

10 The Fog of Freedom

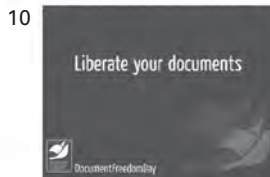
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Talk of freedom and liberty pervade the past and present of the digital computer and the Internet, from everyday “academic freedom” to the more specific notion of a “freedom to tinker”; from the prestigious Computers, Freedom and Privacy conference to “net neutrality”; from “Internet Freedom” in North Africa and the Middle East and the Occupy movement in the United States to the famous case of Free Software, which has articulated precise freedoms as well as a legally constituted commons in reusable technologies; from the “FreedomBox” to the Freedom Fone to “Liberté Linux (see figure 10.1).¹

What kind of talk is this? Idle chatter? A rhetorical flourish? Serious business? Or perhaps it is more than talk? Freedom is associated with the digital computer and the Internet to a greater extent than it is to most other technologies. And the digital computer and the Internet are associated with freedom much more than with other ideals, like justice, well-being, health, or happiness. Further, arguments are made just as often that digital computers and the Internet restrict rather than enhance freedom, leading to a morass of claims about the powers—good and evil—of these new technologies that drape the globe and permeate our consciousness.

There are many ways to dismiss this association as ideology or marketing hype, but there are fewer ways to take it seriously. Careful attention to the history and development of the digital computer and the Internet should be balanced with careful attention to the political theories of freedom and liberty if we want to make sense of the inflated claims associating freedom and computers.

In this chapter I explore the relationship between the concept of freedom and the historical path that the design of computer technology has taken; to do this convincingly requires bringing the approaches of science and technology studies (STS) and media and communication studies (MCS) into closer dialogue with political theory. In particular, I will revisit here



the story of the invention of the personal computer out of the world of batch-processing and mainframe computing in the 1960s, and the roles of people such as JCR Licklider and Douglas Engelbart (Bardini 2000; Campbell-Kelly 1996; Ceruzzi 2003; Markoff 2005; Streeter 2011; Turner 2006; Waldrop 2001). Alongside this story I offer an analysis of the conceptual distinction in political theory between positive and negative liberty, most famously, but not exclusively, associated with Isaiah Berlin. Both parts of this story have been told many times, but never together.

Most contemporary accounts of the birth of the personal computer tend to critically diagnose one particular kind of freedom: libertarianism. What I will demonstrate here is that even a very remedial attention to the conceptual distinctions available in political theory can yield a much richer story about how freedom is related to the design and innovation of computer technology. The distinction between positive and negative freedom, as an example, can be used to articulate and explain different aspects of the invention of the personal computer; it helps specify the meaning of “freedom to” and “freedom from,” how the computer was first imagined to restrict human thought, and then enhance it, and how this relates to assumptions about the capacities and limitations of the human organism.

Scholarship in STS, history of science, and MCS tends to leave the concept of freedom relatively untroubled, whereas work in political theory tends to trouble the concepts of freedom without worrying too much about the details of technology. Neither approach clearly investigates how new technologies change the meaning of freedom itself. My intuition is that the invention of the personal computer clearly represents a transformation of the “powers of freedom” (Rose 1999) at our disposal—both how we practice

Figure 10.1

Diverse expressions of the link between freedom and computers. Collage by C. Keltly. 1. Net Neutrality meets Norman Rockell (<http://www.flickr.com/photos/doctabu/3659665238/>). 2. A proposed logo for the Freedom Box by Joshua Spodek and John Emerson (<http://joshuaspedek.com/freedombox-logo-designs>). 3. Internet freedom t-shirt. 4. Trademarked UNIX “Live Free or Die” license plate (<http://www.unix.org/license-plate.html>). 5. “Internet Freedom Speech,” Secretary of State Hilary Clinton, January 2010. 6. Computers, Freedom and Privacy Conference banner, 2011 (<http://www.cfp.org/>). 7. Freedom Computer Service, Phoenix, AZ (<http://www.freedomcomputerservice.com/>). 8. France 24 advertisement for “The Tweets,” June 2011 (Ad agency: Marcel Paris). 9. Freedom Fone Logo (<http://freedomfone.org/>). 10. “Document Freedom Day” from the Open Document Foundation (<http://www.documentfreedom.org/>). 11. Liberté Linux Distribution Logo (<http://dee.su/liberte>). 12. “Microsoft Is Trashing Your Freedom” sticker (<http://windows7sins.org/>).

freedom, and how we restrict it. But we have neither a descriptive nor a normative theory of this transformation.

The concept of freedom is not only something lived and loved, but also an analytical tool for exploring the implications of the design of new technologies. For instance, the concepts of individual and collective liberty can help make sense of the design of networks—and specifically of the case of the design of the ARPAnet protocols in the 1970s. In that case one sees the classic problems of constitutional design, including issues of contract, neutrality, and justice articulated at the same time in John Rawls's work (1971). By the 1980s, the IT industry was embroiled in debates about “vendor lock-in” and network standardization. The concept of civic-republican liberty or “freedom as non-domination” (Pettit 1997) provides a sophisticated way to understand these debates—and these debates themselves set the terms of debate for what “free software” would come to mean and how a distinctive kind of copyright license was necessitated (Kelty 2008). Although this chapter is restricted to one slice of the story, and one kind of conceptual specification, it is and should be read as part of a much larger field of possibilities.

The association of freedom with information technology, therefore, is not just talk. The intuition that these technologies are directly and materially related to our freedom is predictable. After all, these tools engage our individual capacities to think, create, and manipulate the world, and they transform the collective relationships we have with others. Anything that is both so intimate and so political a technology concerns more than discourse or hype—it is also about design, construction, maintenance, and repair, and about money and power as well.

A notable feature of this constant association is that *new information technologies are seen as a cause both of freedom and of control and coercion*. This polarization is visible not just in the present but in particular moments in the past as well, when new technologies were created in order to respond to or correct perceived encroachments on freedom created by a previous generation of technologies. The personal computer was perceived as a liberation from the constraints of the mainframe; free software has been understood as a liberation from the constraints of proprietary software; “open systems” were seen as a way to liberate the computer industry from “vendor lock-in”; the Internet was designed with the capacity to free organizations from the constraints of bounded, hierarchically controlled local networks, and later understood as an inherently “liberating” tool of personal, political, and innovative expression. In each case, slightly different aspects of the concept of freedom are at work (such as negative, positive, neutral, or nondomination). And in each case, the question is raised as to how these

concepts are *built into, designed into, or made durable in* the creation, innovation, and dissemination of new information technologies. Only by looking at both the detailed history of these technologies and the theoretical refinements of the concept of freedom can we hope to make sense of these intuitions.

Freedom, Thought in Three Domains

The aim of this book is to articulate the intersections between scholarly work in science and technology studies and media and communications studies. I would like to do that by reference to a third domain: that of political philosophy. Both STS and MCS have developed their own peculiar concept of politics based in understanding the empirical realities of technology and media. Frequently, however, this version of politics is a *terminus*: it is the end of the line of analysis. Technology is political; media industries distort politics; new technologies should support freedom, not restrict it.

STS, especially when dealing with the material aspects of scientific and technological culture, has developed a now-standard technique of displaying the ways that technologies are political. From Langdon Winner's account of Robert Moses' Long Island bridges to Bruno Latour's sleeping policemen and Berlin keys, to Shapin and Shaffer's account of political order in seventeenth-century science, to the politics of expertise and the "participatory turn"—in all these cases, the goal is to demonstrate that science and technology are political (see, respectively, Winner 1980; Latour and Venn 2002; Shapin and Schaffer 1985; see also Epstein 1995; Jasanoff 2003; and Nowotny, Scott, and Gibbons 2001). But as Marres and Lezaun (2011) point out, this approach often designates these things as "sub-political": politics are embedded in, designed into, lurk within the things and ideas of science and technology, and it is the analyst's prerogative to reveal this subterranean political action to readers. This "sub-politics" is distinguished from politics *proper* as a kind of hidden order of politics. Whether or not politics *proper* functions in a healthy and orderly form, the "sub-political" domain of technology necessarily haunts it. Only when scholars turn their attention to the governance of science and technology, or the politics of science policy, does the proper domain of politics become an explicit object of analysis. However, in these cases it is not analyzed *in the same way* as the objects of science and technology, though recent work emerging out of science studies has begun to do just that (Barry 2001; Latour 2010; Marres 2009; Marres and Lezaun 2011).

MCS has a different relationship to political theory. Communication studies has always been about the relationship of democracy, freedom, and the medium of communication, but like work in STS, it is reticent to put the communications horse in front of the democracy cart. For instance, in the august tradition of what is now called “media reform” work in communications, there is an explicit connection made between the material and economic configuration of the media and telecommunications industries, and the possibility for a healthy politics—especially democratic politics of free speech in the (mediated) public sphere. The focus on free speech has allowed scholars and policymakers alike to focus on the details of new technologies. From Robert McChesney and Ithiel de Sola Pool to Paul Starr and Michael Schudson, there is a rich tradition of interrogating how free speech is challenged by new technologies, and how it warps, distorts, defends, or enlarges a public sphere or the possibilities for deliberative and participatory engagement in the life of a democracy (de Sola Pool 1983; Klinenberg 2007; McChesney 1999; Schudson 1978, 1998; Starr 2004). These approaches retain the public sphere as a kind of ideal type that communication regimes can fall short of, instead of something that emerges or is co-constituted by the communications media. To be fair, the work of people like Michael Warner (2002) and William Warner (2005) push in this direction, enough so that there are now openings for the pursuit of a different theory of freedom (and free speech, as in Coleman 2009).

There are also ongoing debates in MCS about the nature of engagement by or participation of citizens via different technologies—whether the classic critiques of national broadcast culture, or the current concerns about the intersection of new media, citizen journalism, and politics. Arguably this approach has the same “sub-political” orientation as STS in that the structure of media industries, the patterns of use, or the design of specific affordances are revealed as being political without questioning the proper domain of politics itself. If these theories are normative, they are so (for better or for worse) with respect to relatively unquestioned formulations of free speech and democratic participation.

STS has shown more interest in free speech recently, and MCS has turned more toward an understanding of the heterogeneity and complexity of technical systems, or the “distributed cognition” they might enable (Boczkowski 2010; Coleman 2009, Gillespie 2007; Lievrouw 2011). Nonetheless, both steer well clear of any direct transformation of the concepts of political theory. By contrast, in the places where political theory is contested—that is, in mainstream history, philosophy, political science, and sociology—it is by no means required that a dispute about political theory

will involve questions of science, technology, or communications media at all.² As a result, the proper “technologies” of political theory remain those of face-to-face speech and deliberation, rational and affective relationships, and certain highly circumscribed forms of action like voting, protesting, canvassing, funding, or donating, all of which leave the proper domain of technology or communications media as untouched as in the reverse case.

The great virtue of bringing in more political theory is that freedom comes in many flavors. It apparently has to if it is to support the impressive array of its uses and abuses.³ As Isaiah Berlin said, freedom is a word “so porous that there is little interpretation that it seems able to resist.” (Berlin 1958, 6) This has, however, not stopped anyone who cares deeply about the concept from carefully proposing an array of distinctions and refinements that form a considerably well tricked-out workshop from which one might draw. Understanding this diversity is preliminary to making any progress in understanding how new technologies might encode, incorporate, address, or transform freedom in actual practice.

To begin with, there are the classic distinctions between negative and positive liberty, and between individual or collective liberty (Berlin 1958; Christman 1991; Miller 1983; Steiner 1994; Taylor 1979; von Hayek 1960).⁴ There are debates about whether there are “two concepts of liberty,” “three concepts of liberty” or only one (MacCallum 1967; Nelson 2005; Skinner 2002). There is a large, robust, and very precise analytical concern with the compatibility of free will and determinism (Fischer 1999). There is a general division of labor in the literature between political and individual liberty, as well as attempts to integrate them (Pettit 2001). There is the long-standing tradition of “republican” liberty, recently revived (Pettit 1997, 2001; Skinner 1998). There are debates about the existence of collective subjects, about the multiplicity of the individual (May 1992; May and Hoffman 1991); and so on. All this is no doubt remedial for the political theorist. What is not remedial is the question of how these different concepts relate to innovation, and in particular to the innovation of the digital computer and the Internet.

A rapprochement among STS, MCS, and political theory would be welcome, and there is some evidence of one (Bennett 2010; Braun and Whatmore 2010; Marres and Lezaun 2011). The history of computing technology is a useful case because it nicely interweaves objects and problems central to both STS and MCS. The digital computer and the Internet were conceived as communications devices long before they were consumer goods; they blur the lines between industries (telecommunications, computing, entertainment, and, recently, advertising) and create novel challenges for policy

and regulators. They are evolved in an ecology of “convergence” with other devices, and engineers, designers, and analysts have long treated them as something that provides, enhances, or ensures *freedom* of some kind.

But triangulating STS and MCS with political theory requires two adjustments. First, from the direction of political theory, the range of refinements concerning freedom is rich enough that those of us in STS or MCS should begin to challenge some of the stories and claims that are routinely made in our fields, specifically concerning the relationship between freedom and the design of technologies. Second, scholars in STS or MCS should begin to articulate how “designing freedom into” technologies *changes the concept and practice of freedom itself*.

How can freedom inhere in technologies? Is freedom something more or less real than software, or electrons, or solder? We might approach freedom as having simply a discursive reality: one can ask how particular actors talk (or talked) about freedom as part of the design of particular technologies (the most obvious case would be that of Ted Nelson’s 1974 *Computer Lib/Dream Machines*; see figure 10.2). Or freedom can be approached as being a set of rules for or definitions of action: one can ask how freedom was defined in a particular historical moment and a particular place as evidence for how it might have been used in the design of information technology (an example would be Rawls’s [1971] theory of neutrality, and how it has structured debates about the Internet). Freedom can also be approached as an ethical or moral framework of some kind, and one therefore might settle on a particular normative definition of freedom and then critique various actors or entities for falling short of it in the design of a technology (this is often the approach of free software advocates and analysts).

But to say that freedom can inhere in a technology is to suggest that it has a material existence of some kind—and by implication, that we build, repair, and maintain freedom in particular ways. Engineers, designers, or hackers—just as much as philosophers, jurists, or legislators—repeatedly subject the concept to distinctions and reconstructions that respond to the creation of new institutions, changed conditions (such as movements for liberty and revolutions), and changed understandings of humans and non-humans (McKeon 1957). Freedom cannot be unaffected by our attempts to bring it into being, to enhance it, or to restrict it—explicitly or not. This is all the more so when such attempts result in arrangements of life that make particular aspects of the concept *durable*.

A separate, and related, question is whether engineers and designers—just as much as philosophers, jurists, or legislators—must *intend* to design freedom into a technology for the concept to play a role. What designers

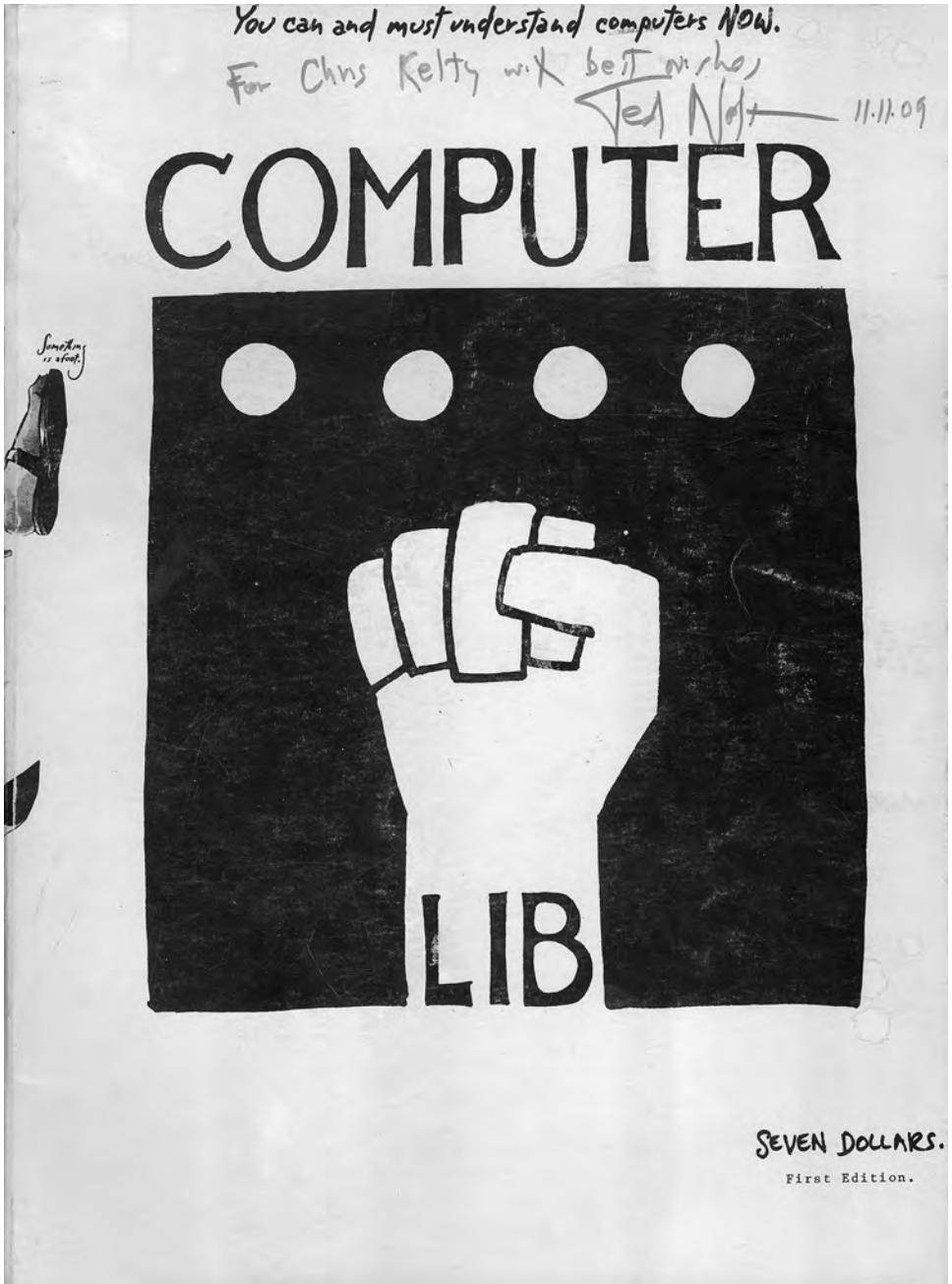


Figure 10.2

Front Cover of Ted Nelson's 1974 classic *Computer Lib/Dream Machines*. Autographed copy inscribed "For Chris Kelty, with best wishes. 11.11.09."

say or intend does not simply map on to the technologies that result. It is too hard a case to make that most or all designers, engineers, or marketers are driven by some particular ideal of freedom to make things one way or another—and that they have the power to do so. Many other motivations crowd the field from simple self-interest to a concern with beauty to a nationalist concern with productivity to egoism, and so on. And many other interests determine the configuration of any given technology. At best, we can point to the kinds of problems that designers and firms think exist and need solutions, and how they attempt to solve them. In doing so, they transform the capacities for and practices of freedom for a subsequent generation, and it is possible to observe this process in action.

What follows thus has an avowedly pragmatic character: it requires identifying the reconstruction of a concept as a result of its testing, use, and rectification by actors in the world (Dewey 2006). The computer has literally transformed the concept of freedom in the last thirty years. It is this claim that I think neither STS nor MCS has taken seriously, instead leaving it implicit in the general conclusion that “technology is political.” What might be the consequences of this transformation, for STS and MCS, to be sure, but also for our *theory and practice of freedom* more generally?

Are Computers Libertarians?

In the social and cultural studies of the history of the digital computer to date, the kind of freedom most often attributed to innovators and their problem-solving activities has been that of libertarianism. This is not an unreasonable association. It is easy to find clear and sometimes disturbingly powerful examples, such as Peter Thiel, cofounder of PayPal, venture capitalist, and early investor in Facebook. He is a frequent supporter of libertarian causes, from the predictable (Ron Paul’s campaign) to the absurd (a \$1.25 million donation to the Seasteading Institute, a group seeking to build sovereign nations on artificial islands in international waters).⁵ Whether Thiel is at all representative of Silicon Valley capitalists, engineers, developers, or designers is a harder claim to make, and one for which there is little other than anecdotal evidence. Nonetheless, the idea of a distinctive brand of Silicon Valley libertarianism has become a kind of mythos of its own.

In 1995 Richard Barbrook and Andrew Cameron inaugurated the Silicon Valley libertarian mythos, dubbing it “The Californian Ideology” (Barbrook and Cameron 1996). The critical nuance that Barbrook and Cameron offered was that Silicon Valley libertarianism combined elements of both

the traditional left and the traditional right; it brought together ostensible lefties like Stewart Brand with ostensible conservatives like Newt Gingrich and George Gilder, combining “the free-wheeling spirit of the hippies and the entrepreneurial zeal of the yuppies (44).” In 2000, journalist Paulina Borsook published *Cyberselfish: A Critical Romp through the Terribly Libertarian Culture of High Tech*, in which she savaged the feral “technolibertarians” of high tech culture, specifically those she perceived to be dominating Silicon Valley and its politics. In both of these cases, “cyberculture” is represented by cyberpunk fiction, *Wired* magazine, *Mondo 2000*, Silicon Valley entrepreneurs and engineers, and libertarianism associated with free markets, deregulation, and radical individualism. Whether or not these specifics should stand in for either the place or the ideology is unclear, and sometimes the proposed connections between Silicon Valley and libertarianism verge on conspiracy.⁶

It is only recently that scholars such as Fred Turner (2006) and Thomas Streeter (2011) have started to put together richer, more convincing accounts of the specific kinds of associations that have permeated information technology and its innovations since the 1960s. Fred Turner’s *From Counterculture to Cyberculture* has made perhaps the most sustained contribution to the cultural understanding of “cyberculture” by charting the detailed ways in which the network of folks including Stewart Brand, Peter Schwartz, and Kevin Kelly helped give a particular cultural meaning to some of the most celebrated moments of the history of computing—from Douglas Engelbart’s famous 1968 demonstration of what a personal computer could be (where Brand manned the camera) to the 1984 Hacker’s conference (which Brand co-organized) to one of the earliest and most celebrated “virtual communities”: the Whole Earth ’Lectric Link or WELL (of which Brand was naturally a member).

Turner makes the distinction between the New Left and the New Communalists, the latter of which Turner suggests “turned away from political action and toward technology and the transformation of consciousness as the primary sources of social change (2006, 4).” His interest is not precisely in the design of technology, however, or in the specific association of technology with freedom, but in the association of technology and consciousness. It was the works of Theodore Roszak (*The Making of a Counterculture*, 1969) and Charles Reich (*The Greening of America*, 1970) that provided the templates for a new kind of social change, beyond, outside, or perhaps within, the failed systems of contemporary governance and political action. What seems to make the story surprising is the countercultural *embrace* of technology—Norbert Wiener and cybernetics, Buckminster Fuller, the

personal computer, to name a few examples of this embrace—and not the conventional association of communalist hippies with Luddism or pre-technological naturalism. On the contrary, it is a story of the wresting of technology from the maws of bureaucracy, hierarchy, and the “organization man”—and the association of technology with *consciousness*. Turner writes: “If the mind was the first site of social change, then information would have to become a key part of a countercultural politics. And if those politics rejected hierarchy, then the circles within circles of information and systems theory might somehow make sense not only as ideas about information but also as evidence from the natural world for the rightness of collective polity” (2006, 38).

What followed was cyberculture, hacker culture, Silicon Valley, the cult of the personal computer, the rise of the “virtual community.” These slowly became associated with libertarianism through this complicated association of individual politics with consciousness. It was, as Thomas Streeter fleshes out, a romantic conception of self-mastery and actualization, an Emersonian American individualism of long and high repute melded with real and focused design and engineering work, in the context of a California still studded with utopian hopes all up and down the coast. This story makes good cultural sense of a large part of what has come to pass in the information technology ecology of the last forty years. But the concept of liberty implied by the association of technology and libertarianism is mostly a derivative one, drawn from the political beliefs and interests of certain individuals who either identify themselves as libertarians, or who are identified as such by those who suspect them of something.

However, the diversity of political associations, and the sophistication with which people in the high tech industry think about freedom (and other values) far outweighs this vocal minority’s simplistic utopias (or their critics’ anxieties). There are conservatives who value strong social bonds and strong government enforcement, and there are liberals who want to make technologies serve communities over individuals; there are hackers with vigorous, anarchist schemes of mutual aid and education, and there are entrepreneurs with visions of human-scale technology projects; there are crusaders for personal privacy, and there are well-intentioned engineers working against consumerism, imperialism, and so on.

The question then remains: are the technologies that have emerged from Silicon Valley in the last forty years (the personal computer chief among them) recognizably “libertarian” in design? The question is poorly posed, in part because the definition of libertarianism routinely goes unquestioned. Even if libertarianism designates a precise understanding of liberty

(and it is not clear that it does), it may not be the most appropriate tool for the job, as it were. The rush to critique the practices of those involved may in fact obscure the ways in which freedom has both been understood and transformed as the technology of the computer has evolved. In the following section, I ask instead how we might make better sense of this story by thinking about a different conceptual analysis of freedom—that of negative and positive liberty.

Negative and Positive Liberty

Isaiah Berlin's *Two Concepts of Liberty*, delivered in 1958, rehearsed a distinction that is possible to find in nearly every canonical meditation on freedom—that between negative and positive liberty. The text is useful in part because of the care with which Berlin disentangled the various approaches to freedom as a concept. It is primarily a work of analytic philosophy, and is clearly designed to make a definitive case for how we should think about freedom generally, even if it has subsequently been subjected to significant critique.

Berlin begins by suggesting that negative and positive versions of liberty answer different questions: “the ‘negative’ sense [of liberty] is involved in the answer to the question ‘What is the area within which the subject—a person or group of persons—is or should be left to do or be what he wants to do or be without interference by other persons? . . . the positive sense is involved in the answer to the question ‘What, or who, is the source of control or interference, that can determine someone to do or be one thing rather than another?’” (Berlin 1958, 6–7).

These two questions—about the zone of control and the source of control—have very different implications, often summed up in the difference between a “freedom from” and a “freedom to,” where the former usually signals a notion of freedom defined negatively (via the absence of something), while the latter signals a notion having positive content (and requiring support, legislation, or enforcement of some kind). Liberty as an absence of coercion is a definition in terms of a lack (ergo, the *negative* part): “coercion implies the deliberate interference of other human beings within the area in which I wish to act. You lack political liberty or freedom only if you are prevented from attaining your goal by human beings” (Berlin 1958, 7).

In Berlin's version of the distinction, certain things are clearly specified, such as the fact that it is *other humans* who coerce, that they do so *deliberately*, and that they interfere with *the goals of those being coerced*. By this definition any form of unintentional or serendipitous constraint is excluded.

The fact that I cannot fly, though I very much want to, is not a constraint on my freedom by this definition.⁷

However, there are a number—and it is probably a large number—of real-world cases for which this definition is not precise. The famous case of Robert Moses' design of bridges too low to allow public buses to pass into wealthy Long Island neighborhoods, for instance, raises issues: Is this interference deliberate? Is it a bridge that interferes, or is it *other people* interfering, mediated by a bridge? Is there an identifiable goal that people on a public bus had in going to Long Island (Winner 1980)? Although the facts of the case support a general sense of injustice, it is not clear that freedom, defined in this negative sense, was restricted; or to put it more precisely, it is not clear what exactly constitutes "the area within which the subject . . . should be left to do or be what he wants to be or do." Is it the bus, or Long Island, or New York, or a parkway, or something abstract like "choice of destination" or "ability to move?" Negative liberty has the enviable characteristic of being an incredibly simple definition of liberty, combined with the unfortunate disadvantage of rarely helping make sense of real-world cases.

Positive liberty, by contrast, is about the source of control, and as Berlin eloquently puts it, has a much wider remit:

The "positive" sense of the word "liberty" derives from the wish on the part of the individual to be his own master. I wish my life and decisions to depend on myself, not on external forces of whatever kind. I wish to be the instrument of my own, not of other men's, acts of will. I wish to be a subject, not an object; to be moved by reasons, by conscious purposes which are my own, not by causes which affect me, as it were, from outside. I wish to be somebody, not nobody; a doer-deciding, not being decided for, self-directed and not acted upon by external nature or by other men as if I were a thing, or an animal, or a slave capable of playing a human role, that is, of conceiving goals and policies of my own and realizing them. (Berlin 1958, 16–17)

For such a stirring and seemingly intuitive definition of liberty, it may come as a surprise that Berlin suggests positive liberty is "no better than a specious disguise for brutal tyranny." But positive liberty is dangerous not for its visions of autonomy or self-actualization per se, but because of the attempt by a person or persons to impose that vision on others. This violates the simpler and more primal definition of negative liberty: it is evil to restrict freedom in the name of freedom, however certain we are of its rightness. This is a point John Stuart Mill made forcefully in *On Liberty*.⁸

The notion of negative liberty has recently—and perhaps wrongly—come to be associated with libertarianism. Both libertarianism and negative liberty are often accused of implying the absence of government, or the

removal and deregulation of markets, or the radical reliance on individual responsibility (frequently encoded today as “neoliberalism”). But this is to rush beyond the relatively narrow zone that theories of negative liberty seek to make precise: the zone of individual coercion, and more specifically, its absence. The myth promulgated about a libertarian Silicon Valley stumbles on this distinction. Libertarians are fierce partisans of negative liberty in many cases, protesting any and all attempts to enforce ideas of the good, of welfare, or of individual success. But on the contrary, they are seen (by their critics) as pushing a particular kind of positive liberty—a vision of well-being that is resolutely individualist and radically divorced from any sense of communal or collective organization or obligation, a belief they seek to enshrine in the dismantling of the state, deregulation of markets, and ever-stronger legal protections of property. What makes libertarians scary (to those who denounce them) is not that they want to be let alone, but precisely the fact that they seem to want to legislate a particularly loathsome vision of radically individual freedom on everyone. Libertarians see themselves as defending liberty; their critics see them as forcing a particular kind of liberty on others.

The association of Silicon Valley with libertarianism—even the modified libertarianism of Barbrook and Cameron’s Californian Ideology or the digital utopians described by Turner—would seem to struggle with the distinction between positive and negative liberty. Or to put it differently, if there is something to be concerned about in Silicon Valley’s approach to liberty, it is not that it is overly libertarian, but that it is a kind of positive liberty imposed not through government action, but through the creation and dissemination of *technologies that coerce us* and that *interfere with our goals*. In this case, it is a set of technologies that has been designed to liberate (or coerce) the individual into being a freer, and more individual, individual.

As Berlin notes, distinguishing between negative and positive liberty has the function of making a logical distinction between the area of control and the source of control. Insofar as we are talking about political liberty, that source has always been considered the government, and only secondarily the church, society, corporations, or technology. The distinction allows us to differentiate the source of control (here presumably the *designed and implemented technology*), and the area of control (what it enables or prevents us from doing, our goals). If it is the case that new technologies do coerce in this sense, then they are precisely something to which libertarians should *object*. But they rarely object, and even when they do, for instance when the area of control is defined as “personal privacy,” they tend to do so by *building more technologies* to preserve privacy. Often the accusation (as well as the

assertion) of libertarianism seems to confuse the source and area of control. What goals are being restricted, by what people—or by what technologies? With Berlin's text in hand, it is possible to tell the story of the development of the personal computer differently than with the blunt criticism of libertarianism. The following section explores the classic distinction of positive and negative liberty, as well as Berlin's understanding of how and why positive liberty is tied to particular understandings of human nature.

Batch Processing, Mainframes, and Freedom of (Augmented) Thought

The personal computer was once identified with bureaucratic, centralized, and standardized corporations, as Turner (2006) and Streeeter (2011) remind us. Computers exemplified “instrumental reason” and the separation of means and ends; they were associated with the organization man, with the military-industrial complex, and with the “closed world” of destructive military power in Vietnam and the Cold War (Edwards 1996). They served as emblems for protestors in the 1960s decrying the psychological inauthenticity of mainstream American life. “These computers were not celebrated as fun; they were imagined as powerful . . . [The computer reached] its fullest cultural expression in HAL, the murderously intelligent computer in Stanley Kubrick's film *2001*” (Streeeter 2011, 28). Similarly, Turner's book begins with the Free Speech activist Mario Savio at Berkeley in the 1960s proclaiming: “‘At Cal you're little more than an IBM card’” (Savio, in Turner 2006, 12). Significant in Savio's words is the choice of IBM, one of the largest monopolies in American history, and the punch card, the emblem of so-called “batch processing” by which means and ends were effectively separated into problems and calculations.

The perception of computers as cold, impersonal symbols of control was shared just as much by people *within* the industry as those outside it sporting “I am a human being—do not fold, spindle, or mutilate” buttons. Streeeter, along with Mitchell Waldrop and others, single out J. C. R. Licklider as one example (Waldrop 2001). Though he was one of the first program directors at the storied Information Processing Techniques Office at the Advanced Research Projects Agency, Licklider's vision of the potential of future computers was radical by the expectations of the day. As one of the few individuals in the early 1960s who would have had more or less unrestricted time in front of a computer, Licklider constantly sang the praises of interactivity and the power of the computer to *augment*, not to replace, human thought (Waldrop 2001, 147–149; Licklider 1960). His famous 1960 paper, “Man-Computer Symbiosis,” suggested a crypto-cyborgian path toward a

new humanity, an augmented intelligence greater than anything humans alone could achieve.

Licklider was far from alone in his frustrations with inaccessible mainframes locked behind closed doors, hierarchical and inefficient batch processing of computing tasks, and the guardianship of “high priests” of the machine. Innovations like Grace Hopper’s early prototype of a software compiler, John Backus’s FORTRAN programming language, John McCarthy’s LISP programming language, and the various “time-sharing” schemes for computers were often presented as liberations from hierarchy, bureaucracy, and *constraint* (Wexelblat 1981). They enabled freedom by allowing people to work as individuals in relationship to the machine and to pursue *individual* goals, not those of an organization. Each innovation in interaction was figured as liberation from the decisions of the past. To program, compile, run, and see the output of a program—all in one sitting—was routinely represented as a kind of revelation for people, almost from the very beginning.

The concept of negative liberty helps make sense of these stories, in part. As an individual engineer or programmer in the 1950s and 1960s, you were routinely “prevented from attaining your goal by human beings” (Berlin 1958, 7) who possessed the keys to the computer room and who decided which tasks to process and when to return the results. It was a kind of power that was resented by engineers, and often described in terms of dependency and frustration—if not quite as enslavement. Most often, the language used was that of “high priests” or of the inner sanctum, a language of protestant and catholic reformation that is endemic to the cultural world of information technology (Kelty 2008, 66–76). Note that this is also a more precise sense of coercion than the diffuse public sentiment that computers contain one’s essential information or control one’s destiny in ways that are inaccessible or mysterious; here the constraint was directly identified with the people, processes, and corporations that interfered with a goal.

But what was that goal? In a mundane sense, it was often a problem circumscribed by other needs: solve this problem, design that system, keep track of this payroll, and so on. But in the sense given it by Licklider, the goal was something grander: *thinking*. The goal was expanding human intellect in ways that allow the exploration of problems, not just “to solve preformulated problems or to process data according to predetermined procedures” (Licklider 1960, 5). Citing Poincaré, Licklider says: “The question is not, ‘What is the answer?’ The question is, ‘What is the question?’ One of the main aims of man–computer symbiosis is to bring the computing machine effectively into the formulative parts of technical problems” (ibid., 5).

Insofar as this kind of coercion was confined to the control of a corporation over its employee, it does not violate negative freedom per se, but raises a different problem, that of the employment contract. Whether individuals freely enter into an employment relation, or are coerced, is complicated by the introduction of machinery of any kind into the workplace. Such machinery arguably impacts freedom in various modes, and the system of batch processing with mainframes computers is no different.

However, what Licklider pointed to was something else, something related to the very *development and innovation* of these machines, not just their integration into industrial or postindustrial capitalism. Licklider's vision was not about breaking down the hierarchical restraints of bureaucracy, and it was not quite the liberation from the "psychological inauthenticity" that 1960s protesters associated with corporations and the military-industrial complex. Rather Licklider was talking about what the computer would become, how it would evolve, in whose interests, and for what purposes. That he associated computing with thinking was also not new—but that he identified a restriction on thinking related to freedom was significant. Computers may replicate one kind of thought (logic and calculation, problem solving) but in their present form, they restrict another: interpretive, uncertain, problem-seeking thought. It is not "What is the answer?" but "What is the question?" Licklider forged a deep association between the *design* of future computers and *freedom of thought*. One can sense how this freedom was positive in a sense: it was not so much about how humans coerce other humans via machines, but about how machines *fail* to liberate us. If the computer of the future would liberate us, it must do so by *design*.

Although Licklider inspired a generation with visions of a "dream machine" of interactive displays, computer graphics, and "the computer as a communications medium," it was one of his star grantees, Douglas Engelbart at Stanford Research Institute, who forged the most precise association between computers and freedom of thought.⁹ Engelbart's vision, as Bardini (2000) has shown, was far richer and more radical than Licklider's. Licklider was more impresario than engineer, more psychologist of "human factors" than visionary philosopher-engineer. Engelbart by contrast had a vision of the augmentation of human intelligence that was broad, evolutionary in orientation, and crafted in response to a sense of a disjunction between the complexity of the changing world and the ability of humans to control it.

In the opening to his famous 1962 report *Augmenting Human Intellect*, Engelbart specifies the kind of problem solving he wants to pursue: "We do not speak of isolated clever tricks that help in particular situations. We refer

to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human 'feel for a situation' usefully co-exist with powerful concepts, streamlined terminology and notation, sophisticated methods, and high-powered electronic aids" (1).

Engelbart's report does not directly address liberty, but it does address something crucial to any concept of liberty: the view taken of what constitutes a person, a human, a self, or human nature. Berlin's understanding of positive liberty was concerned with the ways in which those who would impose it must posit a "man divided against himself . . . the transcendent, dominant controller and the empirical bundle of desires and passions to be disciplined and brought to heel" (Berlin 1958, 19). Positive liberty is anathema when it imposes freedom on someone "for their own good," where that good is not determined by the individual. A whole range of critiques follow from this claim, but it is important to realize that at the core of Berlin's definition is the idea that humans understand and know themselves, that they are not victims of some external or internal manipulation, ideology, or desire.

There is much to say about how Engelbart constructs his vision of human nature (relying on Benjamin Lee Whorf among others) in order to speculate about the kind of machine necessary to truly act as a partner in intelligence. Engelbart insists that human potential is limited physically and evolutionarily—that is, that our capacity to face and solve complex problems is not figured as a social, political, or cultural problem of the organization of knowledge, but as a physical and evolutionary one (which includes here the evolution of language, technology, and machinery), which has been outpaced by our collective life in modernity. By constructing the limitation of human potential in this way, the design of technology becomes a liberation of a particular sort: liberation from the evolved limits of the human body itself. The true self is not so much submerged beneath the passions as latent in the technology we have yet to design.

Engelbart is nowhere explicitly concerned in the report with the problem of liberty or coercion. Rather, the language of the report tends to discuss the envisioned computer of the future in terms of slavery: The computer will be a servant to the human, "a fast and agile helper" that can serve many masters without keeping any of them waiting, but one so intimately connected to the activity of thinking that, like language, it might become indistinguishable from that activity (Engelbart 1962, 70). In a kind of technological Hegelian moment of recognition, our servant-machines will confront us, augment us, and lead us into a domain of human thought impossible in the bodies we have been given by nature.

This is, to be sure, not a question of negative liberty at all. In Berlin's terms other humans must prevent one from achieving a goal, and that is not the case here; just as the inability to fly is not a restriction on freedom, neither is the inability to think. But it might be a case of positive liberty. Berlin, recall, associates positive liberty with autonomy and self-actualization ("I wish to be a subject, not an object; to be, moved by reasons, by conscious purposes which are my own, not by causes which affect me, as it were, from outside.") But the idea of a positive liberty dependent on the existence of external technologies and "augmented thought" would seem to contradict Berlin's notion. Berlin's definition is one of an authentic liberty fully immanent to the autonomous rational thinking human. But as he points out, it is an immediate step in theories of positive liberty to raise the question, "May I not be a slave to nature? Or to my own 'unbridled' passions?" As soon as this internal division of the self is allowed, and an outside force admitted that shapes who we are, it becomes possible to order them, to claim that the "higher self" is the result of civilization, education, and social order, while the lower self is a creature of passion, unreasonable, addicted, and enslaved by nature—*evolved* to be a certain way, perhaps.

It is not so very different, therefore, to see Engelbart's work as introducing a similar distinction: the lower self is that unaugmented intelligence which is the result of nature, of evolution, and which is incapable of facing the tasks and problems thrown at it by our complex world, and only through augmentation will we achieve the state of a "higher self" capable of responding. It is an easy step to suggest that others be coerced in their own interests, that we know what they need better than they do themselves, and what they need is augmented intelligence. The *problem* we face is that the world is too complex for humans (in their current form) to understand; the solution is to augment humanity with tools that can understand it—and to do it before we destroy ourselves.¹⁰

Engelbart does not make this argument explicitly. Nor does anyone necessarily read him this way. But asking about the concept of positive and negative liberty allows us to make sense of what Engelbart proposed for the future design of computing, and explains why freedom is in an uncertain and perhaps difficult tension with that design.

Augmenting Human Intellect is not the only form Engelbart's influence has taken. Engelbart is remembered much more widely for the 1968 demonstration of the oN-Line System. This demonstration of a computing system (or more accurately, a *simulation* of a proposed computer system) took place simultaneously at the Stanford Research Institute in Stanford (where Engelbart sat) and an auditorium in San Francisco (where the audience sat)

via a rudimentary, experimental network link. The demonstration included almost every now-familiar aspect of a personal computer: an early prototype of the mouse, remote network access, word processing, files, desktops, cut and paste, and a host of other techniques that would only slowly be brought into existence over the ensuing decade (most visibly by the engineers at Xerox PARC and the young founders of Apple Computer). The demonstration had a galvanizing effect on a generation of young engineers primed to see a kind of liberation in the demonstration. Whatever the computer had been up until that point, it was now poised to become something radically different—a true augmentation of human cognitive possibility. All that was needed was for it to be correctly designed and brought to the people (see figure 10.3).

Engelbart's liberation was about the freedom to think and to do more than humans could by themselves—incomplete and fragile beings that we are. Only through augmentation could our true selves emerge and come to grips with our dangerously complex world. It was of a piece with the critiques of Reich and Roszak; the constriction and psychological inauthenticity of the 1950s must be replaced by the expanded consciousness of the 1970s. It was of a piece with certain visions of the New Left as well, especially the focus on participatory democracy and the critique of the military-industrial complex (if not quite the large bureaucratic corporation itself). Computers could lead the way, if they were designed to augment rather than restrict human development.

Engelbart's vision had obvious appeal to young designers, engineers, and entrepreneurs in the late 1960s and early 1970s. Chief among them were folks like Seymour Papert, Alan Kay, and Ted Nelson. Papert, an MIT mathematician and disciple of Jean Piaget, created a tool for teaching programming to children; Kay created a prototype iPad called the Dynabook in the early 1970s. Both clearly associated personal freedom with education and childhood and a desire to bring computers to kids as early as possible—to augment thought from the get-go. Papert and Kay sought to make it possible for all humans to augment their intelligence and their freedom (and here is the objection) whether they wanted to or not. Nelson, for his part, sought to bring these innovations and augmentations to people as broadly as possible, and in the very idiom of liberation (see figure 10.2).

What Licklider and Engelbart had understood early on—that it was the design of computers that was the proper locus of intervention if one wanted to bring a different future into the present—Kay and Papert took to heart. They designed software systems and programming languages, not just individual devices, that instantiated a particular vision of positive

Freedom.

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liberty: creativity, constructive learning, expressive communication, the ability to think unconstrained, like an artist or a scientist. Kay's work at Xerox PARC led directly to the design of the Alto, and through that to the Lisa and the Apple Macintosh. Not only this, but many were also involved in the debates about the computer and human freedom conducted among scholars like Hubert and Stuart Dreyfus, Joseph Weizenbaum, Sherry Turkle, and others. Not only did a new device, a new mode of thinking enabled by machines, emerge, but so too a reconstructed concept (or concepts) of human freedom.

Conclusion

The story I have told here is just one part of a much larger story, but even here it is clear that the practice of freedom was transformed. Prior to the innovations of the personal computer, freedom was a practice confined to an autonomous human subject in dialogue with other human subjects. The theory of positive and negative liberty in Berlin explicitly privileges the human capacity to coerce or escape coercion, and worries over the idea of a "man divided against himself." Large-scale bureaucratically controlled, batch-processing mainframes are not just emblems of this view of freedom; they literally encode it in their structure and use. It is the reaction against this design—and toward the individualized, interactive devices that lead to the personal computer—from which a new practice of freedom takes shape, an "augmented thought" perceived as something that will enable humans to think in ways not presently possible, and perhaps enable them to protect themselves. The justification for these innovations, however, makes more sense as a kind of positive liberty: these innovations will liberate us, by their designs, from our incapacity or failure as thinking beings, whether we want to be freed or not. Innovation in the name of freedom leads to a form of coercion—and it will only be with more innovation, also in the name of freedom, that we will be freed from that coercion.

One critique would be simply to point out that our capacity for freedom is not contained in our tools and technologies, but is rather expanded by them. Arguably what Licklider or Engelbart wanted (and what Apple

Figure 10.3

A 1991 advertisement for the Apple PowerBook 100/140/170. Part of a four-part advertisement about the "modest requests" consumers expressed for the next generation of computers. The other images in the series are boldly titled *Power*; *Simplicity*; and *Humanity*.

among others delivered) was not a particular substantive definition of freedom built into our technologies, but a new capacity for *any kind* of freedom. This may be so, but even if it is, it requires a reconstruction of the idea of freedom. Whatever freedom *used to be*, we didn't have it until we had smartphones (note the focus on augmented intelligence in the very name) and iPads and Facebook accounts—and what's more, we (or at least Isaiah Berlin) did not know we needed these things in order to achieve freedom. The essential tension between the historical design of computer technologies and the freedom we possess is not resolved by insisting on a static distinction between positive and negative liberty, a distinction that maintains a stable concept progressively enlarged by the technological innovations of human beings. Instead we now occupy a world in which our very ability to become free depends on our ability to design it into our technologies—and yet we don't have a theory, positive or normative, that would guide us in this endeavor.

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Notes

1. The *Freedom to Tinker* blog run by Edward Felten is at <https://freedom-to-tinker.com/>, accessed April 1, 2013. The Association for Computing Machinery and the Computer Professionals for Social Responsibility run the conference each year; see <http://www.cfp.org/>, accessed April 1, 2013. Net neutrality is primarily associated with issues of *equality*, and in particular *equality of access* (or in legal terminology, *nondiscrimination*; see Wu 2003, 2004). A neutral net is one that separates content from conduit and gives every individual or firm equal access to the network and the ability to innovate (Gillespie 2006).

The definition of Free Software is available at the Free Software Foundation website, <http://www.gnu.org/philosophy/free-sw.html>, accessed April 1, 2013. The FreedomBox was initiated by Eben Moglen's analysis of the dangers of cloud computing; see <http://freedomboxfoundation.org/>, accessed April 1, 2013. The Freedom Fone is an open-source telephony system in use in parts of Africa; see <http://www.freedomfone.org/>, accessed April 1, 2013. Other examples include Diaspora, a free software-inspired replacement for Facebook and other social media (see <http://diasporaproject.org/>, accessed April 1, 2013) and Tor, or "The Onion Router," a long-standing privacy protection system (see <https://www.torproject.org/>, accessed April 1, 2013). Among the many different distributions of Linux, Liberté Linux is perhaps the most appropriate example; see <http://dee.su/liberte>, accessed April 1, 2013.

2. In a recent review of "The consequences of the Internet for politics," Farrell (2012) makes this explicit, arguing that once political scientists can disentangle the relevant causal factors at play, it will no longer be necessary to study the Internet as such. The Internet will either be assimilated into political theory without harm, or retreat into the background of everyday life along with other irrelevant invisible material infrastructures.

3. I use the terms "liberty" and "freedom" more or less interchangeably. There are some arguments against this indifference, such as Pitkin (1988) makes, but I am in reasonably respectable company in asserting that there is little distinction.

4. Berlin's work is not the origin of the distinction, but it is the first to label it as such. The distinction is clearly laid out in the work of Hobbes, Rousseau, Mill, and many others.

5. See <http://www.seasteading.org/about/>, accessed April 1, 2013.

6. The six-hour-long 2010 Adam Curtis documentary called *All Watched over by Machines of Loving Grace*, for instance, not only associates Ayn Rand with Silicon Valley, but in the process implicates 1960s systems theory in ecology, Richard Dawkins's theory of the selfish gene, civil war in the Democratic Republic of the Congo, the Rwandan genocide, and the Chinese Politburo, all as causes of the 2007–2008 financial crisis. A clever send-up of Curtis provides a nice critique in a succinct three-minute film called *A Loving Trap*, <http://www.youtube.com/watch?v=x1bX3F7uTrg>, accessed April 1, 2013.

7. An oblique but effective critique of this notion comes from the field of disability studies; see, e.g., Richard Hull (2009).

8. "The Object of this essay is to assert one very simple principle . . . that the sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection" (Mill 1989, 13).

9. Engelbart's work at the Stanford Research Institute was funded in small part by Licklider's program at ARPA (though at the time of that funding in 1967, ARPA was under the direction of Robert Taylor).

10. As an aside, it should also be possible to see clearly in this approach the origins of "transhumanism" or "singultarian" arguments about the fate of humanity that have become similarly strongly associated with Silicon Valley, especially in the last decade.

References

- Barbrook, Richard, and Andy Cameron. 1996. The Californian ideology. *Science as Culture* 6 (1):44–72.
- Bardini, Thierry. 2000. *Bootstrapping: Douglas Engelbart, Coevolution, and the Origins of Personal Computing*. Stanford, CA: Stanford University Press.
- Barry, Andrew. 2001. *Political Machines: Governing a Technological Society*. New York: Athlone Press.
- Bennett, Jane. 2010. *Vibrant Matter: A Political Ecology of Things*. Durham, NC: Duke University Press.
- Berlin, Isaiah. 1958. *Two Concepts of Liberty: An Inaugural Lecture Delivered before the University of Oxford on 31 October, 1958*. London: Clarendon Press.
- Boczkowski, Pablo J. 2010. *News at Work: Imitation in an Age of Information Abundance*. Chicago: University of Chicago Press.
- Borsook, Paulina. 2000. *Cyberselfish: A Critical Romp through the Terribly Libertarian Culture of High Tech*. 1st ed. New York: PublicAffairs.
- Braun, Bruce, and Sarah Whatmore, eds. 2010. *Political Matter: Technoscience, Democracy, and Public Life*. Minneapolis: University of Minnesota Press.
- Campbell-Kelly, Martin. 1996. *Computer: A History of the Information Machine*. 1st ed. New York: Basic Books.
- Ceruzzi, Paul. 2003. *A History of Modern Computing*. 2nd ed. Cambridge, MA: MIT Press.
- Christman, John. 1991. Liberalism and individual positive freedom. *Ethics* 101 (2):343–359.
- Coleman, Gabriella. 2009. Code is speech: Legal tinkering, expertise, and protest among free and open source software developers. *Cultural Anthropology* 24 (3):420–454.
- De Sola Pool, Ithiel. 1983. *Technologies of Freedom*. Cambridge, MA: Belknap Press.
- Dewey, John. [1916] 2006. *Essays in Experimental Logic*. Carbondale: Southern Illinois University Press.
- Edwards, Paul N. 1996. *The Closed World: Computers and the Politics of Discourse in Cold War America*. Cambridge, MA: The MIT Press.

Egelbart, Douglas. 1962. *Augmenting Human Intellect: A Conceptual Framework*. Summary report prepared for the Director of Information Sciences, Air Force Office of Scientific Research, Washington, DC; Stanford, CA: Stanford Research Institute. <http://www.doungengelbart.org/pubs/augment-3906.html>, accessed April 1, 2013.

Epstein, Steven. 1995. The construction of lay expertise: AIDS activism and the forging of credibility in the reform of clinical trials. *Science, Technology & Human Values* 20 (4):408–437.

Farrell, Henry. 2012. The consequences of the Internet for politics. *Annual Review of Political Science* 15 (1):35–52.

Fischer, John Martin. 1999. Recent work on moral responsibility. *Ethics* 110 (1):93–139.

Gillespie, Tarleton. 2006. Engineering a principle: “End-to-end” in the design of the Internet. *Social Studies of Science* 36 (3):427–457.

Gillespie, Tarleton. 2007. *Wired Shut: Copyright and the Shape of Digital Culture*. Cambridge, MA: MIT Press.

Hull, Richard. 2009. Disability and freedom. In *Arguing about Disability: Philosophical Perspectives*, ed. Kristjana Kristiansen, 93–104. New York: Routledge.

Jasanoff, Sheila. 2003. Technologies of humility: Citizen participation in governing science. *Minerva* 41 (3):223–244.

Kelty, Christopher. 2008. *Two Bits: The Cultural Significance of Free Software*. Durham, NC: Duke University Press.

Klinenberg, Eric. 2007. *Fighting for Air: The Battle to Control America's Media*. 1st ed. New York: Metropolitan Books.

Latour, Bruno. 2010. *The Making of Law: An Ethnography of the Conseil d'Etat*. Malden, MA: Polity Press.

Latour, Bruno, and Couze Venn. 2002. Morality and technology: The end of the means. *Theory, Culture & Society* 19 (5–6):247–260.

Licklider, Joseph Carl Robnett. 1960. Man-computer symbiosis. *IRE Transactions on Human Factors in Electronics* HFE1:4–11.

Lievrouw, Leah. 2011. *Alternative and Activist New Media*. Cambridge, UK: Polity Press.

MacCallum, Gerald C., Jr. 1967. Negative and positive freedom. *Philosophical Review* 76 (3):312–334.

Markoff, John. 2005. *What the Dormouse Said: How the Sixties Counterculture Shaped the Personal Computer Industry*. New York: Viking.

- Marres, Noortje. 2009. Testing powers of engagement: Green living experiments, the ontological turn, and the undoability of involvement. *European Journal of Social Theory* 12 (1):117–133.
- Marres, Noortje, and Javier Lezaun. 2011. Materials and devices of the public: An introduction. *Economy and Society* 40 (4):489–509.
- May, Larry. 1992. *Sharing Responsibility*. Chicago: University of Chicago Press.
- May, Larry, and Stacey Hoffman, eds. 1991. *Collective Responsibility: Five Decades of Debate in Theoretical and Applied Ethics*. Savage, MD: Rowman and Littlefield.
- McChesney, Robert. 1999. *Rich Media, Poor Democracy: Communication Politics in Dubious Times*. Urbana: University of Illinois Press.
- McKeon, Richard. 1957. The development and significance of the concept of responsibility. *Revue Internationale de Philosophie* 39 (1):3–32.
- Mill, John Stuart. 1989. *On liberty and other writings*, ed. Stefan Collini. Cambridge, UK: Cambridge University Press.
- Miller, David. 1983. Constraints on freedom. *Ethics* 94 (1):66–86.
- Nelson, Eric. 2005. Liberty: One or two concepts / Liberty: One concept too many? *Political Theory* 33 (1):58–78.
- Nowotny, Helga, Peter Scott, and Michael Gibbons. 2001. *Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty*. London: Polity.
- Pettit, Philip. 1997. *Republicanism: A Theory of Freedom and Government*. Oxford: Oxford University Press.
- Pettit, Philip. 2001. *A Theory of Freedom*. Cambridge, UK: Polity Press.
- Pitkin, Hanna Fenichel. 1988. Are freedom and liberty twins? *Political Theory* 16 (4):523–552.
- Rawls, John. 1971. *A Theory of Justice*. Cambridge, MA: Harvard University Press.
- Reich, Charles. 1970. *The Greening of America: How the Youth Revolution Is Trying to Make America Livable*. 1st ed. New York: Random House.
- Rose, Nikolas. 1999. *Powers of Freedom: Reframing Political Thought*. Cambridge: University of Cambridge Press.
- Roszak, Theodore. 1969. *The Making of a Counter Culture: Reflections on the Technocratic Society and its Youthful Opposition*. Garden City, NY: Doubleday.
- Schudson, Michael. 1978. *Discovering the News: A Social History of American Newspapers*. New York: Basic Books.
- Schudson, Michael. 1998. *The Good Citizen: A History of American Civic Life*. New York: Martin Kessler Books.

- Shapin, Steven, and Simon Schaffer. 1985. *Leviathan and the Air-Pump: Hobbes, Boyle and the Experimental Life*. Princeton, NJ: Princeton University Press.
- Skinner, Quentin. 1998. *Liberty before Liberalism*. Cambridge, UK: Cambridge University Press.
- Skinner, Quentin. 2002. A third concept of liberty. *Proceedings of the British Academy* 117:237–268.
- Starr, Paul. 2004. *The Creation of the Media: Political Origins of Modern Communications*. New York: Basic Books.
- Steiner, Hillel. 1994. *An Essay on Rights*. Oxford: Blackwell.
- Streeter, Thomas. 2011. *The Net Effect: Romanticism, Capitalism, and the Internet*. New York: New York University Press.
- Taylor, Charles. 1979. What's wrong with negative liberty. In *The Idea of Freedom: Essays in Honor of Isaiah Berlin*, ed. Alan Ryan, 175–193. Oxford: Oxford University Press.
- Turner, Fred. 2006. *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*. Chicago: University Of Chicago Press.
- Von Hayek, Friedrich. A. 1960. *The Constitution of Liberty*. London: Routledge and Kegan Paul.
- Waldrop, M. Mitchell. 2001. *The Dream Machine: J. C. R. Licklider and the Revolution That Made Computing Personal*. New York: Viking.
- Warner, Michael. 2002. Publics and counterpublics. *Public Culture* 14 (1):49–90.
- Warner, William. 2005. Communicating liberty: The newspapers of the British Empire as a matrix for the American Revolution. [English Literary History] *ELH* 72 (2):339–361.
- Wexelblat, Richard. 1981. *History of Programming Languages*. New York: Academic Press.
- Winner, Langdon. 1980. Do artifacts have politics? *Daedalus* 109 (1):121–136.
- Wu, Tim. 2003. Network neutrality, broadband discrimination. *Journal on Telecommunications & High Technology Law* 2:141–176.
- Wu, Tim. 2004. The broadband debate: A user's guide. *Journal on Telecommunications & High Technology Law* 3:69–96.