Journal of Communication Inquiry

http://jci.sagepub.com

Incomplete Determinism: A Discourse Analysis of Cybernetic Futurology in Early Cyberculture

Sheryl N. Hamilton

Journal of Communication Inquiry 1998; 22; 177

DOI: 10.1177/019685998022002005

Sheryl N. Hamilton

Incomplete Determinism: A Discourse Analysis of Cybernetic Futurology in Early Cyberculture

For worse or for better, we are today virtually all struggling to survive and communicate—if differently and in different modes—within the hegemonic exigencies of cybernetic culture.

—Pfohl (1997)[1]

I take the word cybernetic to embrace not only the information sciences but a metaphor so deeply engrained in our culture, so silently driven down to the roots of our imaginations, that it achieves the status of an element in a new mythology.

—Porush (1985, 2)

While not invested in a language of hegemony as is Pfohl (1997), nor limited to analyzing fiction, as is Porush (1985), I share the problems identified by these authors—the production, circulation, and operation of cybernetic culture or *cyberculture*. Cyberculture is emerging as a field of analysis within communications studies, cultural studies, cultural anthropology, and science studies (for example, Dery 1993; Escobar 1994; Sardar and Ravetz 1996; Featherstone and Burrows 1995; Gray, Figueroa-Sarriera, and Mentor 1995; Pfohl 1997; Nichols 1988).[2]

Since the late 1980s, many social analysts have asserted that Western societies are in various stages of becoming cyber. Stephen Pfohl (1997) reflects the feeling of many social critics, analysts, and indeed citizens:

> All around me, inside me, flowing through me, between me and others, it is easy to discern signs of the flexible, mass marketing of cybernetic delirium. This is a delirium associated with both cyber-products and cyber-experience. "Cyber-

Author's Note: An earlier version of this article was presented at the International Communication Association Conference in Montreal, May 1997.

Journal of Communication Inquiry 22:2 (April 1997): 177-204

> this" and "cyber-that." Its [sic] hard to do the ritual of the check-out line these days, without some magnetic cyber-commodity-connectors wrapping their seductive sensors, cheek to cheek, in feedback loops with yours. Commanding attention. Inviting a try. Not that the effects are homogenous. Nor the possibilities. From cyber-sex-shopping-surveillance, to cyber-philosophy, and even utopian dreams of cyborg revolts—whether for fun, or out of desperation, flaming desire, or for want of more passionate and politically effective connections—the world around and within me appears increasingly mediated by a kind of delirious cyber-hyphenation of reality itself.

I, too, have noticed this cyber hyphenation. It seems, however, to be more than semiotic sexiness, more than a marketing strategy to catch Generation X-Files—cyber is a concept with cultural implications. There are power/knowledge effects produced in our practices of express, and implicit, cyber hyphenation or nonhyphenation. I prefer the hybrid term cyberculture because it functions like other hybrids, "chimerical, condensed word forms that are cobbled together without-benefit-of-hyphen in the hyperspace of the New World Order, Inc. . . . communicat[ing] the promiscuously fused and transgenic quality of its domains by a kind of visual onomatopoeia" (Haraway 1997, 3). The larger project of which this article is a part problematizes, interrogates, and generates critical insights into cyberculture. Unlike many other authors, however, I do so through mapping, not how our culture *is* cyber but rather how cyber *works* in our culture.

To examine the work of cyber in culture, I employ notions of social discourse influenced by the work of Michel Foucault. I analyze cyber as a discursive formation to diagnose—to render visible—some of the power effects that are reproduced in how we talk and think about ourselves and our technologies. Foucault's understanding of discourse is useful for a number of reasons. First, it rejects a notion of ideology (in all its multiplicitous incarnations) as, among other things, reproductive of a true-false knowledge binary; second, it seeks patterns (of appearance and absence) across a diversity of texts from various institutional sites. Third, it acknowledges the relevance of the discursive and the nondiscursive, without placing these in determining relations. Fourth, Foucault uses discourse, not to determine the meaning of an individual text but rather to identify the effects of texts, their how, the impact of their being said, at that particular place, at that particular time. It is in these effects of discourse that power is produced (Foucault 1980, 1981).

Foucault (1994a) understands discourse as an event:

> not codes, but events: the conditions of existence of statements, that which renders them possible—them and not others in their place; the conditions of their singular occurrence; their correlation with other previous or simultaneous events, discursive or not. (author's translation, P. 681)

This is always taking place within, is always productive of shifting matrices of power.

> The type of analysis which I practice does not address the problem of the speaking subject, but rather examines the different ways in which discourse plays a role within a strategic system in which power is implicated, and for which power operates. Power is not therefore, exterior to, nor outside of, discourse. Power is neither the source, nor the origin of discourse. Power is something which operates through discourse, since discourse is, itself, an element in the strategic dispositif of power relations. (author's translation, Foucault 1994b, 465)

Foucault specifically argues that the power of discourse is not its meaning; discourse is always already within power relations.[3]

Therefore, I do not seek to fix the *meaning* of cyber nor the *real* power relations that it masks but rather to diagnose its power/knowledge implications: how cyber functions at the level of social discourse to produce particular kinds of knowledge—knowledge about social temporality—that have power effects that ripple through culture. Foucault (1994c) insists that any analysis of discourse take place within its historical specificity of occurrence. Within a moment of historical specificity, discursive formations—or regularities in the production and circulation of discourse—emerge.[4]

> Whenever one can describe, between a number of statements, such a system of dispersion, whenever, between objects, types of statement, concepts, or thematic choices, one can define a regularity (an order, correlations, positions and functionings, transformations), we will say, for the sake of convenience, that we are dealing with a *discursive formation*. (P. 38)

Cyber can be used to name an emergent discursive formation, a discursive formation that implicates computers, cybernetics, and culture; that has a longer history than is typically acknowledged; and that has power/knowledge effects that continue to shape how we represent, frame, and pose questions about ourselves, our technologies, and our future. Specifically, for the purposes of this article, it is my contention that cyber is always already temporal; within the series of regularities that constitute cyber, knowledge is produced and truth claims made with respect to social temporality, concepts of time, and the relationship between the present and the future. What results are cyber futurologies: cyber stories about our future/stories about our cyber future. Nowhere is this more clearly illustrated than in the first special issue of the bible of the cyberculture set, *Wired* magazine.[5]

This cybercultural product serves as an exemplar of the discourses of temporality manifest in the discursive formation of cyber. After highlighting some of the central regularities that emerge, I explore how these regularities have historical antecedents that become visible if one explores *Wired* and its vision of the future as part of a larger discursive formation. In particular, I center on a shift in discourses of social temporality toward a vision of futures shaping, producing, and manifesting cybernetic social thought—a shift toward cybernetic futurologies. By exploring the circulation of cybernetics and the computer (key constituents of cyberculture) as social knowledge in popular and public sites in the period of their mutual emergence, I draw out five regularities that shape the power/knowledge effects of social temporality within cyber. These effects had, and have, implications for the kinds of narratives of the future, the kinds of futurologies, we tell today.

The Future of the Future

This exhortation to discount the present for the future has . . . been a particular, though not peculiar, aspect of American popular culture

—Carey and Quirk 1989, 177.

While much current cyberculture writing is characterized by a silent writing of the future in writing expressly about the present, one recent collection foregrounds "the future" as its specific object. The first special issue of *Wired* magazine—released in fall 1995 and titled "Scenarios: The Future of the Future"—exemplifies a number of the regularities that emerge from current cybercultural constructions of temporality.[6] The special issue is a series of commissioned scenarios of the future, from sex toys to global political disorder to travel in the twenty-first century, distilling many of the discursive regularities of cyber futurology.

As I leaf through the issue, a number of questions arise: Why the future of the future and not just the future? Why *Wired* magazine? What gives it the authority to map the future or the future of the future? What does this future look like? Who is asked to posit their future of the future? Whose future is it? Who, if anyone, is written out of this future? What role do information and communication technologies play in these futures? Perhaps most important, however, how does this attempt to write the future relate to other past attempts to do so—what does it mean to "write the future"?

For these purposes, I highlight three pieces that work directly to construct certain truths of social temporality.[7] The opening article, by Stewart Brand (1995), cofounder of the Well and the Global Business Network, offers a framework for understanding temporality. He suggests two ways to think about time: as wide and long. Wide time is "everything-happening-now-and-last-week-and-next-week," whereas long time is "a deep, flowing process in which centuries are minor events" (p. 38). "The wide view sees events as most influenced by what is happening at the moment. The long view perceives events as most influenced by history" (p. 38). Brand argues that "wide time is on the increase these days and for good reason. Technology seems to be accelerating, and you have to keep up. Networks and markets, instead of staid old hierarchies, rule, and you have to keep up" (p. 38). He concludes that it is impossible to think of the deep past and the deep future, and so we should not bother.

Lawrence Wilkinson (1995) offers readers advice for dealing with the specter of the future in his piece titled, "How to Build Scenarios." Drawing on the planning strategies of current business managers to offer advice on how to "manage" our futures, he argues that "a growing number of corporate executives are using scenario planning to make big, hard decisions more effectively. And it's not just for bigwigs: scenario planning can help us at a personal level as well" (p. 74). Wilkinson reminds us that scenario planning is not about predicting the future but rather about "helping make better decisions today" (p. 74). His four possible scenarios—I Will, Consumerland, Ectopia, and New Civics—"don't fall neatly into 'good' and 'bad' worlds, desirable and undesirable futures. Like the real world from which they're built, the scenarios are mixed bags, at once wonderfully dreadful and dreadfully wonderful" (p. 81). Yet, scenario planning is a useful way to understand the future.

> Ultimately, that is the power of scenario planning. It can prepare us in the same way that it prepares corporate executives. It helps us to understand the uncertainties that lie before us and what they might mean. It helps us to "rehearse" our responses to those possible futures. And it helps spot them as they begin to unfold. (Wilkinson 1995, 81)

The final example is a review of the field of futurism, in which Steve G. Steinberg (1995) rates the predictions of "other" futurists. The notables include John Naisbitt, American business consultant; Alvin and Heidi Toffler, pop social writers of the 1970s, 1980s, and 1990s; Arthur C. Clarke, scientist and science fiction author; Herman Kahn, military futurist; Charlton Heston, Hollywood star of a number of 1970s futurist films; and Faith Popcorn, marketing expert. The work of each is analyzed according to occupation, milestones in his or her career, the "big idea," methodology, "who listens," his or her impact on issues of politics and work, the role of technology, and finally, the "worst flaw" (Steinberg 1995, 116).

At first glance, it seems ironic that Steinberg (1995) argues the futility of "predicting the future"; however, that is an ongoing theme throughout the issue. Brand (1995) also notes the futility of predicting the "deep future."[8]

However, notwithstanding its continual surface eschewal of *predicting* the future, this discourse object is integrally involved in *constructing* the future. Four central temporal regularities emerge from cybercultural writing in general and this exemplar in particular. First, significant time is wide time, to borrow Brand's term. As a result, "the present is more important than the past as a tool for understanding the future" and "the future is now" become two repeated themes. Second, technology is a ubiquitous terrain, integrally connected to the construction of the movement and pace of temporality. Third, time is fast, chaotic, and characterized by continual change. We cannot control our present or future; we can only live for the now. Fourth, because time is fast and perpetually changing, the project of predicting the future is futile, doomed to be instantly dated and likely incorrect; rather, the risks of the present must be managed effectively to impose order on the chaos. This particular portrayal of social temporality is characterized in its discursive sites as new, specific to the 1990s, unprecedented. However, neither the act of attempting to capture the future nor the particular future being posited is as new as its proponents argue; in other words, there is a past to the future.

The Past of the Future

Karl Marx saw the future. Karl Marx was probably the greatest visionary futurist of the 19th century. Karl got it all wrong

—Sterling 1995, 153-54

Visions and forecasts of the future are present from the writing of classical antiquity and early Christianity to the present.[9] However, many scholars recognize a historical break in the Enlightenment in which modernist writing about the future came to be distinguished by the significant, and often determinative, role played by scientific knowledge in the techniques of prediction.[10] As Barry Smart (1992) argues, this writing became marked by a conjuncture of discourses of the inevitability of technological progress and the centrality of scientific knowledge and technology to the emancipation of the human condition:

> The idea of an information technology revolution and much of the discussion over the possible emergence of postindustrial forms of life belong in this context, in so far as they represent contemporary manifestations of a view which constitutes one prominent element of the Enlightenment legacy, namely that the development of technical rationality promotes an increasing understanding and

> control of natural and social phenomena, and in consequence, makes possible the cultivation of improved conditions of existence. (P. 62)

This foregrounding of technology and technical rationality remains central to current writing about the future, particularly within cyberculture. Carey and Quirk (1989) recognize this, suggesting that "the modern history of the future originates with the rise of science and the onset of the age of exploration" (p. 173). Scientific futurology has generated its own industry of products, expertise, and analytic tools. In fact, as many scholars recognize, there is a dramatic shift in the nature of these futurologies as a result of the impact of cybernetic technologies such as systems analysis, computers, and probability statistics.

Andrew Ross (1991) offers an interesting account of different forms of American futurology throughout the 1960s, 1970s, and 1980s; his concern is primarily with futurology as an evolving form of knowledge embedded within certain power structures arising out of World War II. He locates the power of these discourses, however, in institutional structures, lamenting the following:

> Hitherto considered the undisputed home of the left-wing utopian or "scientific" socialist thought, corporations and the military establishment have come to devote enormous energies to the future, setting large numbers of futurologists to work in academia and in foundations, institutes, and think-tanks established to provide legitimation for the policies of the modern corporate state through the use of the new intellectual tools of systems analysis, operations research, information technology, and simulation modelling. (Pp. 172-73)

John Perry Barlow (1995), on the other hand, suggests that "blaming the suits is as ridiculous as blaming ourselves. And as irrelevant. Because any conspiracy that involves 5.5 billion people will be hard to undo" (p. 132). While my political sympathies lie with Ross, in an unanticipated way Barlow is right: Blaming the suits is ridiculous (although not necessarily for the reasons Barlow suggests). I counterbalance Barlow with Ross to illustrate that the future is always already part of our cyberculture. It is not a top-down distribution of knowledge; neither the knowledge nor the technologies by which it is produced are neutral (as is ultimately implied by the ideology model employed by Ross). We are, through our participation in social and cultural forms, the producers, legitimators, consumers of these knowledges about our future. We are active in the production of our cyber futures, and therefore, what is more relevant for my work is the activity, the how of the production of cyber futures.

I draw on Carey and Quirk (1989) who examine the notion—the concept—of the future as it is produced and circulated in culture. They suggest that "the future *as an idea* indeed has a definite history and has served as powerful political and cultural weapon" (emphasis added; p. 174). They suggest that the future has functioned in three ways: as a cause for "revitalization of optimism," as fulfillment of a particular ideology or idealism, and as a rhetoric for technologies. More particularly for my purposes, Carey and Quirk highlight the particular conjuncture of cybernetics, computers, and the idea of the future that characterizes the emergence of what I call cybernetic futurology:

> The future has acquired a new expression in the development of modern technologies of information processing and decision making by computer and cybernated devices. Here the future is a participation ritual of technological exorcism whereby the act of collecting data and allowing the public to participate in extrapolating trends and making choices is considered a method of cleansing confusion and relieving us from human fallibilities. (P. 174)[11]

The computer and its related knowledge of cybernetics emerge out of post-World War II United States as quintessential technologies of social temporality in general and futurology in particular. This particular social temporality emerges as a central discourse—a central regularity—within the discursive formation of cyberculture. To examine the implications of this, unlike many cybertheorists who begin their work on cyberculture in the 1980s,[12] I begin in the period in which the computer and cybernetics, inextricably connected, began to circulate as knowledge forms within the public sphere. It is in and through the circulation of cybernetics and the computer as *social*, and not just scientific or technical knowledge, that something that we can identify as cyberculture emerges.

I examine this specific conjunctural moment in North American history in the period immediately following World War II. It was then that the modern electronic computer was produced; cybernetics emerged as both a scientific-technical and a social knowledge; these developments were articulated and mediated through, and in, the popular press of the day with notions of "electronic brains," "thinking machines," and "cybernation"; and certain individuals and institutions emerged as key figures in the production and mediation of these knowledges and technologies, privileged to make truth claims about them. It is at this time that the discursive formation of cyber begins to take shape in the American cultural imaginary; that certain notions such as feedback, information, memory, computers, and brains begin to take on particular meanings in social discourse, meanings that become productive in the circulation and mediation of what emerges as cyberculture. Cybernetics and early computers as social knowledge function as an intellectual technology within an emergent discursive formation of cyberculture to produce a history of our cyber future.

Cybernetic Futurologies: A History of the Cyber Future

Cybernetics was defined by its "founding father", mathematician Norbert Wiener (1948), as a science of control and communication theory, resting on an assumption of "the essential unity of the set of problems centering about communication, control and statistical mechanics, whether in machine or in living tissue" (p. 19).[13] The term spread rapidly in scientific and other journals, and as early as 1959, Guilbaud (1959) notes that the popular press was not using the term to denote a science but rather a product of a science—a theory of automatic machinery, of "thinking machines" (p. 3).[14] Cybernetics involves the application of a feedback model to any open system. A system is a group of elements of any kind considered as an interconnected whole, with this interconnectedness being generated through modes of communication or exchange of information. The central mechanism for these connections, and that which allows the system to be self-correcting, is feedback. Feedback is a channel along which data on the results of control are fed back into the system. Feedback is heralded as the single-most significant contribution made by the science of cybernetics: "It is due to feedback that cybernetic systems are, in principle, capable of going beyond the limits of actions predetermined by the designer. It is this feature, above all others, which underlies the enormous potentialities of cybernetic systems" (Lerner 1972, 2).

There are a number of reasons why cybernetics did not remain merely a science of computer engineers and mathematicians. After the publication of *Cybernetics* in 1948, colleagues convinced Wiener to publish a more "readable" introduction to cybernetics, resulting in the publication two years later of *The Human Use of Human Beings: Cybernetics and Society* (1950). Two specific factors contributed to its wide circulation. First, it was published in a mass-market paperback edition. Second, *The Human Use* was considerably less mathematical; Wiener used it as a forum to offer various political and social commentaries on law, politics, ethics, religion, academia, and so on. As a result, it was reviewed in a wide array of journals and magazines, including *The Atlantic Monthly*, *Time*, *The Saturday Review of Literature*, *The Commonweal*, *Science*, *Scientific American*, *Science Monthly*, the *Journal of Philosophy*, the *Journal of Religion*, and various sociology and psychology journals.

Cybernetics was almost immediately picked up by a wide array of other sciences and social sciences as a methodology and/or theoretical approach—in the study of psychological abnormalities (Barrett 1950), complex social organizations (Cadwallader 1959), information theory (Bello 1953), and developments in computer technology (see In man's image 1948; The thinking machine 1950; Revolt of the machines 1960). It also clearly caught the popular imagination as can be noted from story headings in popular news journals such as "Can Man Build a Superman?" "Brain Is a Machine" (1948), "Machines that Think" (1949).[15]

For my analysis, I examined classic texts that had a popular readership, such as Wiener's *Cybernetics* (1948) and *The Human Use of Human Beings* (1950), Claude E. Shannon and Warren Weaver's *The Mathematical Theory of Communication* (1949), William Ross Ashby's *An Introduction to Cybernetics* (1964), and Gregory Bateson's article, "Cybernetic Explanation" (1972). I reviewed a number of other texts on cybernetics, academic and popular book reviews of key texts, general social histories, articles applying cybernetics, secondary literature on the social impact of cybernetic knowledge, and most significantly, popular American periodical literature drawn from the period 1947 to 1966. From this corpus emerges a particular cybernetic futurology with continuing power effects in the discursive formation of cyberculture.

Cybernetics, as originally conceived, involved the application of "prediction theory" and of a "statistical approach to communication engineering" to the problem of communication and control in animal and machine systems (Wiener 1950, 18). Thus, cybernetics as a social knowledge was concerned from the outset, not only with the future but with ascertaining methods to predict the future. Wiener acknowledges that the earliest applications of cybernetic models to antiaircraft artillery during World War II were concerned with usurping two human functions: computation and "forecasting the future." With the elimination of improbabilities through the application of statistics, optimum prediction could be produced (Wiener 1948, 13-17). Wiener draws on Gibbs's application of statistics to physics, which "had the effect that physics now no longer claims to deal with what will always happen but rather with what will happen with an overwhelming probability," what Wiener (1950) calls a kind of "incomplete determinism" (p. 18). Gregory Bateson (1972) suggests that unlike causal explanation, which is positive, cybernetic explanation is negative: "We consider what alternative possibilities could have conceivably occurred and then ask why many of the alternatives were not followed, so that the particular event was one of those which could, in fact, occur" (p. 399). One reviewer characterizes this as "the change from theories of definite causality to those of statistical probability" (Albu 1955, 86). Another popular writer makes the connection between cybernetics and the future express: "The ability to make a quantitative prediction is normally a prerequisite for the development of a control theory" (Bellman 1964, 186).

As cybernetics became a social knowledge, it became entwined with the development of "ultra-rapid computing machines," or computers.[16] William Kuhns (1971) recognizes the relatively tangential connection between Wiener and the development of the computer, but recognizes that it was Wiener's name that came to be popularly associated with the computer in the 1950s and 1960s resulting in the linking of Wiener, cybernetics, and the computer in public discourse. The popular press' association of computers and cybernetics led to computers being viewed as tools for the prediction of outcomes. Kuhns argues in his chapter about Wiener, titled "Engineering the Future," that

> the systems engineers hold out the promise of reconstructing the environment of the future in drastic, comprehensive ways. They will be assisted, in almost every venture, by that Pythagoras of the modern age, the computer. Indeed, one must look to the computer as much as the systems designers to glimpse some shape of the world as it is being reconstructed even today. (P. 214)

My research confirms Kuhns's claim. Computers were recognized as having a useful role in long-term planning and decision making (Lerner 1972, 146), in predicting election outcomes (Reckoning with the Robot 1958, 793), and in forecasting the weather (The thinking machine 1950, 58), to name a few examples. This is then articulated as a need to predict technological futures; "the problem becomes one of identifying and even learning to predict the process by which new technologies transform our lives" (Kuhns 1971, 3).

Cyberneticists associated with the development of computers were cast as technical gurus: reliable sources to make predictions for the future impact of computers. Kuhns (1971) suggests that the publication of *The Human Use* made Wiener (1950), for example, "an important figure in interpreting the coming implications of the computer" (Kuhns 1971, 214-15). Reviewers seized on Wiener's futurist claims (see In man's image 1948, 45; Standen 1950, 512). With the benefit of retrospection, an article in *The Science News Letter* claims that "Norbert Wiener Foresaw New Type of Medicine" (1964, 215), and his statements are attributed the status of "predictions." In other popular writing, he is referred to as a "prophet" (Come the revolution 1950, 66). Finally, both Wiener and Charles Aiken (two scientists working on computer technology) are set up as authorities on the future in *The American Mercury* (Fliegers 1953, 61). Thus, from the outset, cybernetics as a social knowledge was concerned with, and helped shape, certain notions of temporality in general and the future in particular. It seemed to offer the tools to know, or at least understand, the future. But what was the face of this future?

Having illustrated an overall role that cybernetics played in the social construction of the future—both as a popular knowledge in its own right and through its discursive and material connection to the development of computing machines—I examine the specific nature of the social temporality being offered. It is a temporality that functions as its own form of incomplete determinism, striving to succeed in its control of the future through managing the present, seeking to determine while recognizing the futility of seeking completeness. I identify and interrogate five modalities of cybernetic futurology's incomplete determinism, five regularities that emerge to construct the discourse of the cyber future. It is through these modalities that one can trace the power/knowledge effects of cybernetic futurologies. The five regularities are the acceptance of entropy as a social notion, the understanding of systemic change in evolutionary terms, the embrace of the present as a revolutionary historical discontinuity, the adoption of a machine standard of time, and the use of memory as a notion of efficiency—performance and time in ratio.

Entropy

The notion of entropy underlies the very premises of cybernetics. Originally developed in thermodynamics, applied more broadly in Gibbs's work, and borrowed by Wiener, entropy can be defined as follows:

> As entropy increases, the universe, and all the closed systems in the universe, tend naturally to deteriorate and lose their distinctiveness, to move from the least to the most probable state, from a state of organization and differentiation in which distinctions and forms exist to a state of chaos and sameness. (Wiener 1950, 20)

Wiener (1950) extends the applicability of entropy from thermodynamics to messages and information: "Just as entropy is a measure of disorganization, information carried by a set of messages is a measure of organization" (p. 31).

Shannon and Weaver (1949) materialize (and naturalize) the application of entropy to human communication in their essays collected in *The Mathematical Theory of Information*. Weaver argues "that information be measured by entropy is, after all, natural when we remember information, in communication theory, is associated with the amount of freedom of choice we have in constructing messages" (Shannon and Weaver 1949, 13). Shannon then sets about determining the communications engineering solution to the problem of entropy in the transmission of messages; information becomes a measure of decreasing entropy. Entropy is extended to an almost ontological level. Because man is analogous to the message, entropy applies to all social organization (Wiener 1950, 129). "Wiener's concept of the universe is that of a highly organized system gradually deteriorating into a general undifferentiated system in which change becomes increasingly unlikely" (Kuhns 1971, 215-16). Cybernetics, men, and computers thus become important because they are "pockets of decreasing entropy in a world of increasing entropy" (Wiener 1950, 46-47).

Entropy circulated in the popular understanding of cybernetics as well, and as a result, cybernetics was embraced as a theory of order, of control (for example, Standen 1950, 512-13). The theory itself suggests the need for control. "What is needed is a method of routing information through the necessary channels to maintain stability or homeostasis of an organization, a system, a society, without the usual encroachments of entropy" (Kuhns 1971, 216). In terms of the construction of time, entropy suggests that time has a force of its own, a natural momentum, a natural progress toward a goal. Entropy produces order as an ideal and naturalizes disorder as a contextual, temporal notion. Control becomes an imperative as order must be established in the flow of disorder. Finally, as entropy is a process of increasing sameness, change becomes an ideal, a tool in the fight for order; it is the frantic call for change that is most remarkable in the popular press.

Many writers suggest that the embrace of change must occur for humanity's future survival in an environment of disorder. "The task is unprecedented: we have to achieve a pace of change in social and economic institutions and ideals which has never occurred in human history" (Theobald 1964, 640). "We must lead the way, and not be dragged, into this new era. . . . We can only play this role if we respond to change" (Diebold 1966, 7). In his application of cybernetics to complex social organizations, Mervyn Cadwallader (1959) disputes claims that cybernetics, with its goal of homeostasis, precludes change. He suggests that cybernetics seeks a stability that "depends upon and is the consequence of change" (pp. 154-55). In fact, cybernetics offers the tools to predict and control change, while embodying change itself.

> By now it is commonplace that cybernetics and automation will bring about radical changes in our way of life. Indeed, our purpose is to see how these changes can be predicted and understood, and thus brought under control for desirable ends. (Neisser 1966, 71)

Evolution

The embrace of entropy leads to homeostasis as an ideal: "the process by which we living beings resist the general stream of corruption and decay" (Wiener 1950, 130). This notion, as my previous reference to Cadwallader's (1959) work recognizes, led some writers to claim that cybernetics—as a theory of order, homeostasis, and stability—precluded change. Cadwallader argues that in fact, cybernetics embraces change. However, it is the particular shape taken by this model of change that is manifest, but not problematized, by popular writers and that forms the second discursive regularity of cybernetic temporality. "An open system, whether social or biological, in a changing environment either changes or perishes. In such a case, the only avenue to survival is change" (Cadwallader 1959, 155). It is this survival of the fittest, an evolutionary doctrine, that is the model of change in social cybernetics.

The early reliance on physiological metaphors for understanding machine systems and their conjuncture with predictive statistical analysis led Wiener (1948, 53-55) to draw parallels between systems and processes of "natural selection" or survival of the fittest. Guilbaud (1959, 50-51) draws on works in "hereditary mechanics" such as *The Mathematical Theory of Hereditary Phenomena* and *The Mathematical Theory of the Struggle for Survival* to elaborate on his notion of self-correcting systems.[17] Bateson (1972) posits the classical example of cybernetic explanation as "the theory of evolution under natural selection" (p. 399). A science writer propounding control theory suggests that the refinement of animal instincts in the evolutionary process is a means by which animals "deal more or less successfully with adaptive control problems" (Bellman 1964, 200).

In technical writing about cybernetics, evolution is evoked as a metaphor or model of a self-correcting system of statistical selection. However, in some science writing and most popular literature, the notion of evolution is employed somewhat differently. It refers to changes in machines themselves, it legitimates the notion of survival of the fittest, and it characterizes the human-technology relationship as a progressive continuum driven by technological advance. A 1955 article opens with the question, "Is man no more than a machine?" and concludes with a section titled "The Genetic Tail," and queries "Could such machines go through an evolutionary process?" (Kemeny 1955, 58, 67). Evolving machines legitimate the survival-of-the-fittest doctrine, particularly in social science and economic writing, as evidenced by Cadwallader's (1959) argument cited above. Some writers argue that men and machines are evolving together: "Cybernation and abundance provide all the potential for evolution into a new and better society" (Theobald 1964, 640). "The Thinking Machine" (1950) speculates that "perhaps the computing machines, by lifting more of the thinking burden, will prove a last step in the long, slow process of mental collectivization" (p. 64).

Another trace of evolutionism in popular literature manifests itself in the use of a terminology of heredity and in the anthropomorphizing of the computer. One correspondent feels that the easiest way to explain the workings of the thinking machine is through the metaphor of a father telling his children about the facts of life, about the "bees and the flowers." He then labels computers as scientists' "babies" (Fliegers 1953, 56). One of the first computers at MIT was nicknamed "Bessie" and is characterized as a "mother," "not the brightest of her breed," "a sort of mechanical Eve," and her "descendants" are referred to as "children" and "grandchildren" (The thinking machine 1950, 54).

Evolutionism shapes cybernetic temporality in very particular ways. First, the notion of a historical manifest destiny is present, the inevitable and inexorable progress toward something better, a long-standing trope in futurist writing. Second, this manifest destiny is always technological; machines are constructed as evolving alongside humans. A notion of agency, of vitality, is attributed to computer technology, in particular.[18] Finally, the teleology of cybernetic knowledge shapes a teleological view of history through evolutionism. While many writers of the day recognize the teleological nature of explanation in cybernetics (see Barrett and Post 1950), none addresses the implications of the unstated teleology present in the social circulation of cybernetics.

Industrial Revolution

Notwithstanding an overall temporal and technological teleology embedded in evolutionism, "the era of automation"—as the period from the late 1940s to the mid-1960s is labeled by its participants—is seen as a very particular historical conjuncture, a break with the past, the beginning of a new future. Wiener (1950) himself was to a large extent responsible for the use of revolutionary language when he suggested that the notion of feedback and the invention of the vacuum tube have enabled a "new automatic age" on the order of a "Second Industrial Revolution" (pp. 207-08). This idea circulated rapidly in the popular press. Wiener's books were reviewed with such titles as "The New Automatic Age" (Rolo 1950, 186) and "Come the Revolution" (Come the revolution 1950, 66). Wiener was widely quoted for his ideas on "the modern industrial revolution" (In man's image 1948, 45; The thinking machine 1950, 55).

This second industrial revolution becomes an assumed context for many articles exploring cybernetics and computer development (for example, Starr 1950, 15; Theobald 1964, 636). Robert Theobald (1966) describes this as a shift from the "industrial age" to the "cybernetics era" (p. 42) and Marshall McLuhan (1966) calls it a revolution greater in magnitude than the sword, pen, or wheel (p. 104). By association, cybernetics becomes a "revolutionary" knowledge (Come the revolution 1950, 66). "Communications and control theory has become a major factor in contemporary technology and lies at the base of the 'second industrial revolution' " (Dechert 1966, 17).

Computers are fundamentally implicated in this revolution. In his chapter, "The First and the Second Industrial Revolution," Wiener (1950, 136-62) highlights the impact of automation on the workforce. In other sites, there was a respondent flurry of writing exploring the impact of computers in terms reminiscent of issues posed by the historical interpretation of the first industrial revolution.

> These two giant electronic computing machines—known commonly as electronic brains—are competing in a race that has so far produced a new science named "cybernetics" and the promise of another industrial revolution, a revolution that may affect our civilization more profoundly than the steam engine or the atomic bomb. (Fliegers 1953, 53)

Thus, computers themselves are seen as the productive force behind cybernetics and behind the impending industrial revolution, a revolution with global social impacts.

> A sweeping technological and intellectual revolution is transforming contemporary society. It is not confined by national or geographic boundaries. The abilities, thoughts, and beliefs of men everywhere are being reshaped by forces which are the result of applied rationality. Norbert Wiener connoted the pattern of these changes with the word "cybernetics," a neologism which has become a general reference term for the contemporary revolution in industrial societies and a portent of the future for developing nations. (Ford 1966, 161)

This view of the present as a moment of revolution—and in particular, technological revolution—has several implications for the construction of temporality. First, as with entropy, the discursive regularity of the second industrial revolution embraces and normalizes change. There is a sense of rapid speed and impending massive social change, not all of it good. Embodied in these claims is a surrender of human agency to control, or even critique, technology. The past, or history, is rendered instantly irrelevant to an understanding of the present and the future because of the qualitatively distinct nature of the present. Finally, the second industrial revolution entrenches and reifies technology as the effective motor of this teleological temporality. Technology and technological change become a ubiquitous and unquestionable terrain of present and future.

Condensed Time

John Diebold (1966) suggests that one of the central problems in Western society trying to understand the significance of cybernetics and technological change "is the condensing time-scale—the rate at which events are happening" (pp. 2-3). The notion of entropy and of the second industrial revolution have embedded within them a rapid pace of change that becomes a hallmark of popular cybernetic writing. The speed of the "ultra rapid computing machine," as Wiener (1948, 1950) describes computers, becomes a metaphor for the speed of change and of technological progress. This notion of condensed time operates as a further discursive regularity in two ways. First, it forms an overall temporal backdrop against which various cybernetic dramas are played out. Second, condensed time becomes a measure of the performance of humans and machines.

Hughes (1985) offers a telling example of the first manifestation of condensed time:

> In the scant two hundred years since the early Industrial Revolution, Western man has totally rescaled and changed the face and fabric of his environment. Indeed, the changes have proceeded at such an accelerated pace that we might use the word "old" or "outmoded" to refer to last month's computer model. (P. 205)

This sense of condensing time—of speed, of rapid change—imbues virtually all of the popular literature examined. It becomes a contextual operator, stated but not questioned. Condensed time is not just a factor in comprehending cybernetics, however; it is also connected to the computer. It is through this connection to computers that condensed time manifests in speed as a measure of performance. A connection is established between the rapid development of computers and the speed of the actual machines themselves. "They [computing machines] are growing with fearful speed. They started by solving mathematical equations with flash-of-lightning rapidity. Now they are beginning to act like genuine mechanical brains" (In man's image 1948, 45).

Computers are fast machines, able to conduct very complex tasks very quickly, with very few errors, and therefore, very efficiently. They quickly become normalized and necessary; "the computer is essential when complex decisions must be made at high speed" (Bellman 1964, 211). Condensed time is the measure of a "good" computer (see A new automation? 1958; Computers or clerks 1958; Computers on the counter 1959). This instrumentalizes the measurement of the computer's value. In popular writing, this is further taken as a measure of human value through casual comparisons between the speed of humans and computers, usually to the humans' detriment.

> Mark III [an early computer] . . . was in the process of writing a book of mathematical equations. It would complete the 300-page book in about three days. A skilled mathematician, working twelve hours a day, seven days a week would take more than a year to accomplish a similar task. (Fliegers 1953, 54)

Other popular writing offers such examples (The thinking machine 1950, 54-55, Come the revolution 1950, 67; Reckoning with the robot 1958, 793-94; Computers or clerks 1958, 916). Wiener himself is drawn on as a legitimating authority in a *Time* interview:

> Even rather simple computing machines, Wiener pointed out, act much faster than humans and with much more precision. "This means that although they are theoretically subject to human criticism, such criticism may be ineffective until a long time after it is relevant. By the very slowness of our human activities, our effective control of our machines may be nullified." (Revolt of the machines 1960, 32)

Condensed time works with the other discursive regularities of the second industrial revolution, evolutionism, and entropy to construct an overall temporal backdrop of speed, change, and progress, which reproduces technological determinism and makes problematic the space from which to critique computer technology. Condensed time as a measure of favorable performance slides between computers and human beings, workers in particular. Speed and reduced errors combine to become an efficiency measure against which human workers can be evaluated, usually unfavorably, with machines. Finally, this shift to an instrumental measure of value elides other measures of value such as use, moral, aesthetic.

Memory

The notion of memory employed in the social circulation of cybernetics operates within the discourse to reduce complex notions of history into improved performativity. This is operationalized through extending the notion of feedback from a technical to a social notion. Cybernetics asserts that the ability to modify behavior on the basis of information is what distinguishes systems like the brain and the computer from systems that do not have feedback mechanisms. It is in this way that both computers and people are *learning systems*. By learning, cyberneticists mean that a system has a feedback loop whereby it can measure its intended action against its actual action and thereby correct errors. This process is made possible by the presence of a memory in the computer.

The first use of memory occurs in the primary literature; the problem of memory is cast as one of the most significant breakthroughs and ongoing challenges in the development of applied cybernetics. After drawing an analogy to biological beings, Lerner (1972) suggests that the "organization of a memory in artificial systems is one of the most important and most difficult problems of communication and control engineering" (p. 66). Comparing computing machines and the human nervous system, Wiener (1948) notes that memory is relevant to each; "a very important function of the nervous system, and . . . a function equally in demand for computing machines, is that of *memory*, the ability to preserve the results of past operations for use in the future" (pp. 142-43). Thus, from an early date, memory is framed as a tool for improved performance.

The anthropomorphic popular literature picks up on the language of memory. In explaining the functioning of the thinking machine to nonscientific readers, one writer suggests that it must have a memory just like a human's (Fliegers 1953, 56-57). "They [flip-flop mechanisms] act as part of the machine's memory, retaining information, wiping it out after it becomes useless by 'forgetting it,' and then acquiring new information as the problem progresses" (Fliegers 1953, 57). Machines can "learn by experience" (Revolt of the machines 1960, 32). Memory is reduced to a matter of performance and learning.

> The human brain, some computermen explain, thinks by judging present information in the light of past experience. That is roughly what the machines do. They consider figures fed into them (just as information is fed to the human brain by the senses), and measure the figures against the information that is "remembered." (The thinking machine 1950, 56)

Another popular article makes similar claims: "They [computers] can observe facts and reach conclusions from their observations. They can store facts in their memories. They can make decisions based on observed facts plus remembered facts" (Come the revolution 1950, 68).

In fact, it is on the basis of poor memories that machines are not yet as efficient as humans. "Practical computermen agree . . . the machines need better memories. The machines are already quicker than the brain: their vacuum tubes act 1,000 times faster than neurons. But their poor memories (rudimentary compared to the brain's) limit their thinking abilities" (The thinking machine 1950, 58). While men are distinguished from machines on the basis of superior memories, the problem is solely technical and one likely to be very quickly overcome (Bronowski 1964, 133). An article, "Man Viewed as Machine" (Kemeny 1955) notes that while humans are "ahead" in the use of energy, machines are leading when it comes to speed. The problem then is "speeding up the memory" of the machine (Kemeny 1955, 58-59).

This reduction of the human memory to a process of data storage and retrieval in a timely fashion to improve efficient performance also results in the casual comparison between humans and machines, again to the detriment of humans. Reporters are quick to report that "bigger is better" (Computers or clerks 1958, 916). Perhaps the most chilling example is found in the reasoning underlying a piece in *Scientific American*:

> Still we are left with the feeling that there are many things we can do that a machine cannot do. The brain has more than 10 billion cells, while a computer has only a few ten thousands of parts. Even with transistors, which overcome the cost and space problems, the difficulty of construction will hardly allow for more than a million parts to a machine. So we can safely say that the human brain for a long time to come will be about 10,000 times more complex than the most complicated machine. (Kemeny 1955, 59)

Several points can be made about the construction of memory in the above claims. "Past experience" is equated with "information" in the cybernetic sense. "Remembering" is reduced to an information retrieval process that is teleological and goal oriented. The sole measure of value of remembering and memory is speed, accuracy, and efficiency. Human sensory perception is assumed to be quantifiable, as are decision-making processes. These characteristics combine to reduce memory from a function of meaning making and experience, to a function of performance evaluation, from a function of time, to a function of behavior in space. Again, this permits the easy comparison of human and machine functioning as it reduces the human activity to a behavior, externally observable, quantifiable, and thus measurable, perhaps controllable.

Conclusion

Taken together, the discursive regularities of social entropy, technological evolutionism, historical discontinuity, condensed time, and memory as performativity combine to produce a very particular idea of the future. This idea of the future is simultaneously product, and productive, of power/knowledge effects within discourse, its determinism present yet incomplete. Within this cybernetic futurology, or particular tale of the future, social temporality becomes about controlling (rather than predicting) the future through the management of the present; it embraces change—perhaps chaos—normalizing it as something inevitable and inevitably outside of our control. Although out of our control, the future is not out of control, because we are on a teleological path of evolutionary development; we are pursuing our manifest destiny toward something, if not utopic, at least better, at least natural. Our future path of social development is so inexorably connected to the machines that are evolving alongside us that any criticism of the technology is a criticism of ourselves. Given the allegedly unprecedented magnitude of technological development in the late twentieth century, the past is rejected as a tool for the comprehension of the present or future. Finally, the present and future are unfolding far too fast for us to intervene in any event. The condensing time scale suggested by the speed of computers means that humans need to "catch up." The very nature of the computer—its homologic connection to our own brains—renders knowledge and experience as information, all activities as teleological and instrumental, and efficiency as the ultimate social value.

This is an historical futurology, a past tale of the future; this is how the idea of the future circulated within public and popular conceptions of computers, cybernetics, and their conjuncture in early cybercultural discourse. Social discourse analysis allows us to see these as the framing ideas that construct understandings of feedback, learning, information, time, speed, memory, intelligence, and so on that then shape what can and cannot be said about time, about computers, and about people within cybercultural discourse. It is not that these concepts are fixed in the immediate post-World War II period and remain unchanged to the present—the determinism is, after all, always incomplete. Rather, through reading cyberculture as a discursive formation and tracing some of its early temporal regularities, we can see how existing notions of the future and the future of the future are not "new," are not independent of their circulation in public and popular knowledge, and most important, are neither neutral nor merely the ideological position of particular institutional power structures deposited from the outside into culture. In this way, it is in diagnosing the spaces of incompleteness that we can intervene.

Existing notions of the future and the future of the future such as those found in *Wired* magazine—where "now" is a radical rupture from the past, where the past is irrelevant, where technology is a ubiquitous terrain, where time is fast and perpetually changing, and where the human objective is not to predict the future but to manage the risks/possibilities of the present—are shaped by, and in dialogue with, the past of that future. This discourse influences what claims can and cannot be made about the future, who can and cannot make them, and how they operate within culture to produce specific knowledges rather than other possible knowledges. It is through tracing our current stories about the future, with past cybernetic futurologies, that the ongoing power/knowledge implications of telling our cyber future become apparent.

Notes

1. There are no page numbers included, because *CTHEORY* is an electronic journal.

2. Those I refer to in the text are primarily collections and pieces that expressly situate themselves as analyses of cyberculture. There are many other scholars exploring aspects of what might be called cyberculture. These include Sheri Turkle's *Life on the Screen: Identity in the Age of the Internet* (1995), Anne Balsamo's *Technologies of the Gendered Body: Reading Cyborg Women* (1996), Donna Haraway's *Modest_Witness@Second_Millennium.Female Man*__Meets_OncoMouse (1997), David Porush's *The Soft Machine: Cybernetic Fiction* (1985), and others.

3. In French, the original texts read as follows: "non des codes, mais des événements: la loi d'existence des énoncés, ce qui les a rendus possibles—eux et aucun autre à leur place; les conditions de leur émergence singulière; leur corrélation avec d'autres événements antérieurs ou simultanés, discursifs ou non" (Foucault 1994a, 681), and "Le type d'analyse que je pratique ne traite pas du problème du sujet parlant, mais examine les différentes manières dont le discours joue un rôle à l'intérieur d'un système stratégique où de pouvoir est impliqué, et pour lequel du pouvoir fonctionne. Le pouvoir n'est donc pas au-dehors du discours. Le pouvoir n'est ni source ni origine du discours. Le pouvoir est quelque chose qui opère à travers le discours, puisque le discours est lui-même un élément dans un dispositif stratégique de relations de pouvoir" (Foucault 1994b, 465). Furthermore, Foucault is not concerned with the "meaning" of discourse, and power is always already a part of discourse. "Le pouvoir n'est pas le sens du discours. Le discours est une série d'éléments qui opèrent à l'intérieur du mécanisme générale du pouvoir. En conséquence, il faut considérer le discours comme une série d'événements, commes des événements politiques, à travers lesquel du pouvoir est véhiculé et orienté" (Foucault 1994b, 465).

4. Foucault uses the notion of discursive formation to get at the positivity of discourse: "To analyze a discursive formation therefore is to deal with a group of verbal performances at the level of statements and of the form of positivity that characterizes them; or more briefly, it is to define the type of positivity of a discourse" (Foucault 1994c, 125).

5. Produced on a Mac powerbook; published on an intriguingly tactile, and of course recycled, paper; and proclaiming Marshall McLuhan as its patron saint, this magazine first began publishing in 1993. Originally a bimonthly publication, its immediate and dramatic popularity led to it very quickly becoming a monthly magazine. The high quality of the ad copy and the deliberate confusion that is induced in a reader in attempting to distinguish advertisements and magazine content—particularly in the first ten to fifteen pages of the magazine—is both intriguing and illustrative. It was one of the first, and still few, magazines sold in the computer section of newsstands that was not merely a catalogue of hardware, software, and games. Its producers were among the first to recognize a number of key factors of cyberculture:

1. There was indeed a culture growing up around the use and enjoyment of information technologies.
2. The members of this culture, those participating in and being affected by these cultural shifts, were not only the "computer nerd" of the 1970s and the "hacker" of the 1980s; there were others interested in playing with, and buying, these technologies. Unlike *Mondo 2000*'s market of self-perceived rebel hackers, *Wired*'s reader's are, according to the profile of its average reader from a recent reader survey, White American males, between the ages of 25 and 45, with at least two university degrees, and an annual income in excess of U.S.$85,000.
3. There is a connection between business or management in North America and the consumption, use, and adoption of these technologies; *Wired* was one of the first

magazines to consciously and deliberately establish a connection between new management writing in the 1990s and its own content.

4. Apropos to these previous realizations, there is a whole range of new products, ideas, and terminologies (products of cyberculture) that could be marketed to the hip "cybermanager" of the 1990s. Questions about the limits, access to, and problems with technology no longer had to be asked, and a lot more could be sold than the technology itself. The entrepreneur, the middle and upper manager, and the professional all wanted and needed to be "up" on these technologies, and *Wired* magazine is there for them.

As a result, *Wired*'s content includes book reviews, music reviews, news from the industry, premasticated postmodern theory, new leisure toys, interviews with all the "hip" players of the field, discussions of social issues such as pornography on the Net, as well as discussion about technological developments. *Wired* has designed itself as basically the only magazine you need to read if you want to be up on all the latest in this area—both socially as well as technically. It is a curious blend of avant-garde technoculture, of a certain kind of intellectualism, with an overall indifference to politics, flip writing style, rampant commodity mongering, and technologically anchored conservatism, all in a very aesthetically intense package.

6. Inevitably, my analysis draws on my reading and interpretation of the works as a whole, as well as in response to the individual pieces cited as examples.

7. These three examples are representative of some of the larger regularities that I wish to draw out for analysis. Some other examples include the following:

- An interesting piece called "Reverse Time Capsule" Coupland (1995) posits a series of current or present phenomena (most technological/media in nature) as the future to a present set in 1975.
- A piece called "Global Neighborhood Watch" by Neal Stephenson (1995a) (who is likely Gibson's science fiction replacement in influencing the aesthetic of this area with his postcyberpunk novels *The Diamond Age* [1995b] and *Snow Crash* [1992]) evokes the well-worn language of "the global village." He reassures us that technology can be used for the protection of middle-class private property through a global neighborhood watch via digital cameras and the Internet. A number of authors combine to offer the ironic "The Leisure Party Manifesto" (1995), arguing that, "in the Age of Thinking Machines, leisure is no longer a privilege—it is a fundamental human right. . . . If machines and computers want to work, let them!"
- An offering of resources to help one navigate the future includes business futurism; scientific, technology, and engineering journals; scientific futurology; and pulp science fiction.
- A polemic from ex-Grateful Dead member and self-appointed cyberculture guru John Perry Barlow (1995) makes some interesting claims that are revealing of the contradictions and politics of the overall journal:

> The Neo-Luddites know. They finger the usual suspects: the gray men who run the multinationals, the national security state, the cruel yoke of consumer exploitation. These plutocratic parasites could halt the leviathan of technology any time they wanted to. But, of course, they won't because they get rich from it. And, they care more about money than humanity.
>
> Unfortunately—or fortunately—it's not that simple. Close examination reveals the perpetrators are, in fact, the usual though rarely suspected culprits: ourselves. [so while

taking the blame, he is careful to distance "us" from "the suits"]. It's us and our itch. It's that little problem over in the corner that we could surely eliminate with a few minor adjustments, one for which we are always willing to buy a solution when the gray men offer to sell us one. Blaming the suits is as ridiculous as blaming ourselves. And as irrelevant. Because any conspiracy that involves 5.5 billion people will be hard to undo. As technology is within us, we are within it. Wherever we go, there it is. (Barlow 1995, 130, 132)

8. In my selection of these pieces, I do not mean to suggest that I do not see their tongue-in-cheek nature, their humor, their irony—but at the same time one can locate these within a larger discursive formation of cyberculture and in particular as highlighting some of the regularities that emerge with respect to social temporality.

9. This desire to predict the future, or the future of the future, is now new. From H. G. Wells in *The Time Machine* (1895) and *The Shape of Things to Come* (1935) to J.B.S. Haldane in *Possible Worlds* (1928) to Herman Kahn, William Brown, and Leon Martel in *The Next 200 Years* (1976) to Alvin Toffler in his trilogy *Future Shock* (1970), *The Third Wave* (1980), and *Powershift* (1990)—a diverse array of writers and thinkers have attempted to capture, extend, and predict the fact of tomorrow.

10. Burnam P. Beckwith (1984, 10-20), in his review of scientific futurologists, offers Marie Jean Antoine Nicolas Caritat, Marquis de Condorcet (1743-1794) as the first scientific futurist of note.

11. Ultimately, however—like Ross (1991) and Carey and Quirk (1989) suggest—the future functions as ideology, as a "false consciousness" deflecting public attention away from the real problems.

12. For many, cyberculture seems to have begun in the 1980s because its analysis as such began in the 1980s. Many thinkers seem to set an explicit or implicit historical origin point with Donna Haraway's "Cyborg Manifesto" (1985) or William Gibson's *Neuromancer* (1984).

13. Wiener coined the term from the Greek word *Kybernétiké*, the art of steersmanship. G. T. Guilbaud (1959, 1) recognizes that the term belongs to a larger family of Greek words for arts, crafts, and sciences (*technai*), with etymological implications for the art of guiding men in society or government.

14. Institutionally, cybernetics can likely be said to have "begun" in and with a series of multidisciplinary conferences in the United States between 1946 and 1953 supported by the Josiah Macy Foundation. A number of the participants had first become interested in the problem of feedback during their work on antiaircraft artillery during the war, but the conferences brought together a combination of mathematicians, statisticians, physicists, physiologists, biologists, anthropologists, economists, and sociologists, all linked by similar concerns with problems of feedback, communication, systems, and control. Although sociologists and anthropologists participated in the Macy conferences, the approach of cybernetics was generated from an application of statistical mathematics to physiology. Wiener (1948) makes very clear in his early work that although he feels there are significant social, cultural, and economic implications to cybernetics, he has significant concerns about the likelihood of its having "an appreciable therapeutic effect" on the social ills to which scholars like Margaret Mead and Gregory Bateson were eager to apply it. Wiener suggests that social scientists "show an excessive optimism, and a misunderstanding of the nature of all scientific achievement" in looking to cybernetics as a theory of the social (p. 189). Notwithstanding the admonitions of Wiener, key notions from cybernetics are reproduced in current understandings of work, computers, and the changing relationship between humans and information technology.

15. *Time*, *Newsweek*, and *Business Week* articles, respectively.

16. Illustrative of this is Charles R. Dechert's edited collection, *The Social Impact of Cybernetics* (1966). Each of the papers in the collection had been presented at a symposium on

cybernetics and society held two years earlier in Washington, D.C. A number of writers focused on the computer as the measure of cybernetics as a social force. Robert Theobald (1966) makes this explicit, asserting that "fundamental changes in the socioeconomic system as a whole . . . are being brought about through the drives exerted on the whole social fabric by the application of cybernetics in the form of computerized systems" (p. 39). Ulric Neisser (1966) links cybernetics and automation in the first paragraph of his essay and then moves easily to a discussion of computers in the second, without acknowledging a shift or reduction in subject matter (p. 71). For some authors in this text and others, "cybernation" becomes an abbreviation for this combinatory notion of cybernetics and automation through computer technology (McLuhan 1966; Theobald 1964). Finally, in his review of the development of cybernetics, Dechert (1966) attributes particular prominence to the computer in the popular comprehension of cybernetics: "Computers are, of course, of fundamental importance to cybernetics, first because they embody so much communication and control technology, and second because they oblige us to sort out vague ideas and feelings from clearly formulated and univocal ideas and relations if we wish to manipulate them by machine, and finally because once ideas are clarified the machine permits the rapid execution of long and detailed logical operations otherwise beyond human capability" (p. 21).

17. Guilbaud (1959) makes reference to Volterra as the author of these works but does not indicate a year of publication or any other information. Guilbaud's volume suffers from a lack of bibliography or citations, and I was unable to locate these texts elsewhere.

18. David F. Channel (1991) offers a very interesting and unique historical analysis of the ongoing tension between the organic and technical in his book, *The Vital Machine: A Study of Technology and Organic Life.*

Acknowledgements

I would like to extend my appreciation to the Social Sciences and Humanities Research Council of Canada and Concordia University for the financial support that allows me to pursue the larger project of which this article is a small part. In addition, I would like to thank Neil Gerlach, Martin Allor, Clive Robertson, and Thierry Bardini for their helpful comments and constructive criticisms on earlier drafts of this article.

References

Albu, Austen. 1955. The human use of human beings. *Twentieth Century* 148:85-86.

Ashby, William Ross. 1964. *An introduction to cybernetics*. London: Methuen.

Balsamo, Anne. 1996. *Technologies of the gendered body: Reading cyborg women*. Durham, NC: Duke University Press.

Barlow, John Perry. 1995. It's a poor workman who blames his tools. In *Wired* S1(01):120-42.

Barrett, Eric. 1950. Cybernetics as applied to a study of normal and abnormal adjustment mechanisms. *Journal of Psychology* 30:11-31.

Barrett, Eric, and Geoffrey Post. 1950. Introduction to some principles of applied cybernetics. *Journal of Psychology* 30:3-10.

Bateson, Gregory. 1972. *Steps to an ecology of mind: Collected essays in anthropology, psychiatry, evolution and epistemology*. San Francisco: Chandler.

Beckwith, Burnam P. 1984. *Ideas about the future: A history of futurism, 1794-1982*. Palo Alto, CA: Beckwith.

Bellman, Richard. 1964. Control theory. *Scientific American* 211:186-90.

Bello, Francis. 1953. The information theory. *Fortune* 48:136-41, 143-44, 150.

Brain is a machine. 1948. *Newsweek*,15 November, 32:89.

Brand, Stewart. 1995. Two questions. *Wired* S1(01):28-46.

Bronowski, J. 1964. Has the concept of cybernetics lived up to its early promise. *Scientific American* 210:130-34.

Cadwallader, Mervyn L. 1959. The cybernetic analysis of change in complex social organizations. *American Journal of Sociology* 65:154-57.

Carey, James, and John J. Quirk. 1989. The history of the future. In *Communications as culture: Essays on media and society*, edited by J. Carey, 173-200. Boston: Unwin Hyman.

Channell, David F. 1991. *The vital machine: A study of technology and organic life*. New York: Oxford University Press.

Come the revolution. 1950. *Time*, 27 November, 56:66-68.

Computers or clerks. 1958. *Economist*, 6 December, 189:915-16.

Computers on the counter. 1959. *Economist* 191:1109-10, 1173-74.

Coupland, Douglas. 1995. Reverse time capsule. In *Wired* S1(01):82-83.

Dechert, Charles R. 1966. The development of cybernetics. In *The social impact of cybernetics*, edited by C. R. Dechert, 11-37. New York: Simon and Schuster.

Dery, Mark. 1993. Flame wars. In *Flame wars: The discourse of cyberculture*, edited by Mark Dery, 559-68. Durham, NC: Duke University Press.

Diebold, John. 1966. Goals to match our means. In *The social impact of cybernetics*, edited by C. R. Dechert, 1-9. New York: Simon and Schuster.

Escobar, Arturo. 1994. Welcome to cyberia: Notes on the anthropology of cyberculture. *Current Anthropology* 35(3):211-31.

Featherstone, Mike, and Roger Burrows, eds. 1995. *Cyberspace, cyberbodies, cyberpunk: Cultures of technological embodiment*. London: Sage.

Fliegers, Serge. 1953. Will *machines* replace the *human brain*? *American Mercury* 76:53-61.

Ford, John J. 1966. Soviet cybernetics and international development. In *The social impact of cybernetics*, edited by C. R. Dechert, 161-92. New York: Simon and Schuster.

Foucault, Michel. 1980. *Power/knowledge: Selected interviews and other writings 1972-1977*. New York: Pantheon.

———. 1981. The order of discourse. In *Untying the text: A post structuralist reader*, edited by R. Young, 48-78. New York: Routledge and Kegan Paul, original date 1970.

———. 1994a. Réponse à une question. *Dits et écrits. 1954-1988 I*. Paris: Gallimard, 673-95.

———. 1994b. Dialogue sur le pouvoir. *Dits et écrits. 1954-1988 III*. Paris: Gallimard, 464-73.

———. 1994c. *The archaeology of knowledge*. New York: Routledge.

Gibson, William. 1984. *Neuromancer*. New York: Ace.

Gray, Chris Hables, Heidi J. Figueroa-Sarriera, and Steven Mentor, eds. 1995. *The cyborg handbook*. New York: Routledge.

Guilbaud, G. T. 1959. *What is cybernetics?* Translated by Valerie MacKay. New York: Grove.

Haldane, John Burdon Sanderson. 1928. *Possible worlds: And other papers*. New York: HarperCollins.

Haraway, Donna. 1985. A cyborg manifesto: Science, technology, and socialist feminism in the late twentieth century. In *Simians, cyborgs, and women: The reinvention of nature*. New York: Routledge, 149-82.

———. 1997. *Modest_witness@second_millennium.femaleman*__meets_oncomouse. London: Routledge.

Hughes, Barry B. 1985. *World futures: A critical analysis of alternatives*. Baltimore: Johns Hopkins University Press.

In man's image. 1948. *Time*, 27 December, 52:45.

Kahn, Herman, William Brown, and Leon Martel. 1976. *The next 200 years: A scenario for America and the world.* New York: Morrow.

Kemeny, John G. 1955. Man viewed as machine. *Scientific American* 192:58-67.

Kuhns, William. 1971. *The post-industrial prophets: Interpretations of technology.* New York: Weybright and Talley.

The Leisure Party Manifesto. 1995. Workers of the world, relax! In *Wired* S1(01):108.

Lerner, A.Ya. 1972. *Fundamentals of cybernetics.* Translated by E. Gros. New York: Plenum, Rosetta edition.

Machines that think. 1949. *Business Week*, 19 February, 38.

McLuhan, Marshall. 1966. Cybernation and culture. In *The social impact of cybernetics*, edited by C. R. Dechert, 95-108. New York: Simon and Schuster.

Neisser, Ulric. 1966. Computers as tools and as metaphors. In *The social impact of cybernetics*, edited by C. R. Dechert, 71-93. New York: Simon and Schuster.

A new automation? 1958. *Economist*, 19 November, 189:824.

Nichols, Bill. 1988. The work of culture in the age of cybernetic systems. *Screen* 29(1):22-46.

Norbert Wiener foresaw new type of medicine. 1964. *Science News Letter*, 4 April, 85:215.

Pfohl, Stephen. 1997. The cybernetic delirium of Norbert Wiener. *CTHEORY: Theory, technology and culture* 20(1-2).

Porush, David. 1985. *The soft machine: Cybernetic fiction.* New York: Methuen.

Reckoning with the robot. 1958. *Economist*, 19 November, 189:793-94.

Revolt of the machines. 1960. *Time*, 11 January, 75:32.

Rolo, Charles J. 1950. The new automatic age. *Atlantic Bookshelf* 186:176-77.

Ross, Andrew. 1991. *Strange weather: Culture, science and technology in the age of limits.* London: Verso.

Sardar, Ziauddin, and Jerome R. Ravetz, eds. 1996. *Cyberfutures: Culture and politics on the information superhighway.* New York: New York University Press.

Shannon, Claude E., and Warren Weaver. 1949. *The mathematical theory of communication.* Urbana: University of Illinois Press.

Smart, Barry. 1992. *Modern conditions, postmodern controversies.* London: Routledge.

Standen, Anthony. 1949. Mind and/or machine. *Commonweal*, 27 May, 50:176-77.

———. 1950. Machines and men. *Commonweal*, 1 September, 52(16):512-14.

Starr, Mark. 1950. The cybernetic way of life. *Saturday Review of Literature*, 19 August, 33:15-16.

Steinberg, Steve G. 1995. I can see for miles! (rating the futurists). *Wired* S1(01):116.

Stephenson, Neal. 1992. *Snow crash.* New York: Bantam.

———. 1995a. Global neighbourhood watch. *Wired* S1(01):100-01.

———. 1995b. *Diamond age: Or, a young lady's illustrated primer.* New York: Bantam.

Sterling, Bruce. 1995. The future? *Wired* S1(01):152-70.

Theobald, Robert. 1964. The cybernated era. *Vital speeches of the day* 30:636-40.

———. 1966. Cybernetics and the problems of social reorganization. In *The social impact of cybernetics*, edited by C. R. Dechert, 39-69. New York: Simon and Schuster.

The thinking machine. 1950. *Time*, 23 January, 55:53-64.

Toffler, Alvin. 1970. *Future shock.* New York: Random House.

———. 1980. *The third wave.* New York: Morrow.

———. 1990. *Powershift: Knowledge, wealth, and violence at the end of the 21st century.* New York: Bantam.

Turkle, Sherry. 1995. *Life on the screen: Identity in the age of the internet*. New York: Simon and Schuster.

Wells, H. G. 1975. *The shape of things to come*. Boston: Gregg, originally published in 1935.

———. 1976. *The time machine*. New York: Bantam, originally published in 1895.

Wiener, Norbert. 1948. *Cybernetics: Or control and communication in the animal and the machine*. New York: John Wiley.

———. 1950. *The human use of human beings: Cybernetics and society*. New York: Avon.

Wilkinson, Lawrence. 1995. How to build scenarios. *Wired* S1(01):74-81.

Sheryl N. Hamilton is a doctoral candidate in the Programme Doctorat Conjoint en Communication in the Department of Communication Studies at Concordia University in Montreal, Quebec, Canada. This article is part of a larger project interrogating the power/knowledge effects of cyberculture as a discursive formation within Deleuzian societies of control. A former practicing lawyer, she teaches in the areas of mass communications, media law, and media and gender, and has published work in Convergence: The Journal of Research into New Media Technologies and Alternate Routes: A Journal of Critical Social Research.