Foreword: Protocol Is as Protocol Does

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There's a scene in the 1982 film *Tron,* in which Kevin Flynn, a computer programmer by day and hacker by night, gets sucked into the digital world of computers. There he meets software programs, each with personalities and identities of their own, held hostage by the "MCP" or "Master Control Program," a kind of despotic operating system that absorbs all software and all parts of the network into itself. One of the hostage programs named Tron, a security application leading a revolution against the MCP, asks Flynn about the mysteries of the world of "Users."

Flynn: I'm what you guys call a "User" . . .
Tron: Well if you are a user, then everything you've done has been according to a plan right?
Flynn: (laughs) You wish . . . you guys know what it's like, you keep on doing wha it looks like you're supposed to be doing, no matter how crazy it seems.
Tron: That's the way it is with programs, yes, but—
Flynn: I hate to disappoint you pal, but most of the time that's the way it is for use too . . .

Tron was made by Disney Studios in the early 1980s as part of an attem to reinvent itself for a new generation of potential consumers. In particula *Tron* was indicative of a particular type of early 1980s culture, one in whic "personal" computers were becoming more and more ubiquitous, along wi a booming video game industry and an equally large, middle-class geek cu ture to go with it. It was also a culture of perceived conflicts between cor puter mega-corporations and an emerging hacker subculture, both hatch

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in the midst of Reaganomics and the Japanese microelectronics boom. The list of gadgets spawned during this period has now entered the cultural museum of dead technology: video game arcades, Atari home consoles, Casio synthesizers, Commodore home computers, floppy disks, laserdiscs, the Walkman, and of course the neon lights of 1980s new wave music. It was from within this 1980s moment that William Gibson crafted the world of *Neuromancer,* and all of this is already making a comeback in the cultural nostalgia of "electroclash."

But more than being about fashion, the American middle-class youth culture *Tron* targeted was also one that existed during significant technological transformations, transformations we are still understanding today. The development of the personal computer, along with computer networks, has had a profound, stratified impact on the way in which social, political, and economic life is experienced. Recent discussions of the post-industrial society, the information society, the network society, disciplinary society, control society, informatization, scale-free networks, small worlds, and smart mobs are all ways of attempting to understand how social change is indissociable from technological development (research, design, use, distribution, marketing, naturalization, consumption)—though not determined by it. This last point is crucial. If one is to foster an understanding and awareness of how the social and the political are not external to technology, then it is important to understand how the technological is in some sense isomorphic to the social and the political.

This book—*Protocol*—points to one possible path for doing this. Throughout the discussions on power, control, and decentralization, *Protocol* consistently makes a case for a material understanding of technology. "Material" can be taken in all senses of the term, as an ontological category as well as a political and economic one. This type of materialist media studies shows how the question "how does it work?" is also the question "whom does it work for?" In short, the technical specs matter, ontologically and politically. As Galloway states here, "I attempt to read the never-ending stream of computer code as we read any text, decoding its structure of control." But this is clearly not literary criticism. Nor is it semiotics—textual, visual, or otherwise. This is because computer code is always enacted. Code is a set of procedures, actions, and practices, designed in particular ways to achieve particular ends in particular contexts. Code = praxis.

Protocol puts forth an invitation, a challenge to us: You have not sufficiently understood power relationships in the control society unless you have understood "how it works" and "who it works for." *Protocol* suggests that it is not only worthwhile, but also necessary to have a technical as well as theoretical understanding of any given technology. "Reading" code is thus more programming or development or debugging than explanation. In this sense, *Protocol* aims less to explain the society of control than to experiment with it; in fact, it might just as well be subtitled "experiments with code."

Which brings us to the following comments. *Protocol* implicitly makes three important points in its experiments with information networks, computer software, and industry standardization. The first has to do with how *Protocol* qualifies networks, the second point has to do with how *Protocol* understands the technical specs as political, and the last point looks toward possible future directions to be explored in the meeting of info-tech and bio-tech, info-politics and bio-politics.

Networks Are Real but Abstract

The first point is that networks are not metaphors. As Galloway states, "Protocols do not perform any interpretation themselves; that is, they encapsulate information inside various wrappers, while remaining relatively indifferent to the content of information contained within." The concept of "protocol" is thus meant to demonstrate the nonmetaphorical quality of networks. Or, put another way, the concept of protocol shows the predilection for general discussion of networks in terms of general tropes. Networks are not tropes for notions of "interconnection." They are material technologies, sites of variable practices, actions, and movements. This is, perhaps, stated too strongly. Yes, metaphors do materialize and corporealize, and, in some sense, metaphor is consonant with language itself. But discussions of networks—especially in cultural theory—have too often slipped into "vapor theory," eliding a specific consideration of the material substrate and infrastructure with a general discussion of links, webs, and globalized connectivity. "Protocol is a circuit, not a sentence." Further, code is not necessarily language, and certainly not a sign. A code, in the sense that *Protocol* defines it, is process-based: It is parsed, compiled, procedural or object-oriented, and defined by ontology standards. A code is a series of activated mechanical gears, or a stack of punched cards circulating through a tape-reading machine, or a flow

of light-pulses or bits in a transistor or on silicon, or a vat of binding interactions between DNA fragments.

When the book suggests that networks are not metaphors (or not merely metaphors), the dichotomy is not one between material and immaterial, but rather between two types of "abstract." On the one hand there is an abstract use of the concept of networks generally to signify any relationship between discrete entities. According to this usage, just about anything can be seen as a network (and thus the overwhelmingly wide application of certain network science or complexity approaches). But there is also another meaning of "abstract," one that is not the opposite of concrete. An abstract that is real is a potential. (Henri Bergson uses the term "virtual" for the immanent unfolding of duration as potentiality.) This is not the abstract use of network as a term, and neither is it an abstraction of a technical term (the metaphorization of technological terms). Rather, this abstract-but-real is the network that is always enacted and always about to enact itself. One can pose the question: Is a network a network if it is not being used? Is the Internet a network because of its fiber-optic cables, its usage, its data transfer, the standards for such use, or the concepts that inform the development of network technology itself? Likely all of these. With multiple local agencies and several interests at stake, information networks like the Internet are always about to do something. In this sense networks are constantly materializing their logics (their formal logics as much as their organizational and political logics). The network as real-but-abstract may involve "information" as an immaterial entity, but that information always works toward real effects and transformations, no matter how localized.

Thus, in an important way, networks are not metaphors. The network metaphor is misleading, limiting. It only provides a general model for discussing relationships (linking, hybridity, boundaries, heterogeneity, etc.). As a cultural metaphor, networks only raise general issues of interrelationality. The discourse of cyberspace and the "information superhighway" is exemplary. Positions boil down to either the libertarian (information-wants-to-be-free) or the bureaucratic (gated access to information). Thus with the network metaphor, one can only see a nebulous thing called "information" that mysteriously exists on an equally nebulous thing called cyberspace or the Internet. Studying user interaction only adds to the confusion, bringing in the language of individual agency and accountability to a space that, to cite Jorge Luis Borges, has its center nowhere, its circumference everywhere.

Understanding networks not as metaphors, but as materialized and materializing media, is an important step toward diversifying and complexifying our understanding of power relationships in control societies. With the network metaphor, one only has a tool that does something in accordance to the agency of the human-user (a computer that downloads at your command, an information network that makes everything freely accessible at the click of a mouse, etc.). Click-download, cause-effect. If we dispense with convenient metaphors and actually ask how a network functions (not "what is it?" but "what does it do?"), then several noteworthy realizations emerge. This is what *Protocol* does. It asks how a particular type of network functions—the information networks that undergird the Internet. It shows how a network is not simply a free-for-all of information "out there," nor is it a dystopia of databanks owned by corporations. It is a set of technical procedures for defining, managing, modulating, and distributing information throughout a flexible yet robust delivery infrastructure. More than that, this infrastructure and set of procedures grows out of U.S. government and military interests in developing high-technology communications capabilities (from ARPA to DARPA to dot-coms). At an even finer level of detail, the Internet is not a simple "ask and you shall receive" tool. It is constituted by a bi-level logic that *Protocol* patiently explains. On the one hand, TCP/IP (Transmission Control Protocol/Internet Protocol) enables the Internet to create horizontal distributions of information from one computer to another. On the other, the DNS (Domain Name System) vertically stratifies that horizontal logic through a set of regulatory bodies that manage Internet addresses and names. Understanding these two dynamics in the Internet means understanding the essential ambivalence in the way that power functions in control societies. As *Protocol* states, "the founding principle of the Net is control, not freedom—control has existed from the beginning." To grasp "protocol" is to grasp the technical and the political dynamics of TCP/IP and DNS at the same time.

What are some common metaphoric uses of networks that *Protocol* resists? One is that networks are synonymous with connectivity (and that connectivity is always good). Tropes of links, nets, webs, and a general relationality also stem from this use of networks. Pop science writing on network science or the gee-whiz rhetoric of magazines such as *Wired* often adopt a quantitative politics: If information wants to be free, then more connectivity equals more freedom.

But the concept of "protocol" is as concerned with disconnection as it is with connectivity. The moment of disconnectivity is the moment when protocol most forcefully displays its political character. Disconnectivity can occur in a number of ways, from a personal dialup disconnected due to a time limit imposed by a commercial ISP, to the management (or surveillance) of large-scale networks involved in political activism. The analysis in part III below of hacking, computer viruses, and the tactical appropriation of both by cyberfeminism provides a set of examples for how disconnectivity can be as instrumental for protocol's (mal)functioning as is connectivity.

Aside from the trope of connectivity, another common metaphorical use of networks that *Protocol* resists is that of collectivity (and that collectivity is always inclusive). Here the language of incorporation, integration, and the constant struggle to include "the other" come together in discussions of virtual communities and online social services providing niche markets for every "difference."

But information protocols are always layered, stratified, sometimes blatantly hierarchical. *Protocol*'s analysis of the DNS system, and the management of "nodes" on the network, is exemplary in this case. The creation of standards is also the prescription of a range of practices that are legitimized (or delegitimized) within those standards. The example of the Name.Space project is instructive because it points to the ways in which both normativity as well as resistance are hardcoded into such standardization procedures. Again, the mere technical details, such as RFCs, suddenly become the grounds for contesting the way in which control takes shape in the materiality of networks.

To the common metaphors of connectivity and collectivity that are problematized, we can add a third, which is participation. Networks are participatory, even democratic (by nature). The notion of networks as participatory has led to much confusion regarding the status of individual and collective agency in such networks. This is the more prescient as the Web becomes a primary nexus of consumer culture, encompassing the production of commodities, information services, communication practices, and changing habits of consumption.

It is this naturalization of participation in networks that is particularly problematic. IRC, online gaming, blogs, e-registration, webcams, and online polls reiterate again and again the inherently participatory nature of the

Web. But one does not have to look far for instances in which some information was not meant to be free, instances in which participation is denaturalized, coded into secure servers, e-surveillance, predatory locales, and a new kind of gated community. The information surveillance practiced by the U.S. government on profiled Muslim individuals and groups is only the most explicit example. However, resistance is built in. The examples of "software art," open source activities, and network politics (such as the Electronic Disturbance Theater) all provide examples of potentials for "counterprotocol" practices.

A recent case helps to show how the vague utilization of network metaphors (connectivity, collectivity, participation) can be problematized in specific contexts. An example is The Thing, a New York-based, nonprofit ISP and virtual community dedicated to art, politics, and the open discussion of a range of cultural and political issues. On December 4, 2002, The Thing's connection was interrupted by Verio, its network provider, on the grounds that The Thing had infringed its service contract with Verio. The contract was terminated a short while later, leaving The Thing, its members, participants, and some two hundred projects in limbo. According to Verio, the perceived cause of the disconnection was an art-activist group known as The Yes Men. On the eighteenth anniversary of the Bhopal disaster, in which a Union Carbide/Dow chemical accident resulted in the illness and death of thousands of Bhopal citizens, The Yes Men had circulated a fabricated press release from the Dow corporation disavowing any responsibility for the accident. The fake press release was intended not only to continue to raise awareness of such incidents, but to raise issues concerning ongoing discourses of globalism and corporate management of information networks. Dow, notified of the fake press release, filed a DMCA (Digital Millennium Copyright Act) notice to Verio. Verio temporarily, and then permanently, pulled the plug on The Thing, as the ISP hosting The Yes Men's website.

Is this an instance of censorship? Is it protocol malfunctioning or functioning too well? Do the politics of this disconnectivity affect the Bhopal community itself? Do policies regarding information content (DMCA) actually encourage such regulation? These are complex questions which have arisen from this event, one that has been made possible by the dual nature of the Internet that *Protocol* points to: its horizontality (community networks; TCP/IP) and its verticality (its stratification; DNS).

Protocol, or Political Economy

If, in the discourses surrounding networks, the tropes of connectivity, collectivity, and participation obscure the material practices of networks, *Protocol* points to several principles for understanding networks as "a diagram, a technology, and a management style." To begin with, general talk about "networks," dissociated from their context and technical instantiation, can be replaced by a discussion of "protocols." Every network is a network because it is constituted by a protocol. If networks display any of the tropes described previously, it is because there is an infrastructure that enables such properties to emerge. Not networks, but protocols.

Given this, *Protocol* can be read as a book of political economy. It argues for a methodological shift from a generalized understanding of networks to a specified one, in which the protocological systems of TCP/IP and DNS operate as what Foucault termed "political technologies." Foucault's later work on biopower and biopolitics is significant in this respect, for while Foucault never reduced technology to an empirical "thing," his analyses of institutions always emphasize the various correlations between bodies and things. *Protocol* adopts a similar methodological outlook, considering technical standards (such as the OSI Reference Model), network technologies (HTTP), institutional histories (IEEE), and, significantly, instances of "tactical media."

Above all, the political economy of protocol is that of management, modulation, and control. Technically and politically the "control society" emerges as much from cybernetics research as it does from a military-industrial imperative toward the "governmentality" of information systems. This historical backdrop sets the stage for the various periodizations and mutations in the life of protocol. At the center of such changes is the issue of political and technological adaptation, situated between centralized control and decentralized regulation.

As a political economy, protocol modulates, regulates, and manages the interrelationality between vital systems. In this sense, a "vital system" is not just a living, biological system, nor is it nineteenth-century "vitalism," or worse, animism. Vital systems have to be understood from the perspective of protocological control. While it may be a truism that the body stands in relation to, but never identical with, technology, protocological control makes different cuts. *Protocol* considers networks through a "diagram," a term borrowed from Gilles Deleuze. *Protocol* considers first a network as a set of nodes and edges, dots and lines. The dots may be computers (server, client, or both),

human users, communities, LANs, corporations, even countries. The lines can be any practice, action, or event effectuated by the dots (downloading, emailing, connecting, encrypting, buying, logging on, port scanning). With this basic "diagram" you can do a number of things. You can connect the dots—all of them—making a totally connected, distributed network with more than one path to the destination. You can also disconnect dots, even delete dots (no paths, no destination). You can filter out which dots are connected to the network. You can create portals for the addition of future dots. You can designate which kinds of lines you want between the dots (for not all lines are equal; some diverge, flee; others converge, coalesce). In short, a network-as-diagram offers all sorts of possibilities for organization, regulation, and management.

But this is depending, of course, on the agencies responsible for the network-as-diagram. As *Protocol* makes clear, there are few instances in which a clearly demarcated, centralized network control is evident. Paraphrasing Foucault, such instances occur only at the terminal ends of power relationships. The central political question that *Protocol* asks is where the power has gone. If we are indeed living in a post-industrial, postmodern, postdemocratic society, how does one account for political agency in situations in which agency appears to be either caught in networks of power or distributed across multiple agencies?

By looking closely and carefully at the technical specifications of TCP/IP and DNS, *Protocol* suggests that power relations are in the process of being transformed in a way that is resonant with the flexibility and constraints of information technology. The Internet is not simply "open" or "closed" but above all a form that is modulated. The very concept of packet-switching demonstrates this on several levels, from the efficiency standards of routing during a download, to the ways in which each individual datagram is tagged for delivery to your email account or hard drive. Information does flow, but it does so in a highly regulated manner. This dual property (regulated flow) is central to *Protocol*'s analysis of the Internet as a political technology.

Isomorphic Biopolitics

As a final comment, it is worthwhile to note that the concept of "protocol" is related to a biopolitical production, a production of the possibility for experience in control societies. It is in this sense that *Protocol* is doubly materialist—in the sense of networked bodies inscribed by informatics, and

in the sense of this bio-informatic network producing the conditions of experience.

The biopolitical dimension of protocol is one of the parts of this book that opens onto future challenges. As the biological and life sciences become more and more integrated with computer and networking technology, the familiar line between the body and technology, between biologies and machines, begins to undergo a set of transformations. "Populations" defined nationally or ethnically are also defined informatically. (Witness the growing business of population genomics.) Individual subjects are not only civil subjects, but also medical subjects for a medicine increasingly influenced by genetic science. The ongoing research and clinical trials in gene therapy, regenerative medicine, and genetic diagnostics reiterate the notion of the biomedical subject as being in some way amenable to a database. In addition to this bio-informatic encapsulation of individual and collective bodies, the transactions and economies between bodies are also being affected. Research into stem cells has ushered in a new era of molecular bodies that not only are self-generating like a reservoir (a new type of tissue banking), but that also create a tissue economy of potential biologies (lab-grown tissues and organs).

Such biotechnologies often seem more science fiction than science, and indeed health care systems are far from fully integrating such emerging research into routine medical practice. In addition, this seems to be far from the "dry" world of bits and data transfer. So then, what is the relation between protocol and biopolitics?

One response is that protocol is isomorphic with biopolitics. Another way of saying the same thing is that "information" is often taken to be isomorphic with vital forms. There is an uneasy dialectic here between a living computer (artificial life) and the programming of life (genetic engineering). From the perspective of protocol, the nature/culture, body/technology binarisms do not matter. Literally. Rather, what matters is the ability of protocol to operate across material-energetic substrates. This, in itself, is not "bad," and as *Protocol* suggests, the question is not one of morality, but rather of ethics. Interests are at stake. From the perspective of protocol, there are no biologies, no technologies, only the possible interactions between "vital forms" which often take on a regulatory, managerial, and normative shape. This can be called biopolitics. In the context of protocol, the reach between info-tech and bio-tech is enabled by several technical concepts.

Layering is a central concept of the regulation of information transfer in the Internet protocols. Layering allows data to find its way into the correct application on your computer, so that an MP3 download is not misunderstood as a Word document, or a virus is not mistaken as a browser plug-in. A datagram coming into your computer moves from the lower levels (encoding of packets) to the higher levels (use by applications). Further, *Protocol* suggests that there exists a layering between the biological and the political. A signaling pathway between two proteins is layered into a disease predisposition pathway in a genome, which is layered onto a genome database, which is layered onto a statistical and demographic record of disease occurrence, which is layered onto research funds going toward biowarfare detection technologies, which is layered into popular science journalism or even science fiction film. Note that some of these layerings are more metaphorical, while others are almost exclusively technical. Sometimes the layering is quite sedimented, there being only one way in, one way out. At other times the layering shifts, rearranges itself, nature not necessarily preceding culture, culture not necessarily preceding nature.

Portability is a central characteristic of software development. Mac or PC? Netscape or IE? The ability to enable software and files to operate across different proprietary standards is a key aspect of software development. In a sense, layering cannot happen without at least a cursory consideration of portability. Portability is not always the will to make something portable; more often than not it is the strategic disabling of portability that is of concern to software companies. If the biological body is a genetic code, and if the genome is a kind of computer, then it follows that the main area of interest for portability will be between the biological body of the patient and the informatic body of the computer database or profile. Despite the ongoing discussion over cloning or gene therapy, some suggest that it will be diagnostic tools that guarantee financial sustainability for the biotech and pharmaceutical industries. The key to that success will be the portability between the two types of genetic codes: one in vivo, one in silico.

Ontology standards is a strange name for agreed-upon code conventions, but in some circles it is regularly used to signify just that. Newer, more flexible markup languages such as XML (Extensible Markup Language) have made it possible for researchers (be they biologists or engineers) to come up with a coding schema tailored to their discipline. XML-based efforts in

molecular biology and biochemistry have been one area of concern. But agreeing upon what exactly that standard code will be is another matter. Should the hierarchy of tags for GEML (Gene Expression Markup Language) go by <chromosome>, <phenotype>, or <gene>? There are a range of vested interests (commercial, ideological, institutional, methodological, disciplinary), and the mere decision about standards becomes a discourse on "ontology" in the philosophical sense. If layering is dependent upon portability, then portability is in turn enabled by the existence of ontology standards.

These are some of the sites that *Protocol* opens up concerning the possible relations between information and biological networks. While the concept of biopolitics is often used at its most general level, *Protocol* asks us to respecify biopolitics in the age of biotechnology and bioinformatics. Thus one site of future engagement is in the zones where info-tech and bio-tech intersect. The "wet" biological body has not simply been superceded by "dry" computer code, just as the wet body no longer accounts for the virtual body. Biotechnologies of all sorts demonstrate this to us—in vivo tissue engineering, ethnic genome projects, gene-finding software, unregulated genetically modified foods, portable DNA diagnostics kits, and distributed proteomic computing. Protocological control in biopolitical contexts is not just the means, but the medium for the development of new forms of management, regulation, and control.

On a general level, *Protocol* provides a set of concepts, or a toolbox, to use Deleuze's phrase. These concept-tools are not so much instruments or hammers, but rather soft machines for interrogating the political-technical dynamics of information and computer technologies, especially as they pertain to networks of all types. *Protocol* can in this sense be read as a technical manual, one that fosters working with, intervening in, and building awareness of our current "political technologies." This is the kind of book that asks us not to interpret, but to experiment.