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## Introduction: Computer Revolutionaries

To be a good programmer today is as much a privilege as it was to be a literate man in the sixteenth century. This privilege leads the programmer to expect recognition and respect on the part of society. Unfortunately, such recognition is not always realized.

—Andrei Ershov, *Aesthetics and the Human Factor in Programming*, 1972

### The Computer People

Chances are that you or someone close to you makes their living “working with computers.” In the decades since the 1950s, the technical specialists most directly associated with the electronic digital computer—computer programmers, systems analysts, and network and database administrators—have assumed an increasingly active and visible role in the shaping of our modern information society. All but the smallest organizations now have their own information technology departments filled with such specialists, and in many cases they represent some of the organization’s most valued—or at least most highly paid—employees. In the United States alone there are more than three million professional computer experts; the total worldwide estimate is nearly thirty-five million.<sup>1</sup> There are now more people working in computing than in all of the other fields of engineering and architecture combined. In recent years, “computer people” have become some of our wealthiest citizens, most important business leaders and philanthropists, and most recognized celebrities.

It is likely, however, that unless you yourself are one of these computer people, you have at best a vague notion of what it actually means to work with computers. Even compared to other esoteric scientific or technical disciplines, the work of computer specialists is opaque to outsiders. Their activities are often regarded by nonpractitioners as being at

once too difficult and technical to be understood by mere mortals, and too trivial and tedious to be worth the effort. The specialists themselves talk about what they do as being a mysterious blend of art and science, high tech and black magic. Many of the colloquial terms that are frequently used to describe these experts—“hackers,” “wizards,” “cowboys,” or “gurus”—reflect the ambivalent fusion of wonder, awe, and suspicion with which they are generally regarded.<sup>2</sup> That so many of these computer specialists seem unwilling (or unable) to communicate to others what it is they do or how they do it only exacerbates the apparent impenetrability of their discipline.

But while you might not know much about what it is that these computer specialists do, you probably can at least imagine what they look like: the stereotype of the scruffy, bearded, long-haired programmer, wearing (inappropriately) sandals and a T-shirt, has been a staple of popular culture since at least the early 1960s.<sup>3</sup> He (always a he, at least in the stereotype) is usually curt, antisocial, and more concerned with maintaining the integrity of the “system” than in being truly helpful to the end user.<sup>4</sup> So recognized is this stereotype that a high degree of proficiency in computer programming has been linked with mild forms of Asperger’s syndrome and autism—the so-called geek syndrome or engineer’s disorder.<sup>5</sup> Regardless of the scientific validity of this particular diagnosis, the more general association of computer programming ability with a specific personality type—eccentric, arrogant, and antisocial—has a long and well-established history, and continues to define how computer specialists are seen by their colleagues and contemporaries. The archetype of the modern American “nerd” is no longer the engineer or scientist but rather the computer specialist.<sup>6</sup>

However little you might know (or care) about the habits and character of the computer people, you can at least appreciate their contributions to contemporary society. The products of their labor are everywhere around us. We live in a society that has been so thoroughly computerized that even the most basic human activities involve us in constant interaction with computers and computer-based technologies. Most obvious are the “personal” computers that many of us rely on daily to do our work, help us study, allow us to create and access entertainment, and facilitate communication with friends and family. Less visible, but no less significant, are the millions of other tiny computing devices that lie hidden, embedded within other products and technologies, quietly gathering data, controlling processes, and communicating between components. Your automobile almost certainly has its own computer (in fact, proba-

bly several), as does your cell phone, digital camera, and television. Even more intangible are the ways in which the electronic digital computer has transformed how we perceive and interact with our environment. In fields as diverse as molecular biology, anthropology, ecology, physics, cognitive science, economics, and medicine, the electronic digital computer has been widely adopted, not only as a useful tool for gathering and manipulating data, but also as a fundamental metaphor for understanding ourselves and the world around us. In fact, it would be difficult to identify a single aspect of contemporary social, economic, political, or cultural life that has not been profoundly influenced by computers and computer-based technologies—and by extension, the computer specialists who designed and developed these technologies.

Despite their omnipresence in contemporary popular culture and sizable representation in the modern information economy, historians have thus far devoted little attention to these ubiquitous but mysterious computer specialists. There are, of course, whole shelves of books devoted to the small number of inventors and entrepreneurs—Bill Gates, Steve Jobs, and Larry Ellison, in particular—who have managed to translate their computing expertise into fabulous wealth and personal celebrity. There is also considerable literature on the intriguingly subversive subculture of teenage computer hackers. Since the late 1970s, these geeky adolescents have been alternatively hailed as the heroic harbingers of the coming “computer revolution” or castigated as dangerous cyber-criminals.<sup>7</sup> But neither of these groups is representative of the larger computing community. Little has yet been written about the silent majority of computer specialists, the vast armies of largely anonymous engineers, analysts, and programmers who designed and constructed the complex systems that make possible our increasingly computerized society. Even basic demographic information about them can be difficult to come by.

To a certain extent, this curious neglect of the computer people, at least in popular histories of technology, is simply the result of the conventions of the genre. Compared to the celebratory and sensationalized accounts of genius inventors, important “firsts,” and machines that “changed the world” that generally dominate such histories, the stories of merely average computer workers would seem at first glance mundane and inconsequential. Even sophisticated academic histories of technology have difficulty incorporating the actions and agendas of nonelite actors, such as end users, operators, maintenance workers, and other “invisible technicians.”<sup>8</sup> The stories of such actors are also surprisingly difficult to

document: technical specialists and other midlevel laborers rarely leave records, or at least the kind of records that are useful and accessible to historians. And since the community of specialists associated with the computer encompasses a broad and diverse range of occupational categories—from academic computer scientists to corporate computer programmers to machine operators and maintenance workers—they are an especially difficult group about which to generalize. It is not altogether startling, therefore, that many conventional histories of computing focus on easily identifiable pioneers and isolated incidents of technological innovation.

A subtler and more significant explanation for the lack of attention paid to computer specialists has to do with the traditional bias in the traditional emphasis of the history of *computing* on the history of the *computer*. Or to be more specific, on the history of a particular type of computer: the electronic, programmable, digital computer. Most histories of computing begin and for the most part end with the invention of this particular artifact. The development of the first modern electronic computers in the late 1940s is typically regarded as the seminal moment in the birth of the modern information age, the culmination of all the innovations in information technology that preceded it, and the precursor and enabler of all that would come after. Once the electronic computer had embarked on its seemingly inexorable march toward Moore's law—toward ever-smaller, faster, and more affordable computing power—the eventual “computerization” of all of society was both desirable and inevitable.

This focus on the invention and perfection of the technology of electronic computing makes for a clear and compelling narrative, and provides a straightforward and largely technologically determined explanation for the emergence of the electronic computer as the defining technology of the modern era. In doing so, however, it downplays or disregards the contributions of the majority of the computer people. Whatever it is that they really do, the typical computer specialist has almost nothing to do with either the design or construction of actual computers. There are certainly engineers and technicians whose primary responsibility is building computers, but they are an increasingly rare breed, and are generally concentrated in a small number of large and highly specialized computer manufacturers. The vast majority of computer specialists, from the earliest days of commercial computing to the present, spend little time interacting with—and probably understand little about—the inner workings of an electronic computer. Their association with the computer is much