Introduction

"Communication" is a registry of modern longings.

— John Durham Peters[1]

IT IS STILL common in some circles to assume that rationality, technology, and the modern are somehow opposed to or fundamentally different from culture, the imagination, nature, and expression. This book starts from the premise that this is not so and that the internet is prima facie evidence of that. The internet has been tangled up with all manner of human longings, in both obvious ways—for example, the internet stock bubble—and more subtle ways, such as certain aspects of its technical design and trends in its regulation. In hopes of better understanding both technology and longings, this book gives that entanglement a close look.

Part of what emerges in looking at the internet this way is our networked desktop computers are not so much direct descendants of the giant computers of the 1960s as they are reactions against those computers and what they represented, a reaction that was to some degree cultural. Beginning in the 1960s, engineers who had different impulses for how to build and use computers began to draw on what is properly called romanticism to construct justifications for their alternative designs. By the 1970s and 1980s, skilled popular writers like Stewart Brand, Ted Nelson, and Steven Levy joined them to elaborate these gestures into a more fully articulate vision.

The original giant computers were often associated with misguided efforts to somehow calculate our way out of human dilemmas: to control the horror of nuclear warfare, for example, or to win the Vietnam war, or to industrialize secretarial work, or to turn school children into studious and obedient users of electronic encyclopedias. Sensing the folly of these plans to use computers to control human complexity and to frame it in a predictable grid, increasing numbers of individuals began to reinterpret the act of computing as a form of expression, exploration, or art, to see themselves as artist, rebel, or both, and to find communities with similar experiences that would reinforce that interpretation. People need to express themselves, it was said, people want and need spontaneity, creativity, or dragon-slaying heroism, and direct, unplanned interaction with computers offered a kind of enticing, safely limited unpredictability that would fulfill

those goals. That is why we need small computers instead of mainframes, the argument went, why we need personal computers instead of dedicated word processors, why we need the open, end-to-end distributed networking of the internet instead of proprietary corporate systems, why we should invest in 1990s dotcoms, why we need open source software. These discursive habits, I have found, had consequences. For example, neoliberalism's quarter century reign as a hegemonic political economic ideology owes much to the linkage of romantic tropes to networked computing. At the same time, the internet has become an important collective thought object for considering new ways of thinking about democracy.

None of this is caused by romanticism alone. Causes are complicated, and in any case romanticism, as I understand it, is always a reaction *to* something; it is in the specific dynamics of its interaction with other trends, we will see, that romanticism can have consequences. But what this book suggests is that the specific forms of the life-shaping digital machinery we have surrounded ourselves with are not the product of some kind of technological necessity; it is not that we once had a mistaken idea about what computers were for and now have discovered their "true" uses. Nor is this "the market" at work alone; most of what is described in this book takes place in situations where buying and selling are not the operative forces. The point is that, while economic and technological forces of course have played a role, the internet's construction is peppered with profoundly cultural forces: the deep weight of the remembered past and the related, collectively organized pressures of human passions made articulate.

This is a book, then, about America's romance with computer communication, a history of the dense interaction of the American social and political imagination with the development of internet technology. It is a look at how culture has influenced the construction of the internet and how the structure of the internet has played a role in cultures of social and political thought. In that sense, it is a case study in "how institutions think."[2] *The Net Effect* explores various ways computer communication has been conceived over the years of its development, with a focus on conceptions that have influenced policy. Beginning with the 1950s, when computers were primarily imagined as machines for rapidly solving complex mathematical problems, the book traces the appearance and character of other notions of what connected computers might be for: as means for fighting nuclear wars in the 1950s, for example, as systems for bringing mathematical certainty to the messy complexity of social life in the early 1960s, as automated writing and reading machines for enlightening individuals in the late 1960s, as countercultural playgrounds in the 1970s, as an icon for what's good about free markets in the 1980s, as a new frontier to be conquered in the early 1990s, and, by the late 1990s, as the transcendence of markets in an anarchist open source utopia. The book is not just about the truthfulness of these various conceptions—inaccuracies are

often revealing—but about their *effects* accurate or not, their impact both on the construction of the internet and on its reception in other parts of life.

Approach: How the Feel of Modern Life Shapes Modern Living

Instead of looking at the internet as a harbinger of the future, *The Net Effect* looks at it more as an expression of the times. This is not a book about the road ahead, inventing the future, the next big thing, or the future of ideas, creativity, or the economy. Nor is it a warning about what might happen or what might be lost if we do not act. Sometimes exploring the complexity of what has actually happened offers more useful insight than the urgent gropings of prognostication. So, rather like Walter Benjamin's angel of history, *The Net Effect* looks backwards more than forwards.[3] It focuses as much on ways that social and cultural trends have shaped the internet as on how the internet has shaped trends, and it finds the imprint of themes from the preinternet past in places where others have seen sharp historical breaks. It does all this by mixing historical storytelling with discussions of philosophical and theoretical issues.[4] And it is written with a sense of inquiry, with more of an eye towards answering questions than winning arguments.

This book began, then, with several sets of questions. One set came out of my earlier work. In *Selling the Air* I found that the development of broadcast technology—easily as mind-blowing in 1920 as the internet was in 1994—can be seen as a kind of social philosophy in practice, as something that was as much a product of social visions as of technical or economic necessities. Over the long term, I found that broadcast policy was neither a blueprint for reality nor just an ideology that legitimates or enables decisions made elsewhere. Rather, policy's contradictions and misrecognitions were themselves a key part of the social construction of the institutions and technologies of broadcasting; the focus was on the productivity of policy discourses, even when they were contradictory.[5] As the internet grew in shape and force in the 1990s, I was struck by the parallels between the 1920s and the 1990s and wondered how the visions associated with the internet might similarly be shaping policymaking.

As I watched developments with these parallels in mind, however, I was struck by two more things: first, the remarkable revival of the market-enamored political economic practices of neoliberalism in the mid-1990s and, second, the often noted but not fully explained extent to which something as dry and seemingly technocratic as computer network policymaking was riddled with odd moments of passion, often in ways that seemed to confound the received ideas about the nature of corporate capitalism. Beginning with an essay first published in 1999,[6] I

sought to develop an explanation of how rebellion, self-expression, and technology and market policies seemed to be harnessed together in a historically unique way, including in places where one would least expect it, such as computing systems funded by the military.

And, the more I thought about all of these concerns, the more they seemed intertwined. Understanding one of them depended on understanding the others. So, finally, the book expanded into an exploration of how the feel of modern life shapes modern living, an inquiry into the interactions of subjectivities or personal experiences with technological, political, and economic relations. My initial observations about the internet became the basis for a case study that helped understand larger questions about culture, society, and modern life.[7]

How do broadly shared habits of thought change over time? Some writers work through the history of ideas, as read through the lives and writings of famous authors. We inherit our ideas about rights, liberty, and markets from John Locke and Adam Smith, it is said, or the role of the 'sixties counterculture in computing in the nineties can be understood by a close look at the life and work of Stewart Brand, whose influential career spanned both periods. Others look more to culture and find zeitgeists or worldviews in cultural forms. Jacob Burckhardt saw a Renaissance spirit in the art and architecture of sixteenth-century Italy, for example, and more recently scholars have seen postmodern celebrations of the malleable self in the cyberpunk-influenced advertisements, novels, and films of the 1980s.[8] While I have borrowed from work in both these traditions, my own approach tackles issues on a more sociological level.

Traditional intellectual history tends to carefully trace ideas over time through the biographies of individuals who take up those ideas and assumes that the ideas have meaning and coherence through those biographies. This has the advantage of linking the development of ideas to real individuals and their direct contacts with others; it is an approach that eschews overgeneralization or a hand-waving approach to ideologies. Yet locating the coherence of a system of thought in the biographies of individuals also risks a false clarity. John Locke articulated an individualist theory of property rights, but the analogies between what he wrote and the intellectual habits of "possessive individualism" central to Western capitalism do not explain the popularity of the idea or why his theories of rights and property are referenced but his views of religion are as often as not ignored.[9] Stewart Brand's ideas from the 1960s were indeed carried into the cyberculture in the 1980s and 1990s, but that does not explain why that importation was successful or why some aspects of his work got attention in the 1960s (for example, environmentalism, a distaste for the singular pursuit of wealth) and others in the 1990s (for example, computer technologies and a libertarian inclination towards markets). There are cases where famous authors in the field of computing some-

times changed their minds or said things that in retrospect seem incoherent or irrelevant. Similarly, drawing broad conclusions about society at large from films, novels, and advertisements risks assuming too much. Does Apple's *1984* TV ad for the Macintosh computer, broadcast nationally only once, tell us about the culture at large in the 1980s, or just about a small subset of that culture?

A century's worth of scholarship in the sociology of knowledge suggests a few principles for understanding the place of ideas in social life. First, ideas do not exist as isolated bits that can be picked up and discarded separately. Rather, they live and die insofar as they are sustained by their place in broad patterns of thought, in paradigms, in systems of value and belief that provide general visions of the world. (The main limitation of Richard Dawkin's popular notion of "memes" is precisely that it treats ideas as singular bits, as if they existed autonomously from larger systems of thought.)[10] When digital pioneer Douglas Engelbart first proposed in the 1960s that computers might be controlled interactively by a keyboard and a mouse through a windowing interface, this was not just the invention of a few devices. Engelbart was a key figure in a movement that was considering a completely different picture of what computers were about. It was a vision of how computers could be distributed communication tools—that is, something much like we understand them today—instead of the 1960s notion of computers as centralized and centralizing calculation and management devices. Engelbart presented an alternative worldview of computing, a different system of thought, of which the mouse and overlapping windows were simply expressions. If you only look at the mouse or the interface in isolation, you miss the underlying vision that made them possible.

Second, ideas emerge within communities. There are unique individuals who make important contributions, but those contributions generally grow out of, and are nurtured within, communities that share a system of thought or inquiry. Isaac Newton discovered calculus, but it is hardly a coincidence that Leibniz came up with the same ideas at roughly the same time.[11] Engelbart's ideas would have gone nowhere without a community of the like-minded, or at least the receptive, around him. Hence, the first thing to look for is shifts in the shared broad patterns, in what is in the air at a given time. And the principal objects of analysis are communities who share ideas, knowledge, methods, and habits of thought and talk. Individuals' actions are most important when they express the character of and changes within broader systems of thought.

Third, ideas inevitably exist in relations to social structures—complex relations, to be sure, but never completely autonomously. Ideas need living sustenance, that is, communities of people with resources and institutional relations that enable them to actively propagate and maintain themselves. A theology needs a church and a community of believers; a new approach to computer

use requires a source of funding and an institutional home. But these connections are rarely formulaic. In the history of the internet, for every visionary like Engelbart there are other important figures with no explicit grand vision, political or otherwise. Andries Van Dam, for example, sometimes credited as one of the three pioneers of hypertext, is a modest college professor and researcher who approached computer programming with a spirit of cheerful professional craftsmanship rather than visionary ardor. While others prognosticated, he built working programs and, most importantly, taught generations of students about new possibilities for using computers, many of whom went on to key places in the industry. Beyond an enthusiasm for promoting computers as communication devices, his efforts show few overt signs of influence from cultural trends or from politics.

So the fact that some computer scientists sported long hair or wore antiwar pins as they built the internet does not make it inherently countercultural, just as the fact that their funding was largely from the military does not by itself make it a war machine. It is rare that systems of thought can be simply linked to broad social structures in mechanical, one-to-one fashion.[12] What priests tell their parishioners about birth control or divorce may be one thing, but what the community actually does may be another. The same may be said about an engineer's grant proposal that talks about using computers for military research, while his graduate students write protocols for email distribution lists that get used to discuss politics and science fiction novels. To say that institutions support ideas, therefore, is not to assume the existence of a clean, unbreakable link between official beliefs and the political valence of the machines that get built.

This messy area of connections between systems of thought and institutions remains a challenge. As we will see, new ideas often gain traction, not just because of an encounter with a big theory, but with small, everyday experiences: the compulsive draw that often comes with computer use, for example, or the repeated wonder of plugging in a new gizmo that a short time ago would have been impossibly expensive or just impossible, or the cubicle dweller's secret pleasure of discovering, on a slow day at work, something striking on computer networks that is unknown to the powers that be. Systems of thought often work at the level of tacit habits of talk and action rather than explicit belief systems and become visible through the accumulation of decisions over time. Outside the graduate seminar or the hard sciences, at least, changes in systems of thought seem to be as much about habits of the heart as habits of the mind. (The notion of "memes" may remain compelling in popular usage because, with its emphasis on things like buzzwords and slogans, it loosely captures the informal dynamic by which new ideas catch on: by slogans, passions, and implicit, culturally specific forms of "common sense," as much as by rational axioms, evidence, principles, and doc-

trines.) Sometimes it is more important that an idea be thrilling than it be logically compelling.

To the extent that this book offers a generalizable method, it is to tackle this microstructural problem of the interplay of ideas and institutions by looking at connections among three levels: (1) shared felt experiences associated with technologies; (2) cultural traditions that people draw on to make sense of those experiences; and (3) articulations between those linked traditions and experiences with political ideas, particularly political ideas that shape policymaking around internet structure.

People think with texts and theories, but in working on this book I found that they also think with objects and institutions. Whether or not computers themselves think, they are things that people think with, things that inspire us to think about our selves and our relations to others. Big ideas, like a revived belief in the justice of markets or an enthusiasm for digital democracy, are sometimes brought in to help individuals account for and connect their everyday experiences with machines to life as a whole rather than the other way around. Intellectual trends thus can gain traction starting at the level of everyday experience and only then drawing from more formally structured statements of principle. This book looks for the philosophy, then, not just in fully articulated theories, but at how ideas and everyday experiences of life in general and computers interact. Keeping an eye on how things might have felt from the bottom up, I found, sometimes better explained the success of writers' ideas than did the lives or works of the writers themselves.

Effects: The Net Effect Is in the Making of It

But how, when working from the bottom up, can one sort out the significant from the trivial? Is there any connection at all, for example, between the internet and the cold war military visions that underwrote the internet's early development and the technology? Or between the internet and the utopian democratic claims made by many internet pioneers?

Instead of working from texts to zeitgeists, I looked for occasions where cultural trends made a material difference. The book looks at instances where people draw on various cultural systems to make sense of common feelings associated with computers and then how those acts of making sense play roles in formal and informal policy making. I looked for cases, in other words, where the intersections of intellectual frameworks and feelings can be seen to actually shape policy decisions influencing the construction of the internet and its social instantiation, cases where changes in policymaking occurred that cannot be otherwise entirely accounted for.[13]

As I worked on this book, people would often assume a book called *The Net Effect* was studying the effect of the internet on people—on children, perhaps, or education, families, or nations. That is not exactly the question here. On the one hand, it is simply too soon to tell what the internet's effects are. True social change is long and deep, taking place over decades or centuries. Scholars are still debating, quite thoughtfully, the effect of the printed book on human civilization several centuries after its widespread adoption. The full effect of the century-old telephone remains something of a sociological mystery. Gauging the social effects of a brand new technology like the internet—as of this writing, barely more than a decade old as a consumer item, still changing almost monthly in its character and reach—is bound to be largely an exercise in guesswork and sloganeering.

On the other hand, there's a question of what one means by effects. Sociologists and historians of technology are quick to tell us to be wary of overly simple forms of technological determinism, in which a technology like television or the internet is imagined as if it were exterior to society, as if it dropped from the sky fully formed and then exerted effects on that society from the outside. Technologies, it is said, are socially constructed.[14] They are deeply embedded in and shaped by social processes and choices and so should not be thought of as something outside of or autonomous from society. This is particularly true of the internet. The choices that go into computer design are not purely technological; the same microprocessor, for example, can guide a missile, run a word processor, or power a home game console, and which of these gets implemented is at least to a large degree a social choice.[15] (And even if computers sometimes have unintended consequences, even if they surprise us, that surprise may be more about us than it is about anything inherent to the machines; consider the unexpected popularity of email in the early days of computer networking.) Contemporary computing, therefore, is in an important way the product of a gradual accumulation of social and cultural choices, choices among competing visions of computers' purposes and social capacities. These choices, in turn, typically rest on those collections of tacit assumptions that power social relations—assumptions about social hierarchy, for example, or constructions of self. As Donna Haraway once put it, technologies are "frozen moments of the fluid social interactions constituting them."[16] To the extent that this is true, then the interesting question is not, what is the effect of the internet on society? but, how has the internet been socially constructed and what role has that process of construction played in society?[17] What did we learn from the way the internet was built, from the unique way that it appeared and came into broad public consciousness?

Social constructionism, however, is more a way of framing the problem than a solution to it. To the extent that computers are simply, as Sherry Turkle's early work suggests, a Rorschach blot onto which we project our dreams and understandings,

one can safely discount the specifics of the technology and just focus on how people imagine it.[18] The internet, certainly, has been frequently looked at through the lens of various utopias and described alternately as, say, the embodiment of the competitive free market or the embodiment of communitarian cooperation. Such claims are interesting, but in the first instance they generally tell us more about the political orientation of the claimants than they do about the internet.

But, on another level, the internet, more obviously than many other technologies, has been and continues to be a gradual, collective work in progress. The way it is built and organized is inseparable from the way its builders imagine it, even if they do imagine it partially or inaccurately. So the more important (and, analytically, more difficult) question is, how have various shared visions, even the inaccurate ones, shaped policymaking around the internet? How have they shaped its construction and, therefore, its character, its role in social life? How have culture and policy interacted to make the internet what it is?

This is the principal methodological question that drives this book. As I approached the massive, sprawling tangle of technical information, personal narratives, and political events that make up the history of the internet, I have sought out instances in which culture played a key role in broad policy and design choices. The internet has figured in many ways in culture—in movies, for example, or novels, or dating habits, even in religion—but I have pursued those instances where culture has demonstrably made a difference in the construction of the internet itself. This book's approach to the question of causality, then, is to understand the internet not as a thing that has an effect but as itself a process of social construction. The net effect is in the making of it.[19]

Culture, Selves, Power

Who are you when, on an ordinary day, you sit down to use a computer? Are you a citizen? A consumer? A manager? A technician? An artist? Are you looking for the familiar, or are you hoping to be surprised? Are you trying to reaffirm who you are, your sense of self? Or are you perhaps hoping to break out of your routine, to experience something different, a better self?

This book suggests that the different answers to these questions offered by culture, that is, shifting varieties of learned self-understanding or selfhood, have made a difference in the development of the internet and that the ways this has happened tells us something about the character of modern life. Multiple forms of self-understanding are at play at any one time; in the last half-century in the United States; for example, utilitarian and managerial constructs of the self have played a key role. But I also look at the role of the romantic self, where the self is understood as the source of a dynamic, inner experience that calls on us to live

creatively beyond the bounds of predictable rationality. We are romantics even, and perhaps especially, in the face of high technologies.

From Locke through Burckhardt to Tocqueville to postmodernism, the question of how societies imagine the self is a recurring theme. In particular, the traditional history of ideas teaches the importance and deep complexities of the historical evolution of what Ian Watt called "that vast complex of interdependent factors denoted by the term 'individualism'"[20] and what poststructuralists suggested was the study of the process of the I in history. The idea here is not that the self is an illusion, nor that "society" mechanically determines our identities, nor that the self has suddenly become, in the postmodern era, infinitely malleable. Rather, as Christina Dunbar-Hester has argued, "the benefit of using [the category of identity] is to get at parts of human experience that are moving targets, slippery, constructed, and yet 'real.'"[21]

To get at the "slippery, constructed, yet real" character of subjectivity, I find it useful to follow John Frow, who has written of "the imaginary forms of selfhood through which we experience the world and our relation to it."[22] Forms of selfhood, in this sense, are forms, not types of individuals. They are discursive patterns embedded in institutions and historical processes that become available to individuals as ways of making sense of who they are in given contexts. One never simply *is* a utilitarian or romantic or gendered self. Rather, most of us find it necessary or useful to adopt roles, to think and speak of ourselves in various established ways, at various moments in our lives. We often have to think of ourselves, for example, as alternately passionate and as administrators, one moment as caring parents or partners and the next as self-interested rational actors in a marketplace and after that as competent professionals with resumes. "Imaginary forms of selfhood," then, are neither fixed identities nor complete or determinate in some kind of mechanical way. They are plural and fluid, but not infinitely so; there are typically several forms available to any given individual in any given context, and it is possible, and probably sometimes necessary, to move among them.[23] We all regularly negotiate the tensions inherent in this situation in our own ways, of course, but the contingencies of social process and history provide us a shifting set of available strategies for accomplishing that negotiation.[24]

Are there particular forms of selfhood associated with computing? There certainly has been speculation along those lines. Software engineer and *Wired* contributor Ellen Ullman, for example, has written evocatively about what she calls "a male sort of loneliness that adheres in programming." Yet she hints at the layers of complexity in the phenomenon when she quips, "Fifteen years of programming, and I've finally learned to take my loneliness like a man."[25]

One of the problems with some of the original work on the history of individualism was a tendency to imagine a singular, European or Western self, as if

everyone in a given time and place experiences the world in the same way. Rhetoric about the spread of the internet and computing frequently echoes this conceit when it speaks in universal terms—"everyone" is on the internet, using email, using Facebook, and so on—in a way that systematically ignores cultural and economic barriers to access and differences in use.[26] For example, the percentage of women entering the fields of computer science has always been small and, according to some reports, has actually declined in the last decade. Because this has occurred at a time when women's participation in many other professions has been going up, most attribute this pattern to a mix of cultural, institutional, and economic barriers.[27]

In response to the blindness inherent in the tradition of a singular we, in the assertion of a unified and universal sense of self, there is now an established set of critiques. From W. E. B. Du Bois's *The Souls of Black Folk* through the feminist writings of the 1970s through the literatures of cultural studies today, the emphasis has been on the *different* forms of selfhood experienced by different groups, and the problems and pain caused by dominant groups' tendencies to imagine their own experiences of selfhood as the only experiences. (It is not always wrong to speak of a we in general; and when I do so, sometimes it signifies myself and the reader and sometimes it speaks of the shared future of humanity.)[28] But, in the end, there is no everyone on the internet, just as there is no single type of Western individual, and the tendency to speak as if there is, the tendency to speak of a we that encompasses everyone, is both inaccurate and potentially manipulative.

Yet the response cannot be only to say that everyone's experience is different or to assert other identities against, say, a white male identity. When Ullman describes "the male sort of loneliness that inheres in programming," she is both pointing to a generalizable pattern of experience our culture associates with a type of masculinity and allowing how, as a woman, she can share in that experience; after fifteen years of programming, she can take her loneliness like a man. The experience is associated with, but not necessarily bound to, masculinity, and the question is how that association has been historically constructed.

Cultural studies' project was never simply the liberal one of giving voice to the voiceless or of asserting one kind of experience mechanically tied to a social grouping against another; it was a rethinking of how voices are established in the first place, focused on how everyday lived experience intersects with power or social struggle. The "male sort of loneliness" associated with computing is in the end a product of history and context, not biology. Forms of selfhood bear the historical markers of their times. On the one hand, this means one needs to carefully explore the cultural patterns of meaning inherited by a given community. Most of the people who played key roles in developing the internet, for example, inherited

a tradition in which technological mastery was imagined as inherently masculine. From railroads to radio, from automobiles to VCRs, mastery of technologies has been treated as a sign of male prowess and control. This history weighs on the cultures of engineering and policymaking discussed in this book and will be discussed at relevant points.

Yet cultural studies also effectively brought to the discussions of identity and difference a concern with the *relational* as opposed to essential quality of subjectivities. E. P. Thompson argued that social class—the social identity with which cultural studies began—needs to be understood as "a relationship, not a thing,"[29] "an active process which owes as much to agency as to conditioning . . . something which in fact happens."[30] So the focus of this book is less with what category people belong to in the fixed sense, less with their socioeconomic or ethnic backgrounds, and more with the dynamics of various constructions of selfhood in specific contexts. Cyberpundit Esther Dyson is a woman, but what mattered most about her activities in the 1990s was her libertarianism; she was a key figure in promoting and making acceptable the tendency to imagine society online as made up of abstract individuals pursuing their interests in a marketplace, individuals imagined as if their ethnic, gender, or class status did not matter. That libertarian model of selfhood—its allures and its limitations—played a key role in the trajectory of the internet and its reception in the early 1990s.

Of course, the libertarian's notion of individuality is proudly abstracted from history, from social differences, and from bodies; all that is supposed not to matter. Both the utilitarian and romantic individualist forms of selfhood rely on creation-from-nowhere assumptions, from structures of understanding that are systematically blind to the collective and historical conditions underlying new ideas, new technologies, and new wealth. For historical and sociological reasons, these blinkered structures of understanding have come more easily to men than to women. And it is in varieties of this gesture, I have found, that the forms of identity promoted by the cultures of the internet have most obviously played a role in the power dynamics of U.S. society. Various experiences of computing, from surfing the web from a cubicle to investing in the wildly expanding stock market, when coupled to various political discourses, have occasioned a revivification of an enthusiasm for the idea of the abstracted individual in the culture and a concomitant insensitivity to social relations and inequalities. The fact that computing can seem thrilling, that it can feel like an escape and thus like a type of freedom happens more often to men than women in the United States. But it is in that *process* of constructing what is experienced as seperateness, in the promotion and reinforcement of, say, "a male sort of loneliness," more than the simple statistical fact of male dominance in computing, that the flux of identities associated with the internet has mattered.

Ullman's depiction of a male loneliness associated with programming counters the individualist rendition of the experience of computing, not by denunciation, but by astute observation. Her writings are full of people alone at their computers who feverishly reach out over the wires for expression, connection, affirmation while ignoring the people around them—in the next room, across the street, in their city. Ullman's work in general, fictional and non-, uses a novelist's attention to human detail to tease out the inner fabrics of the experience of computing, those patterns of grandiosity, obsession, and discovery intertwined with moments of missed human connection characteristic of the last three decades of the computing culture in the United States.[31]

That male sort of loneliness, then, is of a piece with the fact that our culture has imagined personal autonomy to various degrees in terms of the model of the historic power of men over women, in terms of the power to command, to walk out the door, to deny the work of nurturing and the material fact of interdependence. It is this habit of understanding freedom negatively, blindly, as freedom from government, freedom from dependency, freedom from others, that helps set the conditions for the popularity of the rights-based free market. But, this book suggests, the same structures of self-understanding also set the conditions for the constructed sense of a lack, a felt absence, that can turn into romantic longing for some unknown or unachievable other. In that longing may lie seeds to change.

The Chapters

Many of the collective technological decisions that have constructed the internet have been gradual and are still underway. The discussion of them, therefore, is in various ways woven throughout the book. But each chapter centers on a particular set of choices and associated visions. Shared visions tend to evolve gradually between communities, without sharp boundaries in either time or space, so while the chapters are organized roughly chronologically, there is some overlap, and some simultaneous events appear in different chapters.

Chapter 1 sets the stage for the rest of the book by introducing several key concepts while exploring the early cultural and institutional contexts that set in motion the research and institutional support leading to the creation of the internet. Starting around 1960, it looks at the beginnings of the shift from the original vision of computers as calculating machines, in a category with slide rules, towards the idea that they might be communication devices, in a category with books, writing, and the telegraph. This conceptual change was crucial to the shift from centralized, batch-processed computers to the interactive, decentralized computers of today. At stake in these differences are competing visions of the character of human reason, particularly the problem of relating means to ends.

Are computers strictly a means to an end, or can they be an end in themselves, for example, a form of play? Early computers, this chapter shows, embodied and foregrounded this question for their designers.

Chapter 2 looks at how the initial discoveries of the playful possibilities of computing were seized upon in the late 1960s and early 1970s. In the wake of the 1960s counterculture, approaches to computing that loosened the connection between means and ends—that allowed play—helped create a subculture within the community of computer engineers. This in turn helped set the conditions for the rise of the modern, internet-connected, graphically-capable computer. The chapter introduces the theme of romantic individualism, an enduring Western cultural discourse with an associated way of imagining the self that passed from milieus like the San Francisco based counterculture, particularly that surrounding Stewart Brand and the *Whole Earth Catalog*, into the computer counterculture, as exemplified in the work of Ted Nelson, the computer visionary who coined the word *hypertext*. Against a background of Vietnam War era social disaffection, key romantic tropes—the strategic use of colloquial language, a studied informality, appeals to self-transformation instead of need-satisfaction, tales of sensitive rebel heroes, and a full-throated departure from instrumental rationality—became associated with alternative uses of computing.

Chapters 3 and 4 both focus on the 1980s. Chapter 3 considers events that happened very much in the public eye: the rise of the microcomputer envisioned as an icon of neoliberal marketplace enthusiasms, which helped justify the radical market-oriented policies of the Reagan era. The microcomputer revolution for the first time brought large numbers of Americans into direct contact with interactive computers, an experience framed by the historical accident of the stand-alone technical design of the machines and the entrepreneurial character of many of the businesses involved. Networking was ignored in part because the dominant culture was seeing things through free-market lenses and thus imagined that microcomputers were about isolated individuals buying and selling objects; this obscured the broader social relations like networking that both produced microcomputers and that could be enabled by them. The experience of first-generation microcomputers as distinct commodities thus helped articulate in the popular imagination a new sense of how a market vision reminiscent of the seventeenth-century philosophies of John Locke might be relevant to a modern, high-tech world.

Chapter 4 focuses on events of the 1980s that happened almost invisibly for most Americans: the development of an unusual culture of informal, open, horizontal cooperation—that very distinct set of practices that are incompletely summarized today under phrases such as "rough consensus and running code" and "end-to-end design." This chapter looks at two historically consequential but not

often noticed instances of this set of practices. First, it looks at the development of new chip design methods in the late 1970s which led to VLSI (Very Large Scale Integration) microprocessors in the 1980s—the platform upon which the computing industry has grown ever since. The VLSI chip design process illustrates the discovery inside computer engineering of the sheer technical value of attention to social process—what engineers at the time called learning to "design the design process"—and the value of networked horizontal relations towards that end. Second, the chapter discusses the remarkable process by which ARPANET efforts were split off from the military and quietly transferred to National Science Foundation (NSF) funding. Theoretically, packet-switched global computer networking could have come to us in any variety of institutional packages, but this 1980s experience of quietly guiding the growing internet into a space between the differentially charged force fields of military, corporate, university, and NSF funding left a stamp on the institutions of the internet that would have far-reaching consequences.

Chapter 5 looks at the structure of feeling created in the early 1990s as knowledge workers began to discover the pleasures of online communication in substantial numbers, and elites groped for an organizational framework under the umbrella of the "information superhighway." Web browsing articulated itself with a structure of desire centered around an endless "what's next?" and spread in a context in which middle ranks knew things that their superiors did not, adding to that articulation a romantic sense of rebellion; one could in theory rebel, express oneself, and get rich all at once. Taken together, this fusion of romantic subjectivity and market enthusiasms, exemplified and enabled in the early *Wired* magazine, created the conditions that fueled both the rapid triumph of the internet as the network of networks and the dotcom stock bubble.

Chapter 6 looks at the rise to legitimacy of open source software production in the late 1990s. The open source software movement represents a rather sudden and dramatic transformation of dominant managerial principles in the high-tech industries. By 1998, Apple, IBM, Netscape, and others were investing heavily in open source software projects, actions that only a year or two earlier would have been considered laughably irrational. While there were economic conditions behind this, principally the Microsoft monopoly, those conditions also existed in 1996; economic forces alone cannot explain why the shift happened when it did. This chapter shows how the shift was enabled by a rearticulation of the romantic construction of computing through a retelling of the story of computer-programming-as-art that situated the narrative against, rather than for, the commodification of code. The effect of Eric Raymond's "Cathedral and Bazaar" essay and the spread of the rhetoric of open source associated with the Open Source Initiative were conditioned upon a widely experienced tension between the experiences of

creating software and using computers and the structures of reward and industrial organization that emerged from commodified software; the same romanticism that had fueled free market visions earlier in the decade was now marshaled against them.

The conclusion summarizes the larger point to be learned from the previous chapters: our embrace, use, and continued development of the internet has been shaped by our experience of how it emerged. The openness of the internet is a product of the peculiar way in which it developed, not something inherent in the technology; the internet's history, as a result, is inscribed in its practical character and use. The internet has served as a socially evocative object for millions and created a context in which an ongoing exploration of the meaning of core principles like rights, property, freedom, capitalism, and the social have been made vivid and debated in ways that go well beyond the usual elite modes of discussion. It has played a key role in casting into doubt the certainties of both market policies and corporate liberal ones and widened the range of possibility for democratic debate and action, bringing to the surface political issues that have been dormant since the Progressive Era in the United States. But this efflorescence of openness is not the result of underlying truths about technology (or about progress or humanity) breaking through the crusts of tradition and inequality. It is the result of peculiarities of history and culture. The role of romanticism in particular reveals, not a universal truth, but the historical contingencies at work in the creation of both technology and democracy. As a practical matter, a new politics of internet policy making in the United States would be wise to take that history into account and start from the widely felt tensions between romantic and utilitarian individualism and move towards a richer, more mature approach towards democratic decision making.