentiate their microcomputers by bundling them with high quality development tools. Software could become a key site of competition but profitability still lay in the sale of silicon and steel.

Perhaps the best known response to the Open Letter came from members of the Silicon Valley hobbyist milieu.<sup>44</sup> Jim Warren, then the editor of *Dr. Dobb's Journal of Computer Calisthenics and Orthodontia*, published a lengthy retort in *SIGPLAN Notices*, an ACM journal on programming languages read by an academic and industry audience.<sup>45</sup> Whereas Wada emphasized the need to increase the market for hobby software, Warren focused on software pricing, citing popular microcomputer programs that cost five dollars or less. If Altair BASIC were more affordable, he argued, hobbyists would have been happy to pay for a copy. Unfortunately, Warren’s response did not address the question of fair compensation for programmer labor. Instead, he assured readers that hobby software would continue to be produced so long as hobbyists thought of programming as “fun” rather than “work.” He went on to describe a “symbiotic” division of labor in which “experienced computer professionals” (i.e., university professors) would provide high-level software designs for hobbyists to implement (“hack-work” that is “exciting to [hobbyists] but drudgery to the ‘old pro.’”)<sup>46</sup> Warren did not raise the issue of monetary compensation.

#### *An Argument in Code: The Development of Tiny BASIC*

Jim Warren’s economic analysis may have been limited, but his vision of voluntary software development was not merely hypothetical. Rather, Warren was writing from his first-hand experience with Tiny BASIC, a lively and successful cooperative effort to produce a low-cost BASIC interpreter for microcomputers with limited memory. As outlined by Warren, Tiny BASIC was first specified by Dennis Allison, a Stanford computer science professor, but all of the implementation work was carried out by hobbyists. In the context of the Open Letter, Tiny BASIC was not simply a programming project but an argument expressed in running code.

Whereas Microsoft’s BASIC was written specifically to demonstrate the features of

the MITS Altair 8800, Allison designed Tiny BASIC as a simple, platform-independent dialect of the language that could be developed cooperatively with the hobbyist community.<sup>47</sup> In the pursuit of accessibility and portability, Tiny BASIC itself was written in a “pseudo language” that was understood by a second, lower-level interpreter.<sup>48</sup> The advantage of this layered design was that the lower-level interpreter could be implemented in assembly language more easily than the entire Tiny BASIC language. Once a programmer got the lower-level interpreter running, no additional work was required to start using Tiny BASIC as written by Allison.<sup>49</sup> As a result, several implementations of Tiny BASIC were soon available for the microprocessors commonly used by computer hobbyists.<sup>50</sup>

Tiny BASIC is remembered as an early demonstration of successful voluntary collaboration among microcomputer programmers; a precursor to the free and open source software movement.<sup>51</sup> But it would be a mistake to use Tiny BASIC as evidence of anti-commercial consensus in the hobby computing community of the mid-1970s. Although Allison’s original design and many community implementation efforts were circulated at no cost, Tom Pittman’s version of Tiny BASIC, one of the few written for non-Intel processors, was indeed sold as commercial software.

Pittman remembers writing his version of Tiny BASIC in direct response to the “whining” of fellow hobbyists at a meeting of the Homebrew Computer Club and the “moaning” of Gates in the Open Letter.<sup>52</sup> In addition to the technical challenges posed by Allison’s clever design, Pittman planned to test his peers’ professed willingness to pay for software at a lower rate. “I asked if anybody would buy it if it cost only \$5,” he recalled in 2004, “There seemed to be some affirmation, so I wrote my interpreter.”<sup>53</sup> If price were the only reason that unauthorized copies of Altair BASIC were being circulated, then a \$5 Tiny BASIC should have been a solution. If the hobbyist culture was opposed to commercialization, however, then the price should not have made a difference.

The outcome of Pittman’s experiment was, of course, that both explanations were true. According to Pittman’s recollection, none of his fellow hobbyists in the Homebrew Computer Club bought his version of Tiny BASIC but a small blurb in *Byte* magazine brought in an overwhelming number of orders from other parts of the country; each with \$5 paid up front.<sup>54</sup> “I didn’t get rich off it,” he recalls, “but it did pay a lot of my expenses at grad school.”<sup>55</sup> The lack of local sales should not be simply interpreted as evidence that the members of Pittman’s circle were dishonest, however. The Homebrew Computer Club was among the most sophisticated microcomputing groups in the country, Pittman was not the first to implement Tiny BASIC, and it is likely that many of the Club’s members already had

a version of BASIC up and running, thereby obviating the need to buy one from Pittman. The deluge of orders, on the other hand, is a handy illustration of the diversity of hobby computing at the time. The Homebrew Computer Club was the best documented group of the period, but it was not necessarily representative of the technical culture of 1970s hobby computing, either in its geographical concentration, technical sophistication, or its opinion on commercialization.

### *Historiography and the Open Letter*

At the start of 1976, the Open Letter inserted the legal and ethical problems of authorship into a hobby computing discourse that was otherwise principally concerned with technology. As the microcomputing industry continued to grow and Microsoft was joined by dozens of new software companies, the economics of software—who should pay for what and at which prices—were tested in the marketplace. The Open Letter soon began a second and even more influential life, however, as an object of mythical significance in computing folklore. This transformation into myth began eight years later with the first published histories of microcomputing.

By 1984, microcomputing had been fully popularized through the elaboration of the microcomputer into the “personal computer” or “PC.” Unlike mainframe data processing systems that were associated with large, dehumanizing bureaucracies such as the Selective Service System, PCs were marketed as accessible information appliances to empower the modern individual subject.<sup>56</sup> The ideological positioning of the PC as an instrument of individual resistance was never more clearly dramatized than on January 22 of 1984 when the well-known “1984” advertisement for the Apple Macintosh was broadcast during Superbowl XVIII. The notion that the PC might be used to resist oppression and conformity, as it did in “1984,” reflected an origin myth that positioned the microcomputing industry as an extension of the Bay Area counter-culture of the 1970s.<sup>57</sup>

In 1984, curious viewers of the Superbowl ad could explore the history of the PC in two widely-available books: *Hackers: Heroes of the Computer Revolution* by Steven Levy, and *Fire in the Valley: The Making of the Personal Computer* by Paul Freiberger and Michael Swaine, published by Penguin and McGraw-Hill, respectively.<sup>58</sup> These two accounts structured the 1970s computer scene as a confrontation between asymmetric forces: the entrenched mainframe industry and an insurgent community of microcomputing enthusiasts. In both books, IBM represented the computing establishment, fearsome and impenetrable in its bureaucratic complexity, while microcomputer makers like Apple were defined by a

commitment to a populist vision of everyday interactivity. IBM was described as “hulking” and “clumsy,” and its mainframe products were “dinosaurs.”<sup>59</sup> Later dramatizations of the period, adapted from these earlier texts, employed a similar David-and-Goliath narrative. In *The Pirates of Silicon Valley*, a fictional Steve Ballmer explained that IBM was “the scariest beast of all... like Attila the Hun, Genghis Khan, and Vlad the Impaler all rolled into one.”<sup>60</sup> Microsoft, in contrast, was but a “two-bit little outfit.”<sup>61</sup>

The Open Letter played a pivotal role in these histories of personal computing because it marked a moment of transition in which the technical culture of hobby computing began to seriously confront the ethical challenges of commercialization. In particular, *Fire in the Valley* became a crucial vehicle for the preservation of the Open Letter, as it included a photograph of the letter sent to Bob Reiling of the Homebrew Computer Club.<sup>62</sup> A problem with these journalistic histories, however, is that they tended to overgeneralize from the Bay Area hobbyist scene to hobby computing in general. Ironically, considering that this skew was due to the commercial successes of the Silicon Valley hobbyists, it obscured the diversity of opinion on commercialization elsewhere during the mid-1970s.

In Levy’s *Hackers*, the MITS-Mobile caused a commotion when it came to Palo Alto in June 1975.<sup>63</sup> By contrast, the coverage of this event in *MITS Computer Notes* did not mention anything out of the ordinary.<sup>64</sup> In Levy’s telling, members of the Homebrew Computer Club were stunned when they observed the MITS employees interacting with Altair BASIC in real-time through a teletype. Amid the confusion of the crowd, an unknown member of the club is said to have “borrowed” a copy of punched paper tape containing the demo version of Altair BASIC and handed it off to another member who had access to a machine that could rapidly reproduce copies.<sup>65</sup> At the next meeting, dozens of copies of the unfinished Altair BASIC were distributed with the stipulation that each recipient should find a way to make a second copy to bring back to the club. According to Levy’s account, this unauthorized duplication was justified according to a combination of frustration at MITS’ long shipping delays and a “hacker ethic” in which the “proper price for software [was] nothing.”<sup>66</sup>

Neither the responses to the Open Letter published elsewhere, nor the factual elements of Levy’s story indicate that the members of the Homebrew Computer Club believed that all software should be distributed at no cost. Indeed, *Hackers* also recounts Tom Pittman’s experience writing and selling Tiny BASIC, evidence that club members held more nuanced views of commercialization. Furthermore, the level-headed responses of Childs, Hayes, and Wada to the Open Letter suggest that other hobbyist computer clubs may have been even

more amenable to the notion of a commercial software industry.<sup>67</sup> Instead, it was Levy's editorial voice that suggests commercialization is incompatible with a common "hacker ethic."

In *Fire in the Valley*, Freiburger and Swaine were more equivocal in their account of the Open Letter. Rather than read the Letter from the point of view of computer hobbyists, Freiburger and Swaine situated the Letter within a growing number of professional programmers irked by unauthorized copying. From this vantage, Gates was merely the first to publicly decry "the piracy problem."<sup>68</sup> The authors did not elaborate on the reception of the letter except to say that it had "no effect whatsoever."<sup>69</sup> Unauthorized copying continued unabated and simply became "a cost of doing business" for the nascent software industry.<sup>70</sup> Of course, as the authors reminded readers, the cost was manageable for most new software publishers because "business was good, very good."<sup>71</sup>

The personal computing origin stories published in 1984 both preserved and shaped the memory of the Open Letter in computing folklore. Extracted from its original context, and presented in isolation from the responses of hobbyist readers, the Open Letter served as a compelling illustration of the growing pains experienced by the hobbyist community as the microcomputing industry rapidly expanded. It is important to note that although *Hackers* and *Fire in the Valley* were each widely read at the time of their publication, *Hackers* went on to serve a unique function in the construction of the Open Letter as myth.

The full text of the Letter was not reproduced in *Hackers*, but it remains the primary channel through which the story of the Open Letter persists. Reprinted by Penguin four times between 1984 and 2010, *Hackers* is a key text in the collective memory of many self-identified hackers.<sup>72</sup> The book not only detailed the people, technologies, institutions, and events of the early microcomputing period, it theorized a shared value system that Levy dubbed "the Hacker Ethic."<sup>73</sup> The Hacker Ethic, enumerated into seven principles, outlined a meritocratic technical culture in which information is freely exchanged among peers. The Ethic was not explicitly anti-commercial, but the adherents profiled in *Hackers* seemed scarcely concerned with the political-economic dimensions of their technological endeavors. In this context, the Open Letter is remembered primarily as a violation of community norms, rather than a provocation to consider the problems raised by the commercialization of microcomputer software. In the 1990s, advocates of the free and open source software movement seized upon this mythical rendition of the Open Letter in their opposition to Microsoft's unfair business practices.

## The Use of the Open Letter Myth in Open Source Advocacy

By the late 1980s, Microsoft could no longer be reasonably described as a “two-bit operation” like it had a decade before. With the diffusion of affordable “clones” of the IBM PC, Microsoft operating systems—first DOS, then Windows—became the most widely-used desktop computing platforms, found in homes and offices around the world. This dominant position was achieved by “bundling” Microsoft software with the sale of new PCs. Even those buyers who planned to use a different operating system were compelled to pay a licensing fee. As interest in the GNU/Linux operating system, a free and open source alternative, swelled in the middle of the decade, a new David and Goliath story emerged in which Microsoft, rather than IBM, played the unjust hegemon. On this new ideological terrain, the myth of the Open Letter served as evidence of Microsoft’s evil origins and was retold in an apocryphal form by advocates of the free and open source software movement.

### *Institutional Origins of the Free Software Movement*

The epilogue to Levy’s *Hackers*, titled “The Last of the True Hackers,” introduced Richard Stallman, a former member of the MIT Artificial Intelligence (AI) Lab, as the steward of the Hacker Ethic. In 1983, at the time of Levy’s writing, Stallman was just beginning to conceive of the GNU Project, an effort to cooperatively build an operating system that would prove to be the origin of the free and open source software (FOSS) movement. With the Hacker Ethic as a unifying narrative frame, *Hackers* drew a direct line from Tiny BASIC and the hobby computing culture of the mid-1970s to the GNU Project and Stallman’s experience of hacker culture in the MIT AI Lab. It is an exciting comparison, but it obscures significant structural differences that separated the two groups of computer enthusiasts.

In a 2001 interview with Richard Stallman about his halcyon days at MIT in the 1970s, he recalled the Artificial Intelligence Lab as a place populated by “playful,” “clever” hackers who approached their work with a zeal for collaboration, curiosity, and friendly competition.<sup>74</sup> The Lab provided staff, students, and a small number of trusted community members with an unfettered opportunity to tinker and experiment with interactive computing facilities to which access was highly restricted at other research labs. In this respect, computing in the MIT AI Lab was remarkably “open,” but any account of its openness must also be tempered by attention to the essential closed-ness of the elite institutions that housed it. In contrast to the typical hobbyist clubs meeting regularly in computer stores, libraries, and



garages throughout the country, the AI Lab may as well have been locked inside of a fortress.

In 1985, Stallman officially announced the GNU Project, an effort to build a completely free operating system that might liberate users from the constraints of commercial software.<sup>75</sup> The principles undergirding the GNU Project reflected the technical culture that Stallman treasured during his time working in the MIT AI Lab. All GNU software would include a copy of the human-readable source code and users were encouraged to make modifications and copies, as long as their source code was shared under similar terms. To preserve these “freedoms,” Stallman wrote a special “copyleft” software license to be distributed along with source code.<sup>76</sup> Together, the operating system project and the copyleft license provided the foundation for a “free software” social movement.<sup>77</sup>

Before the popularization of internet access in the early 1990s, however, very few people were able to participate in the collaboration and code-sharing practices at the heart of the free and open source software movement. Although the GNU code was nominally and legally open, most of the programs that Stallman and his peers developed required expensive minicomputing platforms that were not available outside of university, industry, and military research institutions. Furthermore, early free and open source software projects leveraged access to the nascent internet in order to coordinate their projects and trade code between sites. Public portals to the internet were also quite rare during the 1980s. Lacking access to either minicomputers that could run GNU software or the data networks where the software was exchanged, personal computer users were almost entirely absent from the early free and open source software movement.<sup>78</sup>

As privatization facilitated greater access to the internet in the early 1990s, however, the principles and promises of free and open source software began to resonate beyond the small group of early GNU participants and the movement grew considerably. In an ironic turn, the promise of a completely free operating system was first realized in 1991 when a Finnish computer science student developed a small kernel that could run alongside free software tools on the personal computer he maintained at home.<sup>79</sup> The resulting system, known as “GNU/Linux” or simply “Linux,” served as the first material bridge between the institutional computing infrastructures found at universities like MIT and the much more widely-installed personal computer architectures such as the IBM PC.

Toward the end of the 1990s, as an increasing number of home computer users turned to free and open source software such as GNU/Linux, Microsoft dominated the market for personal computer operating systems and office software. Rather than sell integrated hardware and software systems like Apple, Microsoft licensed their software to many

different hardware manufacturers. As a result, the cost of the Microsoft Windows operating system was typically incorporated into the overall cost of a new personal computer, an arrangement that contributed to eventual antitrust regulation in Europe and the US.<sup>80</sup> Some GNU/Linux advocates believed that the free operating system represented not only a novel method for developing personal computer software but also disruptive market force that might upend Microsoft's dominance. On one hand, Bruce Perens and other entrepreneurs began to promote the term “open source” as a pragmatic, business-friendly alternative to the politically-charged “free software.”<sup>81</sup> On the other hand, anti-Microsoft sentiments bubbled over into letter writing campaigns, boycotts, and demonstrations, many of which were organized through regional clubs and grassroots “user groups.”<sup>82</sup> In particular, free and open source software advocates resented being compelled to pay for an operating system that they did not want when purchasing a new personal computer.<sup>83</sup>

#### *Apocryphal Readings of the Open Letter*

The myth of the Open Letter was revived amid rising excitement around the free and open source software movement and consumer discontent at Microsoft's anti-competitive business practices. Production on the documentary film *Revolution OS* began in 1999 at the height of both popular sentiments. Director J. T. S. Moore, an admitted outsider to the free and open source software movement, was drawn in by the “classic underdog story” of a “grassroots revolution...battling one of the most powerful corporations on Earth.”<sup>84</sup> Unable to secure an interview with a spokesperson from Microsoft, Moore turned instead to the text of “An Open Letter to Hobbyists” in order “to give Bill Gates a chance to speak for himself.”<sup>85</sup> In the resulting scene, Moore effectively obliterated the historical context in which the Letter was written. The camera quickly panned across a reproduction of the Open Letter as it appeared in the Homebrew Computer Club newsletter. A narrator was heard reading selected sentences from the letter in an increasingly frenzied tone as tense music swelled in the background. Far from giving Microsoft a voice, this scene primarily served to mock Gates personally. By presenting the Letter, apocryphally, as a response to the early advocates of free software, *Revolution OS* obscured the long temporal distance and significant structural gaps separating the microcomputing hobbyists addressed by Gates from the hackers ensconced at MIT.<sup>86</sup>

Moore reported finding the Open Letter in the archives at Stanford University but he was not the only person to use the Letter as a stand-in for Gates' personal opinion of the free and open source software movement.<sup>87</sup> Moore may have been tipped off to the Letter by open

source advocate Bruce Perens. During an on-camera interview in *Revolution OS*, Perens recounted an Edenic history of early computing similar to Stallman's in which software was "just passed around between people" before commercialization brought about a metaphorical fall from grace at the end of the 1970s.<sup>88</sup> Unlike Stallman, whose perspective was initially limited to university computing, Perens obliquely referred to the Open Letter when he remarked, "you can blame some of [the commercialization of software] on Microsoft."<sup>89</sup>

On the surface, Stallman and Perens seemed to be drawing on a shared understanding of computing history but Perens' anti-Microsoft comment subtly indicated a disjuncture. As the history of the GNU Project suggests, the free and open source software movement was materially and socially isolated from personal computing for several years before the popularization of the internet enlarged the potential for cross-platform collaboration. Not only were the microcomputer hobbyists of the 1970s embedded in a vastly different technical and economic regime from Stallman's academic milieu at the AI Lab, but even a decade later, the GNU Project was not producing software that could run on a personal computer. Treating the university hacker and microcomputer hobbyist cultures as two parts of a single, shared social world overstated the extent to which these groups were in communication with one another in the 1980s and understated the role that the internet played in bringing them together in the 1990s.

Several books and articles published in the last decade recount the myth of the Open Letter in much the same fashion as Moore used it in *Revolution OS*.<sup>90</sup> More compelling, perhaps, are the conspicuous works that do *not* mention the letter. None of Stallman's many essays on free software or the GNU Project make mention of the Open Letter; nor do any of the contributors to the edited collection *Open Sources: Voices from the Open Source Revolution*.<sup>91</sup> While advocates of free and open source software used the Open Letter instrumentally in the late 1990s and early 2000s, it was scarcely mentioned by the writers who built the ideological foundation of the movement.

### Conclusion

"An Open Letter to Hobbyists" illuminates a winding path through the history of computing. In 1975, many computer hobbyists regarded the unauthorized copying of software as a peccadillo, on par with taping a song off of the radio. With the publication of the Open Letter, however, the moral calculus of the software economy shifted. The Letter prompted a wide-ranging discussion of the role that software would play in the emerging

microcomputer industry. In short time, entrepreneurial developers began to experiment with many different models of packaging and pricing their programs, leading to the proliferation of retail shops, software libraries, disk magazines, and shareware bulletin board systems (BBS) during the following decade.

Beginning in the mid-1980s, the Open Letter was gradually enveloped in the rich folklore of computing history. Initially preserved in the romantic narratives of Steven Levy's *Hackers* and Paul Freiberger and Michael Swaine's *Fire in the Valley*, the Letter came to represent an important moment of reckoning in the commercialization of hobby computing. Later, however, advocates of the free and open source software movement took up the Letter to portray Microsoft as the company that brought about the end to a blissful period of cooperation and free sharing. As the Open Letter traveled through each of these discursive contexts, it was used to think about the problems of ownership, authorship, labor, and value brought about by commercial software.

Revisiting the Open Letter also indicates that more historical work is needed to understand the technical culture of microcomputing hobbyists during the 1970s and 1980s. While the existing literature attends to those Bay Area hobbyists who became commercially successful, much less attention has been paid to the hobby computing groups that formed outside of Silicon Valley. As a result, regions of the country that were once hotbeds of hobby computing activity, such as Albuquerque and Fort Worth, are scarcely studied. This lack of attention has, in turn, contributed to a problematic conflation and oversimplification of hacker and hobbyist norms, values, discourses, and practices.

The distinction between hacker and hobbyist was anything but clear-cut. There were numerous individuals and technologies that could be described variously as hobbyist, professional, amateur, experimental, or entrepreneurial. But “hobbyist” conveyed a cultural meaning that has yet to be fully understood. Indeed, the word “hobby” appeared twelve times in the Open Letter. It was used to refer to a population (“hobbyists”), an economy (“the hobby market”), a platform (“hobby computer”), and a specific form of code (“hobby software”).<sup>92</sup> The prevalence of the term indicates that the authors intended to hail a particular subset of the period's computing culture.

Clarification of the meaning of “hobbyist” will also occur through examination of the boundary work done by those who resisted being classified as such. The members of the MIT AI Lab from whom Levy adopted the term in *Hackers* considered themselves of a separate class from the grant-funded “Officially Sanctioned Users” who used computers merely to conduct research.<sup>93</sup> But it seems likely that these self-identified hackers would also have

resisted being labeled “hobbyists.” The hackers’ nocturnal coding marathons were not merely a “hobby,” but rather an all-consuming vocation.<sup>94</sup> Indeed, when attendees of the 1984 Hackers’ Conference were asked to define “hacker,” Brian Harvey, a former MIT hacker, suggested that hackers were a special type of hobbyist who “take [their] hobby seriously” and are not “dilettantes.”<sup>95</sup> Harvey continued, “If programming is something you do on a Sunday afternoon and the rest of the time you don't think about it, you're not a hacker.”<sup>96</sup> Moments like these revealed the degree to which identifying as either a “hacker” or “hobbyist” conveyed significant social meaning for computer enthusiasts of the period.

Crucially, the distinction between the hobbyist and the hacker rested on the different political-economic conditions within which they carried out their computing practices. Although the hackers at MIT were generally not assigned to carry out grant-funded research themselves, the timesharing minicomputers that they treasured were purchased, maintained, and housed within an institutional infrastructure sustained by outside funding. Conversely, the activities of the microcomputer hobbyist were constrained temporally by their commitments to work and family, and materially by the limits of their discretionary income. The hacker and the hobbyist populations shared a passionate commitment to interactive computing, but due to structural conditions during the 1970s and 1980s, the two groups remained socially and technologically distinct.

While many hobbyists took exception to being called “thieves,” the Open Letter prompted thoughtful reflection on the ethical and economic dimensions of microcomputer software. Just as ham radio, hot-rodding, and many other 20<sup>th</sup> century technical cultures had developed niche markets that provided supplemental (and in some cases, substantial) incomes to enterprising hobbyists, Gates’ letter suggested that software might be a new arena for hobby entrepreneurship. Whereas university computer facilities were supported through complex flows of institutional funding, personal computing was an expensive hobby for middle class families in the 1970s. For many self-funded hobbyists, the emergence of a profitable microcomputer software industry offered new opportunities for professionalization, employment, and entrepreneurship. To understand the lasting impact of early personal computing on American society, it is essential to grapple with the experiences of computer hobbyists who lived, worked, and played outside of the geographical and institutional centers of technological power.

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<sup>1</sup> For an examination of a similar romantic narrative in the context of the early web, see: Thomas Streeter, *The Net Effect: Romanticism, Capitalism, and the Internet* (New York: New York University Press, 2011).

<sup>2</sup> The mainboard of the Altair included a set of standardized slots for adding new circuit boards; a design that welcomed tinkering and customization. As competing microcomputer companies such as IMSAI and Processor Technology began to adopt a similar approach, the name of this design became a source of conflict. MITS, the makers of the Altair, preferred the name “Altair bus” for the brand recognition, but an informal consortium of MITS competitors settled on “S-100 bus” and the generic name stuck. The circumstances of this resolution reflected a shift in the geographic center of microcomputing from MITS’ home in Albuquerque to the mid-California coast. According to Freiburger and Swaine’s account of the period, the S-100 name was chosen on an airplane as the founders of several California-based companies flew together from San Francisco to Atlanta for a computer show. The folks from MITS must have been on a different plane. Paul Freiburger and Michael Swaine, *Fire in the Valley the Making of the Personal Computer* (New York: McGraw-Hill, 1984), 48–49.

<sup>3</sup> See: Paul E Ceruzzi, *A History of Modern Computing* (Cambridge, Mass.: MIT Press, 1998).

<sup>4</sup> “By the late 1960s, hackerism was spreading, partly because of the proliferation of interactive machines like the PDP-10 or the XDS-940, partly because of friendly programming environments (such as the one hackers had created at MIT), and partly because MIT veterans would leave the lab and carry their culture to new places.” Steven Levy, *Hackers: Heroes of the Computer Revolution* (Garden City, N.Y.: Anchor Press/Doubleday, 1984), 138.

<sup>5</sup> Theodor H. Nelson, *Computer Lib / Dream Machines* (Self-published, 1974).

<sup>6</sup> Fabrice Florin, *Hackers: Wizards of the Electronic Age*, DVD, 1984, <http://hackersvideo.com>.

<sup>7</sup> *73* magazine represents a particularly important crossroads between amateur radio and hobby computing. The founding editor of *73*, Wayne Green, would later start *Byte*, one of the first widely-circulated personal computing magazines. Green also published an edited collection of computer-related material from *73* to encourage amateur radio enthusiasts to participate in the nascent hobby computing scene. See: Wayne Green, ed., *Hobby Computers Are Here!* (Peterborough, NH: 73 Publications, 1976).

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- <sup>8</sup> A microcomputer equipped with a modem offered the best of both worlds and telecommuting was a recurring interest among futurists of the period. In 1980, *Creative Computing* magazine published an excerpt of Alvin Toffler's *Third Wave* discussing a future of tele-work. Alvin Toffler, "The Electronic Cottage," *Creative Computing*, December 1980.
- <sup>9</sup> Freiberger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 51; H. Edward Roberts and William Yates, "Altair 8800 Minicomputer, Part 1," *Popular Electronics*, January 1975; M. Mitchell Waldrop, *The Dream Machine: J. C. R. Licklider and the Revolution That Made Computing Personal* (New York, NY: Penguin Books, 2001), 431.
- <sup>10</sup> "Altair BASIC - Up and Running," *Computer Notes*, March 1975.
- <sup>11</sup> Nick Montfort, *10 PRINT CHR\$(205.5+RND(1));:GOTO 10* (Cambridge, Mass.: MIT Press, 2013), 182–186.
- <sup>12</sup> David H. Ahl, ed., *BASIC Computer Games: Microcomputer Edition* (New York, NY: Workman Publishing, 1978).
- <sup>13</sup> Thomas E. Kurtz, "The Many Roles of Computing on the Campus," in *Proceedings of the May 14-16, 1969, Spring Joint Computer Conference, AFIPS '69 (Spring)* (New York, NY, USA: ACM, 1969), 649–56, doi:10.1145/1476793.1476903.
- <sup>14</sup> Freiberger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 141; Bill Gates, interview by David Allison, 1993, Division of Computers, Information, & Society, National Museum of American History, Smithsonian Institution, <http://americanhistory.si.edu/collections/comphist/gates.htm>.
- <sup>15</sup> "People just bought it thinking that it would be neat to build a computer." Gates, interview.
- <sup>16</sup> This vignette, which is corroborated in an interview with Gates conducted by the Smithsonian, is one of the most often retold anecdotes of the period. See: Martyn Burke, *The Pirates of Silicon Valley*, DVD (Warner Home Video, Inc., 1999); Freiberger and Swaine, *Fire in the Valley the Making of the Personal Computer*; Stephen Manes and Paul Andrews, *Gates: How Microsoft's Mogul Reinvented an Industry--and Made Himself the Richest Man in America* (New York: Doubleday, 1993).
- <sup>17</sup> Freiberger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 142; Bill Gates, "An Open Letter to Hobbyists," *Computer Notes*, February 1976.
- <sup>18</sup> Manes and Andrews, *Gates*, 82–83.
- <sup>19</sup> "Updated Price List," *Computer Notes*, March 1975.
- <sup>20</sup> *Ibid.*
- <sup>21</sup> Manes and Andrews, *Gates*, 82–83.

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- <sup>22</sup> “MITS-Mobile Hits SE,” *Computer Notes*, August 1975.
- <sup>23</sup> Freiburger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 123.
- <sup>24</sup> The name MITS, or Micro-Instrument Telemetry Systems, refers to its founding purpose: to provide radio telemetry devices to model airplane builders. *Ibid.*, 28.
- <sup>25</sup> David Bunnell, “Across the Editor’s Desk,” *Computer Notes*, August 1975.
- <sup>26</sup> David Bunnell, “Across the Editor’s Desk,” *Computer Notes*, September 1975.
- <sup>27</sup> Gates, “An Open Letter to Hobbyists.”
- <sup>28</sup> *Ibid.*
- <sup>29</sup> “Local User Groups,” *Computer Notes*, December 1975.
- <sup>30</sup> For several years, Michael Holley, a collector of computing ephemera, has maintained the best list of known publications to carry the Open Letter on Wikipedia. See: “Open Letter to Hobbyists,” *Wikipedia*, August 30, 2013, [http://en.wikipedia.org/w/index.php?title=Open\\_Letter\\_to\\_Hobbyists&oldid=560256193](http://en.wikipedia.org/w/index.php?title=Open_Letter_to_Hobbyists&oldid=560256193).
- <sup>31</sup> See: Calvin N. Mooers, “Are You an Author?,” *Byte*, September 1976.
- <sup>32</sup> In *Hackers*, Steven Levy quoted Steve Dompier, a member of the Homebrew Computer Club, using the term “piracy” and comparing it to “taping music off the air.” Levy, *Hackers*, 230.
- <sup>33</sup> Gates, “An Open Letter to Hobbyists.”
- <sup>34</sup> Gates’ second letter emphasized a categorical distinction between software development tools like Altair BASIC and the types of programs that BASIC enabled hobbyists to write. While he foresaw, accurately, that hobby organizations would soon assemble large libraries of the latter type, he worried that system tools could not be sustainably developed without a commercial incentive. Bill Gates, “A Second and Final Letter,” *Computer Notes*, April 1976.
- <sup>35</sup> By some accounts, members of the Southern California Computer Society “threatened to sue” for defamation, though this is not evident in the pages of *Interface*, the SCCS magazine. See: Levy, *Hackers*, 230.
- <sup>36</sup> Mike Hayes, “Regarding Your Letter 3 February 1976 Appearing in Homebrew Computer Club Newsletter Vol. 2 No. 1,” *Homebrew Computer Club Newsletter*, February 29, 1976.
- <sup>37</sup> Robert Wada, “An Opinion on Software Marketing,” *Byte*, July 1976.
- <sup>38</sup> *Ibid.*
- <sup>39</sup> Art Childs, “Interfacial,” *Interface*, May 1976.
- <sup>40</sup> *Ibid.*
- <sup>41</sup> *Copyright Act of 1976*, vol. 90 Stat. 2541, 1976, <http://www.copyright.gov/title17/>.



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<sup>42</sup> Childs, “Interfacial.”

<sup>43</sup> Ibid.

<sup>44</sup> In Levy’s account, the Open Letter is published in direct response to the unauthorized duplication of Altair BASIC among members of the Homebrew Computer Club in Menlo Park, CA. This was a powerful narrative strategy and it was replicated in later dramatizations, but the notion that the Open Letter was addressing any one club is not supported by the historical record. See: Levy, *Hackers*, 228–229.

<sup>45</sup> Jim C. Warren Jr., “Correspondence,” *SIGPLAN Notices*, July 1976.

<sup>46</sup> Jim C. Warren Jr., “Correspondence,” *SIGPLAN Notices*, July 1976.

<sup>47</sup> Dennis Allison, Happy Lady, and friends, “Design Notes for Tiny BASIC,” *People’s Computer Company*, September 1975.

<sup>48</sup> Ibid.

<sup>49</sup> Ironically, most of the implementations of Tiny BASIC skipped Allison’s two-layer design and simply implemented the language directly in assembly language. Tom Pittman, “The Return of Tiny Basic,” *Dr. Dobbs’s*, January 1, 2006, <http://www.drdobbs.com/web-development/the-return-of-tiny-basic/184406381>.

<sup>50</sup> Warren Jr., “Correspondence.”

<sup>51</sup> Levy described the production of Tiny BASIC as an “organic process.” Levy, *Hackers*, 231.

<sup>52</sup> Ibid., 234; Pittman, “The Return of Tiny Basic”; Tom Pittman, “Itty Bitty Computers & TinyBasic,” *Tiny Basic Info*, November 15, 2011, <http://www.ittybittycomputers.com/IttyBitty/TinyBasic/index.htm>.

<sup>53</sup> Pittman, “Itty Bitty Computers & TinyBasic.”

<sup>54</sup> Ibid. Levy’s account of Pittman’s commercial success indicated that some hobbyists felt an ethical compunction to pay for his software: “Some sent in five dollars with a note saying not to ship anything to them—they’d already copied it from a friend.” Levy, *Hackers*, 235.

<sup>55</sup> Pittman, “Itty Bitty Computers & TinyBasic.”

<sup>56</sup> For a closer look at the popular fear of data processing, see: Kevin Driscoll, “From Punched Cards to ‘Big Data’: A Social History of Database Populism,” *communication+1* 1, no. 1 (August 29, 2012), <http://scholarworks.umass.edu/cpo/vol1/iss1/4>.

<sup>57</sup> Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006).

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<sup>58</sup> Freiburger and Swaine, *Fire in the Valley the Making of the Personal Computer*; Levy, *Hackers*.

<sup>59</sup> Freiburger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 7; Levy, *Hackers*, 41.

<sup>60</sup> Burke, *The Pirates of Silicon Valley*.

<sup>61</sup> Ibid.

<sup>62</sup> Freiburger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 169.

<sup>63</sup> Levy, *Hackers*, 227–228.

<sup>64</sup> “Altair... On the Road,” *Computer Notes*, July 1975.

<sup>65</sup> Levy, *Hackers*, 228.

<sup>66</sup> Ibid.

<sup>67</sup> Childs, “Interfacial”; Hayes, “Regarding Your Letter 3 February 1976 Appearing in Homebrew Computer Club Newsletter Vol. 2 No. 1”; Wada, “An Opinion on Software Marketing.”

<sup>68</sup> Freiburger and Swaine, *Fire in the Valley the Making of the Personal Computer*, 153.

<sup>69</sup> Ibid.

<sup>70</sup> Ibid., 154.

<sup>71</sup> Ibid.

<sup>72</sup> For example, in a footnote to an essay describing the origins of the GNU free software project, Richard Stallman recommended that readers seek out *Hackers* to understand the cultural context within which the norms and values of the free and open source software movement developed. Joshua Gay, ed., *Free Software, Free Society: Selected Essays of Richard M. Stallman* (Boston, MA: Free Software Foundation, 2002), 15.

<sup>73</sup> Levy, *Hackers*, 39–49.

<sup>74</sup> J. T. S. Moore, *Revolution OS*, DVD (Wonderview Productions, 2001), <http://www.revolution-os.com/>.

<sup>75</sup> Richard M. Stallman, “The GNU Manifesto,” *Dr. Dobb’s Journal of Software Tools*, March 1985.

<sup>76</sup> Li-Cheng (Andy) Tai, “The History of the GNU General Public License,” *Free-Soft.org*, July 4, 2001, [http://web.archive.org/web/20130530224656/http://www.free-soft.org/gpl\\_history/](http://web.archive.org/web/20130530224656/http://www.free-soft.org/gpl_history/).

<sup>77</sup> The “free” in “free software” refers to liberty rather than cost. For Stallman's explanation and defense of this ambiguous terminology, see: Richard M. Stallman, “The Free Software

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Definition,” in *Free Software, Free Society: Selected Essays of Richard M. Stallman*, ed. Joshua Gay (Boston, MA: Free Software Foundation, 2002), 41.

<sup>78</sup> Although PC users were not included in the early stages of the GNU Project, microcomputer enthusiasts circulated source code through newsletters, magazines, and bulletin-boards, and conducted numerous cooperative software development projects independently of their academic contemporaries. The story of Tiny BASIC describes one such project. Histories of the free and open source software movement rarely include these projects, however. For additional examples of distributed software development in the context of hobbyist BBSes, see: Kevin Driscoll, “Hobbyist Inter-Networking and the Popular Internet Imaginary: Forgotten Histories of Networked Personal Computing, 1978-1998” (Dissertation, University of Southern California, 2014), 161–244, <http://digitallibrary.usc.edu/cdm/compoundobject/collection/p15799coll3/id/444362/rec/2>.

<sup>79</sup> Eric S. Raymond, “A Brief History of Hackerdom,” in *Open Sources Voices from the Open Source Revolution*, ed. Chris DiBona, Sam Ockman, and Mark Stone (Cambridge: O’Reilly, 1999), 27.

<sup>80</sup> For a more detailed economic analysis of Microsoft’s business strategy during the 1990s, see: David S Evans, Andrei Hagiu, and Richard Schmalensee, *Invisible Engines How Software Platforms Drive Innovation and Transform Industries* (Cambridge, Mass.: MIT Press, 2006).

<sup>81</sup> Bruce Perens, “The Open Source Definition,” in *Open Sources Voices from the Open Source Revolution*, ed. Chris DiBona, Sam Ockman, and Mark Stone (Beijing: O’Reilly, 1999), 171. Stallman strongly objected to the term “open source” and its focus on pragmatism. Rather, he argued that the continued use of “free software” kept focus on the moral imperative of protecting user freedoms. In 1999, Perens publicly supported Stallman’s objection and distanced himself from the term “open source.” Bruce Perens, “It’s Time to Talk About Free Software Again,” *Debian-Devel*, February 17, 1999, <http://web.archive.org/web/20121014032019/http://lists.debian.org/debian-devel/1999/02/msg01641.html>; Richard M. Stallman, “Why ‘Free Software’ Is Better than ‘Open Source,’” in *Free Software, Free Society: Selected Essays of Richard M. Stallman*, ed. Joshua Gay (Boston, MA: Free Software Foundation, 2002), 55.

<sup>82</sup> Moore, *Revolution OS*.

<sup>83</sup> In 1999, members of the Silicon Valley Linux Users Group declared February 15 “Windows Refund Day” and protested outside of Microsoft’s offices. Photos and an

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eyewitness account may be found at Marc Merlin, “Windows Refund Day,”

*Marc.merlins.org*, December 6, 1999,

<http://web.archive.org/web/20130509041449/http://marc.merlins.org/linux/refundday/>.

<sup>84</sup> J. T. S. Moore, “About,” *Revolution OS*, accessed September 9, 2014,

<http://web.archive.org/web/20130603172342/http://www.revolution-os.com/about.html>.

<sup>85</sup> *Ibid.*

<sup>86</sup> During the height of anti-Microsoft sentiment, critics routinely used Bill Gates as a synecdoche for the Microsoft Corporation. For example, Slashdot, a popular tech news site identified all news stories about Microsoft with a photograph of Gates edited to look like a part of the Borg from *Star Trek: The Next Generation*. James Glave, “Slashdot: All the News That Fits,” *Wired*, August 26, 1999,

<http://web.archive.org/web/20120803000305/http://www.wired.com/culture/lifestyle/news/1999/08/21448>.

<sup>87</sup> Moore, “About.”

<sup>88</sup> Moore, *Revolution OS*.

<sup>89</sup> *Ibid.*

<sup>90</sup> E.g., John Markoff, *What the Dormouse Said: How the Sixties Counterculture Shaped the Personal Computer Industry* (New York: Viking, 2005), 285; Matt Mason, *The Pirate’s Dilemma: How Youth Culture Is Reinventing Capitalism* (New York: Free Press, 2008), 145; Douglas Thomas, *Hacker Culture* (Minneapolis: University of Minnesota Press, 2002), 39.

<sup>91</sup> Chris DiBona, Sam Ockman, and Mark Stone, *Open Sources Voices from the Open Source Revolution* (Beijing: O’Reilly, 1999); Gay, *Free Software, Free Society*.

<sup>92</sup> Gates, “An Open Letter to Hobbyists.”

<sup>93</sup> Levy, *Hackers*, 31.

<sup>94</sup> Levy, *Hackers*, 31–32.

<sup>95</sup> Brian Harvey’s off-the-cuff definition of “hacker” was recorded by a documentary film crew and included in Florin, *Hackers: Wizards of the Electronic Age*. A partial transcript of the event was also published in the *Whole Earth Review* and later transcribed for circulation online, see: “Hacker’s Conference 1984,” *Whole Earth Review*, May 1985, 44–55.

<sup>96</sup> Florin, *Hackers: Wizards of the Electronic Age*.