Introduction

Every society has its diagram(s).
—GILLES DELEUZE, *Foucault*

This book is about a diagram, a technology, and a management style. The diagram is the *distributed network,* a structural form without center that resembles a web or meshwork. The technology is the digital *computer,* an abstract machine able to perform the work of any other machine (provided it can be described logically). The management style is *protocol,* the principle of organization native to computers in distributed networks. All three come together to define a new apparatus of control that has achieved importance at the start of the new millennium.

Much work has been done recently on theorizing the present historical moment and on offering periodizations to explain its historical trajectory. I am particularly inspired by five pages from Gilles Deleuze, "Postscript on Control Societies," which begin to define a chronological period after the modern age that is founded neither on the central control of the sovereign nor on the decentralized control of the prison or the factory. My book aims to flesh out the specificity of this third historical wave by focusing on the controlling computer technologies native to it.

How would control exist after decentralization? In former times control was a little easier to explain. In what Michel Foucault called the sovereign societies of the classical era, characterized by centralized power and sovereign fiat, control existed as an extension of the word and deed of the master, assisted by violence and other coercive factors. Later, the disciplinary societies of the modern era took hold, replacing violence with more bureaucratic forms of command and control.

Deleuze has extended this periodization into the present day by suggesting that after the disciplinary societies come the *societies of control.* Deleuze believed that there exist wholly new technologies concurrent with the societies of control. "The old sovereign societies worked with simple machines, levers, pulleys, clocks," he writes, "but recent disciplinary societies were equipped with thermodynamic machines[1] . . . control societies operate with a third generation of machines, with information technology and

---

Epigraph: Gilles Deleuze, *Foucault,* trans. Seán Hand (Minneapolis: University of Minnesota Press, 1986), p. 35.

1. "Thermodynamic machines" refers primarily to steam and internal combustion engines and to nuclear power.

computers."[2] Just as Marx rooted his economic theory in a strict analysis of the factory's productive machinery, Deleuze heralds the coming productive power of computers to explain the sociopolitical logics of our own age.

According to Critical Art Ensemble (CAE), the shift from disciplinary societies to control societies goes something like this:

> Before computerized information management, the heart of institutional command and control was easy to locate. In fact, the conspicuous appearance of the halls of power was used by regimes to maintain their hegemony. . . . Even though the monuments of power still stand, visibly present in stable locations, the agency that maintains power is neither visible nor stable. Power no longer permanently resides in these monuments, and command and control now move about as desired.[3]

The most extensive "computerized information management" system existing today is the Internet. The Internet is a global distributed computer network. It has its roots in the American academic and military culture of the 1950s and 1960s.[4] In the late 1950s, in response to the Soviet Sputnik launch and other fears connected to the Cold War,[5] Paul Baran at the Rand Corporation decided to create a computer network that was independent of centralized command and control, and would thus be able to withstand a nuclear attack that targets such centralized hubs. In August 1964, he published an eleven-volume memorandum for the Rand Corporation outlining his research.[6]

Baran's network was based on a technology called packet-switching[7] that allows messages to break themselves apart into small fragments. Each fragment, or packet, is able to find its own way to its destination. Once there, the packets reassemble to create the original message. In 1969, the Advanced Research Projects Agency (ARPA) at the U.S. Department of Defense started the ARPAnet, the first network to use Baran's packet-switching technology. The ARPAnet allowed academics to share resources and transfer files. In its early years, the ARPAnet (later renamed DARPAnet) existed unnoticed by the outside world, with only a few hundred participating computers, or "hosts."

All addressing for this network was maintained by a single machine located at the Stanford Research Institute in Menlo Park, California. By 1984 the network had grown larger. Paul Mockapetris invented a new addressing scheme, this one decentralized, called the Domain Name System (DNS).

The computers had changed also. By the late 1970s and early 1980s personal computers were coming to market and appearing in homes and offices. In 1977, researchers at Berkeley released the highly influential "BSD" flavor of the UNIX operating system, which was available to other institutions at

---

2. Gilles Deleuze, "Postscript on Control Societies," in *Negotiations,* trans. Martin Joughin (New York: Columbia University Press, 1990), p. 180; an alternate translation is available as "Postscript on the Societies of Control" in *October: The Second Decade, 1986–1996,* ed. Rosalind Krauss et al. (Cambridge: MIT Press, 1997).

3. Critical Art Ensemble, *Electronic Civil Disobedience and Other Unpopular Ideas* (New York: Autonomedia, 1996), pp. 7–8, 9.

4. Katie Hafner and Matthew Lyon dispute this in their book *Where Wizards Stay Up Late: The Origins of the Internet* (New York: Touchstone, 1996), arguing instead that the Internet was derived from the altruistic concerns of a few academics rather than the strategic interests of the Department of Defense. Yet they equivocate, writing on the one hand that "[t]he project had embodied the most peaceful intentions—to link computers at scientific laboratories across the country so that researchers might share computer resources. . . . the ARPANET and its progeny, the Internet, had nothing to do with supporting or surviving war—never did" (p. 10); yet on the other hand they admit that Paul Baran, the man who has contributed most to the emergence of protocol, "developed an interest in the survivability of communications systems under nuclear attack" (p. 54).

5. American anxiety over Soviet technological advancement was very real after the Sputnik launches. "The launching of the sputniks told us," wrote John Dunning for *The New York Times Magazine* in 1957, "that a great despotism is now armed with rockets of enormous thrust, and guidance systems that could deliver a hydrogen warhead of one or more megatons to any spot in the United States." See John Dunning, "If We Are to Catch Up in Science," *New York Times Magazine,* November 10, 1957, p. 19.

6. Baran tells us that these memoranda "were primarily written on airplanes in the 1960 to 1962 era." See Paul Baran, Electrical Engineer, an oral history conducted in 1999 by David Hochfelder, IEEE History Center, Rutgers University, New Brunswick, NJ, USA.

7. A term coined instead by British scientist Donald Davies who, unknowing of Baran's work, also invented a system for sending small packets of information over a distributed network. Both scientists are credited with the discovery; however, because of Baran's proximity to the newly emerging ARPA network, which would be the first to use Baran's ideas, Davies's historical influence has diminished.

virtually no cost. With the help of BSD, UNIX would become the most important computer operating system of the 1980s.

In the early 1980s, the suite of protocols known as TCP/IP (Transmission Control Protocol/Internet Protocol) was also developed and included with most UNIX servers. TCP/IP allowed for cheap, ubiquitous connectivity. In 1988, the Defense department transferred control of the central "backbone" of the Internet over to the National Science Foundation, who in turn transferred control to commercial telecommunications interests in 1995. In that year, there were 24 million Internet users. Today, the Internet is a global distributed network connecting billions of people around the world.

At the core of networked computing is the concept of *protocol*. A computer protocol is a set of recommendations and rules that outline specific technical standards. The protocols that govern much of the Internet are contained in what are called RFC (Request For Comments) documents.[8] Called "the primary documentation of the Internet,"[9] these technical memoranda detail the vast majority of standards and protocols in use on the Internet today.

The RFCs are published by the Internet Engineering Task Force (IETF). They are freely available and used predominantly by engineers who wish to build hardware or software that meets common specifications. The IETF is affiliated with the Internet Society, an altruistic, technocratic organization that wishes "[t]o assure the open development, evolution and use of the Internet for the benefit of all people throughout the world."[10] Other protocols are developed and maintained by other organizations. For example, many of the protocols used on the World Wide Web (a network within the Internet) are governed by the World Wide Web Consortium (W3C). This international consortium was created in October 1994 to develop common protocols such as Hypertext Markup Language (HTML) and Cascading Style Sheets. Scores of other protocols have been created for a variety of other purposes by many

8. The expression derives from a memorandum titled "Host Software" sent by Steve Crocker on April 7, 1969, which is known today as RFC 1.

9. Pete Loshin, *Big Book of FYI RFCs* (San Francisco: Morgan Kaufmann, 2000), p. xiv.

10. "Internet Society Mission Statement," available online at http://www.isoc.org/isoc/mission/.

different professional societies and organizations. They are covered in more detail in chapter 4.

Protocol is not a new word. Prior to its usage in computing, protocol referred to any type of correct or proper behavior within a specific system of conventions. It is an important concept in the area of social etiquette as well as in the fields of diplomacy and international relations. Etymologically it refers to a fly-leaf glued to the beginning of a document, but in familiar usage the word came to mean any introductory paper summarizing the key points of a diplomatic agreement or treaty.

However, with the advent of digital computing, the term has taken on a slightly different meaning. Now, protocols refer specifically to standards governing the implementation of specific technologies. Like their diplomatic predecessors, computer protocols establish the essential points necessary to enact an agreed-upon standard of action. Like their diplomatic predecessors, computer protocols are vetted out between negotiating parties and then materialized in the real world by large populations of participants (in one case citizens, and in the other computer users). Yet instead of governing social or political practices as did their diplomatic predecessors, computer protocols govern how specific *technologies* are agreed to, adopted, implemented, and ultimately used by people around the world. What was once a question of consideration and sense is now a question of logic and physics.

To help understand the concept of computer protocols, consider the analogy of the highway system. Many different combinations of roads are available to a person driving from point A to point B. However, en route one is compelled to stop at red lights, stay between the white lines, follow a reasonably direct path, and so on. These conventional rules that govern the set of possible behavior patterns within a heterogeneous system are what computer scientists call protocol. Thus, protocol is a technique for achieving voluntary regulation within a contingent environment.

These regulations always operate at the level of coding—they encode packets of information so they may be transported; they code documents so they may be effectively parsed; they code communication so local devices may effectively communicate with foreign devices. Protocols are highly formal; that is, they encapsulate information inside a technically defined wrapper, while remaining relatively indifferent to the content of information contained within. Viewed as a whole, protocol is a distributed management system that allows control to exist within a heterogeneous material milieu.

It is common for contemporary critics to describe the Internet as an unpredictable mass of data—rhizomatic and lacking central organization. This position states that since new communication technologies are based on the elimination of centralized command and hierarchical control, it follows that the world is witnessing a general disappearance of control as such.

This could not be further from the truth. I argue in this book that protocol is how technological control exists after decentralization. The "after" in my title refers to both the historical moment after decentralization has come into existence, but also—and more important—the historical phase *after* decentralization, that is, after it is dead and gone, replaced as the supreme social management style by the diagram of distribution.

What contributes to this misconception (that the Internet is chaotic rather than highly controlled), I suggest, is that protocol is based on a *contradiction* between two opposing machines: One machine radically distributes control into autonomous locales, the other machine focuses control into rigidly defined hierarchies. The tension between these two machines—a dialectical tension—creates a hospitable climate for protocological control.

Emblematic of the first machinic technology, the one that gives the Internet its common image as an uncontrollable network, is the family of protocols known as TCP/IP. TCP and IP are the leading protocols for the actual transmission of data from one computer to another over the network. TCP and IP work together to establish connections between computers and move data packets effectively through those connections. Because of the way TCP/IP was designed, any computer on the network can talk to any other computer, resulting in a nonhierarchical, peer-to-peer relationship.

As one technical manual puts it: "IP uses an anarchic and highly distributed model, with every device being an equal peer to every other device on the global Internet."[11] (That a technical manual glowingly uses the term "anarchic" is but one symptom of today's strange new world!)

Emblematic of the second machinic technology, the one that focuses control into rigidly defined hierarchies, is the DNS. DNS is a large decentralized

11. Eric Hall, *Internet Core Protocols: The Definitive Guide* (Sebastopol, CA: O'Reilly, 2000), p. 407.

specific address
physical network

database that maps network addresses to network names. This mapping is required for nearly every network transaction. For example, in order to visit "www.rhizome.org" on the Internet one's computer must first translate the name "www.rhizome.org," itself geographically vague, into a specific address on the physical network. These specific addresses are called IP addresses and are written as a series of four numbers like so: 206.252.131.211.

All DNS information is controlled in a hierarchical, inverted-tree structure. Ironically, then, nearly all Web traffic must submit to a hierarchical structure (DNS) to gain access to the anarchic and radically horizontal structure of the Internet. As I demonstrate later, this contradictory logic is rampant throughout the apparatus of protocol.

The process of converting domain names to IP addresses is called *resolution*. At the top of this inverted tree are a handful of so-called "root" servers holding ultimate control and delegating lesser control to lower branches in the hierarchy. There are over a dozen root servers located around the world in places like Japan and Europe, as well as in several U.S. locations.

where
root &

To follow the branches of control, one must parse the address in reverse, starting with the top-level domain, in this case "org." First, the root server receives a request from the user and directs the user to another machine that has authority over the "org" domain, which in turn directs the user to another machine that has authority over the "rhizome" subsection, which in turn returns the IP address for the specific machine known as "www."

Only the computer at the end of the branch knows about its immediate neighborhood, and thus it is the only machine with authoritative DNS information. In other words resolution happens like this: A new branch of the tree is followed at each successive segment, allowing the user to find the authoritative DNS source machine and thus to derive the IP address from the domain name. Once the IP address is known, the network transaction can proceed normally.

Because the DNS system is structured like an inverted tree, each branch of the tree holds absolute control over everything below it. For example, in the winter of 1999, a lawsuit was brought against the Swiss art group Etoy. Even though the basis of the lawsuit was questionable and was later dropped, the courts would have been able to "turn off" the artist's Web site during the course of the trail by simply removing DNS support for "etoy.com." (Instead the artists were forced to pull the plug themselves until after the trial was over.)

A similar incident happened at The Thing, an Internet service provider based in New York who was hosting some of Etoy's agitprop. After some of this material was deemed politically questionable by the Federal Bureau of Investigation, the whole server was yanked off the Internet by the telecommunications company who happened to be immediately upstream from the provider. The Thing had no recourse but to comply with this hierarchical system of control.

The inventor of the World Wide Web, Tim Berners-Lee, describes the DNS system as the "one centralized Achilles' heel by which [the Web] can all be brought down or controlled."[12]

If hypothetically some controlling authority wished to ban China from the Internet (e.g., during an outbreak of hostilities), they could do so very easily through a simple modification of the information contained in the root servers at the top of the inverted tree. Within twenty-four hours, China would vanish from the Internet.

As DNS renegade and Name.Space founder Paul Garrin writes: "With the stroke of a delete key, whole countries can be blacked out from the rest of the net. With the "." [root file] centralized, this is easily done. . . . Control the "." and you control access."[13] Since the root servers are at the top, they have ultimate control over the existence (but not necessarily the content) of each lesser branch. Without the foundational support of the root servers, all lesser branches of the DNS network become unusable. Such a reality should shatter our image of the Internet as a vast, uncontrollable meshwork.

Any networked relation will have multiple, nested protocols. To steal an insight from Marshall McLuhan, *the content of every new protocol is always another protocol.* Take, for example, a typical transaction on the World Wide Web. A Web page containing text and graphics (themselves protocological artifacts) is marked up in the HTML protocol. The protocol known as Hypertext Transfer Protocol (HTTP) encapsulates this HTML object and allows it to be served by an Internet host. However, both client and host must abide by the TCP protocol to ensure that the HTTP object arrives in one piece. Finally, TCP is itself nested within the Internet Protocol, a protocol

12. Tim Berners-Lee, *Weaving the Web* (New York: HarperCollins, 1999), p. 126.

13. Paul Garrin, "DNS: Long Winded and Short Sighted," *Nettime,* October 19, 1998.

that is in charge of actually moving data packets from one machine to another. Ultimately the entire bundle (the primary data object encapsulated within each successive protocol) is transported according to the rules of the only "privileged" protocol, that of the physical media itself (fiber-optic cables, telephone lines, air waves, etc.). The flexible networks and flows identified in the world economy by Manuel Castells and other anchormen of the Third Machine Age are not mere metaphors; they are in fact built directly into the technical specifications of network protocols. By design, protocols such as the Internet Protocol *cannot be centralized.*

Protocol's native landscape is the distributed network. Following Deleuze, I consider the distributed network to be an important *diagram* for our current social formation. Deleuze defines the diagram as "a map, a cartography that is coextensive with the whole social field."[14] The distributed network is such a map, for it extends deeply into the social field of the new millennium. (I explore this point in greater detail in chapter 1.)

A distributed network differs from other networks such as centralized and decentralized networks in the arrangement of its internal structure. A centralized network consists of a single central power point (a host), from which are attached radial nodes. The central point is connected to all of the satellite nodes, which are themselves connected only to the central host. A decentralized network, on the other hand, has *multiple* central hosts, each with its own set of satellite nodes. A satellite node may have connectivity with one or more hosts, but not with other nodes. Communication generally travels unidirectionally within both centralized and decentralized networks: from the central trunks to the radial leaves.

The distributed network is an entirely different matter. Distributed networks are native to Deleuze's control societies. Each point in a distributed network is neither a central hub nor a satellite node—there are neither trunks nor leaves. The network contains nothing but "intelligent end-point systems that are self-deterministic, allowing each end-point system to communicate with any host it chooses."[15] Like the rhizome, each node in a distributed network may establish direct communication with another node,

14. Deleuze, *Foucault,* p. 34.

15. Hall, *Internet Core Protocols,* p. 6.

without having to appeal to a hierarchical intermediary. Yet in order to initiate communication, the two nodes must *speak the same language*. This is why protocol is important. Shared protocols are what defines the landscape of the network—who is connected to whom.

As architect Branden Hookway writes: "[d]istributed systems require for their operation a homogenous standard of interconnectivity."[16] Compatible protocols lead to network articulation, while incompatible protocols lead to network disarticulation. For example, two computers running the DNS addressing protocol will be able to communicate effectively with each other about network addresses. Sharing the DNS protocol allows them to be networked. However, the same computers will not be able to communicate with foreign devices running, for example, the NIS addressing protocol or the WINS protocol.[17] Without a shared protocol, there is no network.

I turn now to Michel Foucault to derive one final quality of protocol, the special existence of protocol in the "privileged" physical media of *bodies*. Protocol is not merely confined to the digital world. As Deleuze shows in the "Postscript on Control Societies," protocological control also affects the functioning of bodies within social space and the creation of these bodies into forms of "artificial life" that are *dividuated,*[18] sampled, and coded. "Artificial life" is a term I use in chapter 3 to describe protocol *within the sociopolitical theater.* Artificial life simply means the active production of vital forms by other vital forms—what Foucault calls the "work of the self on the self."

I later suggest that Foucault's relationship to life forms is a protocological one. This is expressed most clearly in his later work, particularly in the twin concepts of biopolitics and biopower. Foucault defines biopolitics as "the endeavor, begun in the eighteenth century, to rationalize the problems presented to governmental practice by the phenomena characteristic of a

16. Branden Hookway, *Pandemonium: The Rise of Predatory Locales in the Postwar World* (New York: Princeton Architectural Press, 1999), p. 77.

17. WINS, or Windows Internet Name Service, is an addressing technology developed by Microsoft for distributed networks; NIS, or Network Information Service, is a similar technology developed by Sun Microsystems.

18. Deleuze's neologism comes from the word "*in*dividuate." Dividuation would thus be the opposite: the dissolving of individual identity into distributed networks of information.

group of living human beings constituted as a population: health, sanitation, birthrate, longevity, race."[19] Thus one can assume that technologies like biometrics and statistical analysis—from the Bertillon identification system, to the Social Security Act of 1935, to the tabulation of birth rates by the Children's Defense Fund—all fall into the category biopolitics.

Further, he writes that biopolitics "tends to treat the 'population' as a mass of living and coexisting beings who present particular biological and pathological traits and who thus come under specific knowledge and technologies."[20] Biopolitics, then, connects to a certain statistical knowledge about populations. It is a species-knowledge (an expression that sounds less ominous if one considers an allusion to Marx's utopian concept of "species-being").

Still, Foucault puts equal stress on "technologies" and "knowledge" in his definition of biopolitics. But which technologies in particular would correspond to Foucault's biopolitical scenario? I argue here that they are the distributed forms of management that characterize the contemporary computer network and within which protocological control exists.

In *The History of Sexuality, Volume 1,* Foucault contrasts the older power of the sovereign over life (one characterized by the metaphysical concern of either the absence or presence of life) to a new mode in which life is either created or destroyed: "One might say that the ancient right to *take* life or *let* live was replaced by a power to *foster* life or *disallow* it to the point of death."[21] He continues: "The old power of death that symbolized sovereign power was now carefully supplanted by the *administration of bodies* and the *calculated management of life.*"[22] Foucault's treatment of biopower is entirely protocological. Protocol is to control societies as the panopticon is to disciplinary societies.

While protocol may be more *democratic* than the panopticon in that it strives to eliminate hierarchy, it is still very much structured around command and control and therefore has spawned counter-protocological forces.

19. Michel Foucault, *Ethics: Subjectivity and Truth,* ed. Paul Rabinow (New York: New Press, 1997), p. 73.

20. Foucault, *Ethics,* p. 71.

21. Michel Foucault, *The History of Sexuality, Volume 1,* trans. Robert Hurley (New York: Vintage, 1978), p. 138.

22. Foucault, *The History of Sexuality, Volume 1,* pp. 138–140, emphasis mine.

Deleuze recognized this, that the very site of Foucault's biopower was also a site of resistance.

Lest readers overlook its importance, he repeats his realization three times consecutively in an important section of his book *Foucault:* "[1] When power . . . takes life as its aim or object, then resistance to power already puts itself on the side of life, and turns life against power. . . . [2] Life becomes resistance to power when power takes life as its object. . . . [3] When power becomes bio-power resistance becomes the power of life, a vital power that cannot be confined within species, environment or the paths of a particular diagram."[23] Is *life resistance* a way of engaging with distributed forms of protocological management?

Part III of this book, "Protocol Futures," answers yes. While the new networked technologies have forced an ever more reticent public to adapt to the control structures of global capital, there has emerged a new set of social practices that inflects or otherwise diverts these protocological flows toward the goal of a utopian form of unalienated social life.

What is wrong with protocol? To steal a line from Foucault, it's not that protocol is bad but that protocol is *dangerous*. To refuse protocol, then, is not so much to reject today's technologies as did Theodore Kaczynski (the Unabomber), but to direct these protocological technologies, whose distributed structure is empowering indeed, toward what Hans Magnus Enzensberger calls an "emancipated media" created by active social actors rather than passive users.[24]

As Deleuze remarked to Antonio Negri several years ago:

> It's true that, even before control societies are fully in place, forms of delinquency or resistance (two different things) are also appearing. Computer piracy and viruses, for example, will replace strikes and what the nineteenth century called "sabotage" . . . You ask whether control or communication societies will lead to forms of resistance that might reopen the way for a communism . . . The key thing may be to create vacuoles of noncommunication, circuit breakers, so we can elude control.[25]

The key here is less the eluding or the breaking or the *non*communication, but simply that Deleuze had the foresight to situate resistive action *within the protocological field.* In the same way that biopower is a species-level knowledge, protocol is a type of species-knowledge for coded life forms. Each new diagram, each new technology, each new management style both is an improvement on the previous one and contains with it a germ that must grow into a still higher form. I am not suggesting that one should learn to love the various apparatuses of control, but rather that, for all its faults, protocological control is still an improvement over other modes of social control. I hope to show in this book that it is *through* protocol that one must guide one's efforts, not against it.

"No more vapor theory anymore," wrote Geert Lovink. Vapor theory tends to ignore the computer itself. The computer is often eclipsed by that more familiar thing, information society. Mine is not a book about information society, but about the real machines that live within that society.

Thus, my study skips direct engagement with the work of Alvin Toffler, Peter Drucker, Daniel Bell, and others who discuss the third phase of capitalist development in social terms.

The large mass of literature devoted to artificial intelligence and speculations about the consciousness (or lack thereof) within man and machine is also largely avoided in this book. Writers like Ray Kurzweil forecast a utopian superfuture dominated by immortal man-machine hybrids. Hans Moravec predicts a similar future, only one less populated by humans who are said to "retire" to the mercy of their ascendant computerized progeny.

Marvin Minsky, Daniel Dennett, John Searle, Hubert Dreyfus, and others have also wrestled with the topic of artificial intelligence. But they are not addressed here. I draw a critical distinction between this body of work, which is concerned largely with epistemology and cognitive science, and the critical media theory that inspires this book. Where they are concerned with

23. Deleuze, *Foucault,* p. 92.

24. Natalie Jeremijenko uses the rubric of "structures of participation" to think about how certain implementations of technology promote active user involvement and understanding while other technologies obfuscate understanding and control user involvement.

25. Gilles Deleuze, "Control and Becoming," in *Negotiations,* trans. Martin Joughin (New York: Columbia University Press, 1990), p. 175.

minds and questions epistemological, I am largely concerned with bodies and the material stratum of computer technology.

My study also ignores the large mass of popular responses to the new technological age, such as Nicholas Negroponte's *Being Digital,* whose gee-whiz descriptions of the incredible *newness* of new technologies seem already dated and thin.

Except for chapter 4, this is largely *not* a book about issues specifically relating to law, Internet governance, state sovereignty, commercial power, or the like. Several books already do an excellent job covering these issues including Milton Mueller's *Ruling the Root.*

While my ultimate indebtedness to many of these authors will be obvious, it is not my goal to examine the social or culturo-historical characteristics of informatization, artificial intelligence, or virtual anything, but rather to study computers as André Bazin studied film or Roland Barthes studied the striptease: to look at a material technology and analyze its specific formal functions and dysfunctions.

To that end this book focuses on distributed computer networks and the protocological system of control present within them. I hope to build on texts such as Friedrich Kittler's groundbreaking *Discourse Networks, 1800/1900,* which describes the paradigm shift from a discourse driven by meaning and sense, to our present milieu of pattern and code. Kittler's two ages, symbolized by the two years 1800 and 1900, correspond structurally (but less so chronologically) to the social periodization supplied by Foucault and Deleuze. The passage from the modern disciplinary societies to those of the control societies, as I have already suggested, is the single most important historical transformation in this book.

Norbert Wiener is also an important character. His books laid important groundwork for how control works within physical bodies. The provocative but tantalizingly thin *Pandemonium: The Rise of Predatory Locales in the Postwar World* from architect Branden Hookway, looks at how cybernetic bodies permeate twentieth-century life. Other important theorists from the field of computer and media studies who have influenced me include Vannevar Bush, Hans Magnus Enzensberger, Marshall McLuhan, Lewis Mumford, and Alan Turing.

I am also inspired by Lovink's new school of media theory known as Net criticism. This loose international grouping of critics and practitioners has grown up with the Internet and includes the pioneering work of Hakim Bey

and Critical Art Ensemble, as well as newer material from Timothy Druckrey, Marina Gržinić, Lev Manovich, Sadie Plant, and many others. Much of this intellectual work has taken place in online venues such as *CTHEORY, Nettime,* and *Rhizome,* plus conferences such as the annual Ars Electronica festival and the Next 5 Minutes series on tactical media.

Although my book is heavily influenced by film and video theory, I include here little discussion of media formats prior to the digital computer.[26] I gain much of my momentum by relying on the specificity of the digital computer as a medium, not its similarity to other visual media. In my estimation, it makes little sense to try to fit non-protocological and nondistributed media such as film and video into this new context—in the same way that it makes little sense to speak of the aura of a Web page, or the essence of a digital text. Nevertheless the history of avant-garde artistic production, from modernist painting to conceptual art, significantly influences my perspective vis-à-vis work being done today.

While lay readers may group all literature dealing with new technologies under the general heading informatization, there is an alternate path that I attempt to follow in this book. This alternate path recognizes the material substrate of media, and the historical processes that alter and create it. It attempts to chart what Manuel DeLanda calls "institutional ecologies." He writes here of the history of warfare, but it could easily refer to digital computing:

> I would like to repeat my call for more realistic models of economic history, models involving the full complexity of the institutional ecologies involved, including markets, anti-markets, military and bureaucratic institutions, and if we are to believe Michel Foucault, schools, hospitals, prisons, and many others. It is only through an honest philosophical confrontation with our complex past that we can expect to understand it and derive the lessons we may use when intervening in the present and speculating about the future.[27]

---

26. For an anthology of recent writing on the confluence of cinematic practices and new media, see Martin Rieser and Andrea Zapp, eds., *New Screen Media: Cinema/Art/Narrative* (London: BFI, 2002).

27. Manuel DeLanda, "Economics, Computers, and the War Machine," in *Ars Electronica: Facing the Future,* ed. Timothy Druckrey (Cambridge: MIT Press, 1999), p. 325.