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CLOUD CONTROL, or The NETWORK as MEDIUM

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ABSTRACT ***Cloud computing*** **is an increasingly commonplace term today, used to describe the relocation of hardware resources, programs, and data from individual, local machines to a network accessible from a variety of platforms and devices. In unpicking the complex cultural logic that cloud computing emblematizes, this essay analyzes the connections between the interrelated histories of cybernetics, computing, and distributed networks and the emerging economic models that ubiquitous networked computing facilitates.**

KEYWORDS: cloud computing, networks, cybernetics, critique

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Rise, my sisters, Clouds eternal,
Shining bright with morning dew,
From the roaring Ocean's bosom
To the sky, the world to view.

—Aristophanes, *The Clouds*

THE CULTURAL POLITICS OF THE CLOUD

What can a cloud do for us? What can a cloud do *to* us? In the light of the current ubiquity of cloud computing both as an industrial infrastructure and as a conceptual reframing of computer technology, these questions foreground a critical contradiction through which a political analysis of informatic culture might be possible. This particular contradiction—between the specific material possibilities and limitations afforded by computer technologies and the way these technologies are culturally framed as immaterial sources of boundless possibility—is in fact doubly useful for critical engagement with informatic culture. First, it is the analysis of contradiction in general that, for Fredric Jameson (1983: 1), represents a necessary entry point into the political reading of

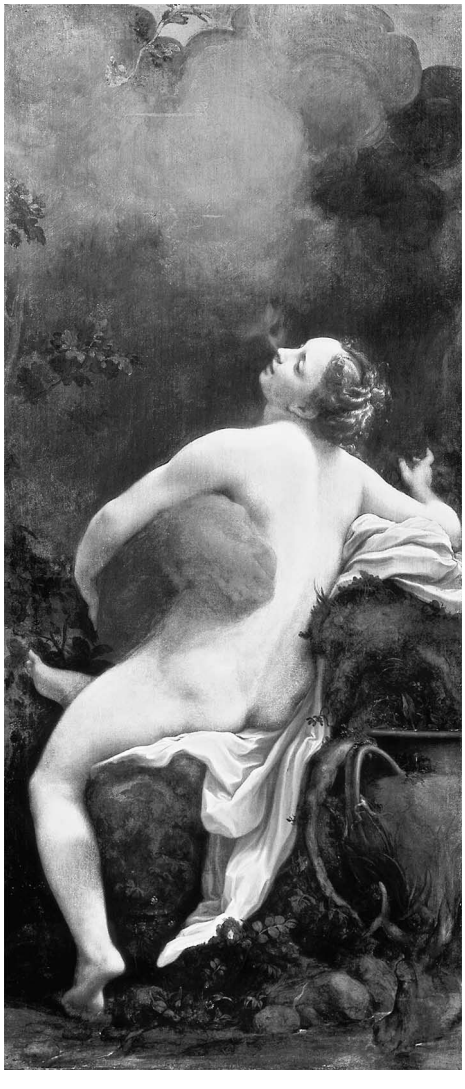

Figure 1
Correggio, *Jupiter and Io*, c. 1531

cultural objects—that is to say, the type of analysis that forms "the absolute horizon of all reading and all interpretation." Second, beyond the general principles of cultural critique, the specific contradiction presented by cloud computing foregrounds the need to reconsider notions of "reading" and "interpretation" themselves in the age of ubiquitous informatics. Engagement with cloud computing requires the development of analytic modes that go beyond texts and images into the complex relationship between these latter forms and the purely technical or systemic dimension that is native to all digital objects. Beginning from the doubly useful contradiction between technical materiality and conceptual immateriality that is the essence of the cloud computing paradigm, what follows represents an attempt to use the cloud as a lens through which the political character of the information age can be read.

It is perhaps because of the knotty intertwining of materiality and immateriality introduced above that analogies with divine bodies persist with surprising regularity in critical analyses of digital technology. Wendy Hui Kyong Chun (2008: 300) notes in her essay "On 'Sourcery,' or Code as Fetish" that the "invisibility, ubiquity, and alleged power" of new media appear to lend themselves to analogies with the divine. This is far from an isolated observation: it clearly echoes, for example, Jean Baudrillard's (2002: 161) earlier claim that in playing the Microsoft-programmed Deep Blue computer at chess, Gary Kasparov "was more or less pitting himself against a technical divinity, a technical superego divine in essence." A mediatic function of divine bodies that provides a conceptual precursor to technical media is suggested by Alan Liu (2006) in an interview with Geert Lovink, where Liu claims that "a long time ago (and, of course, still in many parts of society today), people had another name for massive information dumps that occurred spontaneously without any query having been made. They called it God. It was God, or the gods, who spoke out of the burning bush to tell you what you didn't even know you needed to ask. Before Oracle, Inc., in other words, there were oracles." From these three examples it is evident that while digital technologies themselves may have clearly definable histories, the complex of concepts that come to frame them culturally are not necessarily bound to these historically specific technologies. Following this mode of thought, one might begin with two classical depictions of divine clouds in order to foreground a crucial relationship between material efficacy and conceptual immateriality that underpins the cultural politics of informatic culture.

In Aristophanes's play *The Clouds* the chorus takes the form of clouds, making otherwise inaccessible information available to both characters and audience. These clouds rise from the oceans to the sky and promise a transcendent vantage point over the world. As their human users understand them, they are not limited to the role of passive information dump. Beyond providing information, these clouds are also claimed to bring about new modes and structures

of thought: in Aristophanes's (1973: 125) play Socrates states that "from them come our intelligence, our dialectic and our reason; also our speculative genius and all our argumentative talents."

In Aristophanes, then, the cloud appears to be *revealing* and also *enabling*. But these characteristics are what the cloud promises, not what it actually delivers. John Ruskin (1905: 327), with no knowledge of the information-theoretical implications of the cloud-chorus, wrote of Aristophanes's play in 1869 that the clouds make manifest the "tumult in men's thoughts . . . making them alike forsake the laws of their ancient gods, and misapprehend or reject the true words of their existing teachers." These clouds may promise knowledge and possibility, but they also exist in a discrete relation to the world, since the chorus can only ever produce commentary, never direct action. One must "connect" to this type of cloud in a way that eliminates manipulability in favor of intelligibility. Neither Socrates nor Strepsiades in Aristophanes's play can do anything *with* the clouds. They can only offer them requests for knowledge and accept whatever is returned.

In a second instance of the divine clouds, described in Aeschylus's *Prometheus Bound* and Ovid's *Metamorphoses* and depicted in Correggio's *Jupiter and Io*, divine clouds take on a more invasive character. In this episode Zeus (or Jove, or Jupiter) covers the human Io with clouds to keep her hidden from Hera (or Juno), before eventually transforming himself into a cloud, and Io into a white heifer, to continue this deception through the heightened proximity his desire necessitates. In this instance the cloud is both *obfuscating* (since it is able to hide or make visible certain information) and ultimately in a *continuous* relation with the world. It occupies an oscillating role between environment (the distribution of the clouds that hide) and agency (of Zeus as the cloud, exercising power over human bodies). It is able to transform bodies in the world, as is exemplified when the cloud-Zeus transforms Io from a human to a heifer, yet the desire for total immersion in it remains constant (as demonstrated in Correggio's painting). This cloud represents a logic of capture spread over the world through volitional acts of connection: in this regard it is notable that Hubert Damisch (2002: 23), in his discussion of the Zeus-Io myth as represented by Correggio, suggests that Zeus takes the cloud form not only to hide the object of his desire from view but to "deny Inachos's daughter any chance of escape."

This detour into the conceptual history of the cloud as both enabling and ensnaring is warranted because today it is no longer the web, with its clear distinction between logged-in and logged-out (or online and offline) states as well as its more or less explicit suggestion of capture, that describes the most novel, hyped, and advertised form of the distributed network. Today it is the cloud, with its privileging of perpetual connectivity over presence and its presentation of a conceptual immateriality that carries no obvious suggestion

of entrapment or capture, that is increasingly invoked in the popular and commercial framing of work and leisure computing.

Broadly put, "cloud computing" is used to describe the relocation of computational resources, including hardware, programs, and data, from individual local machines to a distributed network. Its principal contribution to the computational ecosystem of work and leisure computing—a distinction whose gradual slide toward untenability cloud computing makes a substantial contribution to—is the removal of the need for the user to be near to the larger material forms of storage and processing that have been, it must be said, themselves progressively shrinking and receding from view since the invention of the computer. As a source of new and boundless productivity cloud computing is plastered on billboards, bus stops, and web advertisements, placed at the forefront of both global technology corporations such as Apple and Microsoft and smaller start-ups promising this or that variation on the cloud infrastructure as a service.

On the one hand, then, cloud computing promises a massive expansion in the space over which computation (including all forms of information work but also including so-called leisure computing such as social networking and web search) can take place. In many ways this is a simple extension of the distributed network into a larger space of access. On the other hand, cloud computing makes the more radical promise to do away with the individual, self-contained computer (as the fixed site at which a given task is completed) in favor of the greater power and flexibility of distributed processing, where tasks are spread out between a network of smaller, less powerful machines. The growing ubiquity of computing devices composed of little more than screens, including tablet PCs and smartphones, presents clear evidence of the impact of this mode of distributed computation in industrial (or postindustrial, or network—the sheer variety of terms attached to this historical period is indication enough of the difficulty of grasping its most pressing features) societies.

As raised at the outset, the present essay is concerned with working through a political reading of the cloud iteration of the network form. This reading will develop not through the tracing of surface-level political content or applications but rather through the complex formed by the technical character, the cultural and conceptual framing, and the specific political-economic relations that cloud computing facilitates. This is not because cloud computing appears to carry no political significance at the level of content and uptake: in fact, examples of the surface political implications of cloud computing are easy enough to find. In a promotional e-mail dated December 28, 2010, for example, a senior public relations manager of Amazon Web Services (AWS), Kay Kinton, proudly details the extensive uptake of AWS-provided cloud services by the US government over the previous year. In this e-mail, which is worth reproducing at length, she states:

> Government adoption of AWS grew significantly in 2010. The Recovery Accountability and Transparency Board became the first government-wide agency to migrate to a cloud-based environment when it moved Recovery.gov to AWS in March 2010. Today we have nearly 20 government agencies leveraging AWS, and the U.S. federal government continues to be one of our fastest growing customer segments. The U.S. General Services Administration awarded AWS the ability to provide government agencies with cloud services through the government's cloud storefront, Apps.gov. Additional AWS customers include Treasury.gov, the Federal Register 2.0 at the National Archives, the openEI.org project at DoE's [the Department of Energy's] National Renewable Energy Lab, the Supplemental Nutrition Assistance Program at USDA [the US Department of Agriculture], and the Jet Propulsion Laboratory at NASA [the National Aeronautics and Space Administration]. The current AWS compliance framework covers FISMA [the Federal Information Security Management Act], PCI DSS [the Payment Card Industry Data Security Standard] Level 1, ISO [International Standards Organization] 27001, SAS70 [Statement of Auditing Standards No. 70] type II, and HIPAA [the Health Insurance Portability and Accountability Act], and we continue to seek certifications and accreditations that make it easier for government agencies to benefit from AWS. (Quoted in Winer 2010)

The obvious (one is tempted to say traditional) political questions raised by Kinton's e-mail concern the nature and impact of relationships between government and big business, particularly in the light of Amazon's termination of the server hosting services it formerly provided to Wikileaks (Winer 2010). Put bluntly, these questions, which nonetheless remain of substantial importance, are of no great interest for this essay since they simply reflect concerns about state corruption and corporate sovereignty that predate the emergence of the novel, informatic, and systemic modes of sociopolitical logic that characterize the present historical moment.

The problems posed to theory by informatic culture are foregrounded in the existing attempts to critique cloud computing. Slavoj Žižek (2011), for example, has written briefly on the process whereby cloud computing passes proprietary ownership from content to infrastructure while promising to make content universally accessible. Passing from the cloud platform itself to the prospective social impacts of ubiquitous connectivity, Julian Assange, in a May 2011 TV interview with *Russia Today*, condemns ubiquitous access to Google, Yahoo, and Facebook as constituting an "appalling spy machine."[1] These responses, concerned as they are with corporate greed and corporate-governmental conspiracy, respectively, do not do much to work through the novel forms of cultural logic that cloud computing emblematizes. Accounts such as those produced by Žižek and Assange

leave emerging forms of governmentality and economism untouched in focusing on the more "traditional" forms of intertwinement that exist between modes of production and social control. As Jameson convincingly argues in *The Geopolitical Aesthetic*, these types of conspiracy narrative in fact serve to prevent one from engaging with the systemic character of late capitalism. For Jameson (1992: 9–66), the conspiracy narrative insulates the subject from the unimaginable scale and overdetermination of the world system by allowing identifiable and nameable (if untouchable) individuals, be they greedy, corrupt, or both, to stand in for the systemic indifference of late-capitalist political economy. When the world system itself becomes synonymous with the distributed network both as material technology and as conceptual frame, the need for a mode of analysis optimized toward critiquing this form (rather than transferring its effects to specific individual nodes or actors) becomes clear.

To concentrate on monopoly or conspiracy, then, is to avoid confronting the formal and technical logics that both drive and come to describe a given social system. This is not to say that such accounts do not have a useful place: one should certainly be concerned, for example, with the ways the proprietary infrastructure Žižek touches upon exemplifies the return to rent as a primary source of income characteristic of post-Fordist economism. But if one wishes to mount a historically and materially specific critique of post-Fordism, one needs to apply a method analogous to Jameson's cognitive mapping—a mode of extracting a graspable diagram of relations from a world system that encourages us through its complexity to give up and pursue the type of paranoid fantasy described above—that does not stop at using the network form as descriptive metaphor but that accounts for the ways the world this form models clashes with the unmodelable world that exists beyond the totalizing logic of informatics. In other words, one must extract a cognitive map from the interactions of the metaphorical and the technical in cloud computing. This is not a straightforward project—not least because the distributed network form itself promises to do away with the problem of representing systems that in Jameson's analysis leads to the call for cognitive mapping in the first place—but it is an essential one.

To state the importance of such an approach is to be in methodological agreement with Alexander R. Galloway and Eugene Thacker (2004), who state in response to Geert Lovink and Florian Schneider that the political dimension of networking (that which Lovink and Schneider define as "Info-Empire") "should not be defined in terms of either corporate or state power" but instead be addressed at "the level of the medium itself. . . . Otherwise we are no longer talking about Info-Empire but about the more familiar topics of corporate greed [and] fascism." Informatic control, for Galloway and Thacker (2004), "must be defined via the actual technologies of control that are contained within networks." The present essay seeks to pursue this principle—of seeking to scrape the network model of power in

order to extract a mode of theoretical response that is withheld by the supposed immateriality of its form—through cloud computing.

A crucial theoretical problem within this analysis, which makes its pursuit appear all the more necessary, can be found in a 2008 Microsoft-sponsored paper by David Chappell, chief executive officer of the technology consultancy Chappell and Associates, titled "A Short Introduction to Cloud Platforms." Here Chappell states:

> The coming shift to cloud computing is a major change in our industry. One of the most important parts of that shift is the advent of *cloud platforms*. As its name suggests, this kind of platform lets developers write applications that run in the cloud, or use services provided from the cloud, or both. Different names are used for this kind of platform today, including *on-demand platform* and *platform as a service* (*PaaS*). Whatever it's called, this new way of supporting applications has great potential. (2008: 3)

At the close of his report Chappell (2008: 13) declares that "the next generation of application platforms is here," but before this, in the final line of the above-quoted segment, he suggests that the cloud metaphor itself is an inessential component of the model, being interchangeable with several others including "on-demand platform" and "platform as a service." But these terms exhibit a clear distinction from the notion of the cloud: the general notion of a platform suggests a materiality that is then conceptually altered or obfuscated by the modifier "cloud." (And one thinks here of *platform* as designating a specific computer hardware system as in the "Platform Studies" project of Ian Bogost and Nick Montfort or in the video game genre of "platformer," whose principal dynamic is the navigation of solid units [platforms] within open spaces into which the player-character can fall and die.) In other words, the insistence on the immateriality of a material system that cloud computing suggests emerges as central to its growing ubiquity and cultural framing, regardless of the irrelevance of the term that Chappell suggests.

As hinted at above, the most obvious characteristic of the cloud, considered culturally, is its nominal immateriality and amorphousness. As Damisch puts it in his *A Theory of /Cloud/* (2002: 15), the notion of the cloud "contradicts the very idea of outline and delineation and through its relative insubstantiality constitutes a negation of the solidity, permanence, and identity that define *shape*, in the classic sense of the term." In Damisch the cloud defeats linear perspective and thus stands in opposition to the mathematical rationality of the latter. Bodies in clouds, for Damisch (2002: 15), "defy the laws of gravity and likewise the principles of linear perspective" and lend themselves "to the most arbitrary of positions, to foreshortenings, deformations, divisions, magnifications, and fanciful nonsense." In contrast to a web, which is flexible but bound by a clear material form,

the cloud can be deformed, compressed, expanded, intensified, or thinned out to fit any available space and stretch beyond the reach of any earthly material base. If anything, the merging of immaterial cloud with material network presents a closer proximity to the mathematical discipline of topology than, for example, a fiber-optic distributed network does, because it can (conceptually at least) be even more extensively deformed into different shapes and arrangements.

There is, in addition, a second formal aspect of the cloud that might prove instructive in the theorization of cloud computing as a political-economic form—a dimension hinted at in the discussion of Aristophanes that opens this essay. As Steven Connor (2009) suggests, the cloud inhabits a space between the material earth and the ethereal heavens, or between immanence and transcendence: it "inhabit[s] the middle region between the upper air, domain of ethereal lambency, and the clammy earth." This is supported by the distinct appearances of clouds in the work of William Wordsworth, who, as Ron Broglio points out in *Technologies of the Picturesque* (2008: 82–92), presents them at different times as transcendent vantage points and dizzying, rationality-defeating tumults surrounding an earthbound observer. Wordsworth, in seeking to present to the reader a total survey of landscape in his *A Guide through the District of the Lakes in the North of England*, asks that we "suppose our station to be a cloud . . . above [the] highest elevation" (1835: 2–3). Here the cloud affords a privileged perspective on the world below, but one that is clearly framed as imaginary. The cloud offers a privileged view, but at the same time it can obscure or halt understanding, as suggested toward the end of book 6 of Wordsworth's *The Prelude* (628–34), by the presentation of "unfettered" clouds taking their place alongside "thwarting winds," "muttering rocks," and a "raving stream" in a scene manifesting the breakdown of the Enlightenment notion of objectivity in the face of complex phenomena. In addition to amorphousness, then, the cloud exhibits an in-between status vis-à-vis its exact location, as well as its ambivalent relationship to knowledge.

There is, of course, another name in wide use today for this in-between status, especially with regard to communication: *mediation*. Friedrich Kittler (2009: 26) makes this connection clear when he states, considering the oft-claimed absence of mediation as a concept in classical Greek philosophy, that "Aristotle . . . speaks of two elements, namely air and water, as of two 'betweens.' In other words, he is the first to turn a common Greek preposition—*metaxú*, between—into a philosophical noun or concept: *tò metaxú*, the medium. 'In the middle' of absence and presence, farness and nearness, being and soul, there exists no nothing any more, but a mediatic relation." The two "betweens" in Aristotle are thus shown to be the two constituents of the cloud as a meteorological phenomenon. The cloud, then, is foundationally a medium (or more accurately a composite of the two elemental media of air and water that Kittler locates

in Aristotle) in a way that the web most assuredly is not. Viewed in this light, the way clouds oscillate between the realms of transcendent ethereality and complex materiality—and, in doing so, mirror the critiques of software presented as computation set out by Kittler (1997a, 1997b) and Chun (2004, 2005)—proves highly suggestive when considering the political character of cloud computing. The critical question now becomes that of what one can determine from the emergence of "cloud computing" rather than "on-demand computing" or "computing as a service" as the dominant cultural framing of such a technical system. To begin answering this question it is necessary to detour into the history of cybernetics as an intertwined program of technical development and proto-neoliberal dreaming, before returning to the interrelated technical and cultural dimensions of cloud computing that underpin its emblematic role within contemporary cultural politics.

CYBERNETICS AND NETWORKS

In a memorandum dated April 23, 1963, and addressed to the "Members and Affiliates of the Intergalactic Computer Network"—a group that is itself instantiated by this memorandum, having not existed beforehand—J. C. R. Licklider sums up a lengthy description of problem solving using the automated pooling of programs and data stored on various computers. In this account Licklider (1963) states that he hoped to implement "a sophisticated network-control system" within which he (i.e., the user) would "not decide whether to send the data and have them worked on by programs somewhere else, or bring in programs and have them work on [his] data" but instead would be able to leave it to "the computer, or the network, somehow, to do that."

What Licklider proposes here is computation distributed in space. At a time when the size and speed of computers made the concept of a personal computer, not to mention a portable device such as a smartphone, unthinkable, the implementation of such distributed computing was a necessity. As Licklider would go on to suggest in his 1968 paper "The Computer as Communication Device," the necessity to carry out complex computation through distributed, parallel processing in fact drove the development of distributed networking, leading to the first deployment of the Advanced Research Projects Agency Network, or ARPANET, in October 1969.

This historical dimension of cloud computing is intensified if one notes that the principle of distributed processing is not only older than the first actual instance of digital computer networking but is in fact actually older than the digital computer itself. Lewis Fry Richardson's *Weather Prediction by Numerical Process* of 1922 describes the placement of an imaginary grid over the globe. According to Richardson's system each cell would contain a "computer" (in this case a human mathematician) who would be responsible, first, for a specific subsection of a larger equation and, second, for sending the

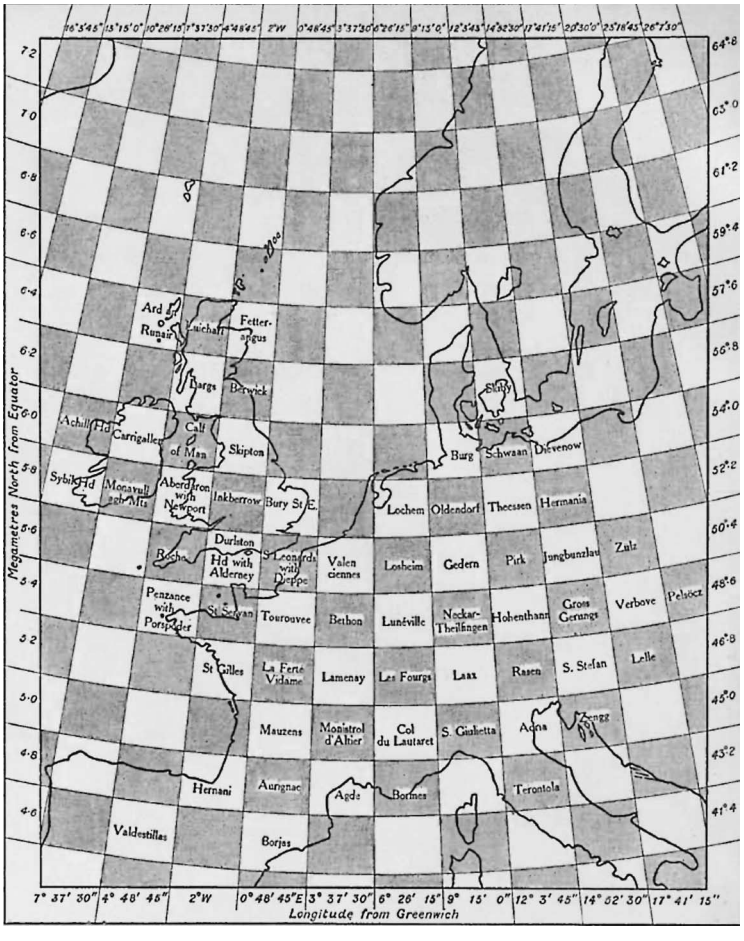

Figure 2
Distributed processing as a gridded map of physical space. Lewis Fry Richardson, *Weather Prediction by Numerical Process* (1922)

outcomes of these subroutines via telegraph so that they could be compiled at some central location to predict future weather. The general principle of network logic rooted in abstract computational approaches to physical space has an even earlier precedent in the intellectual formation of cyberneticians such as Warren McCulloch, who in a posthumously published essay in the *ASC Forum* writes of learning topology and mathematical communication theory in the late 1910s through marlin-spike seamanship, training in semaphore while employed as a second-class seaman, and acquiring "a thorough working knowledge of spherical trigonometry . . . picked up from old whaling captains" (1974: 5), the amalgamation of which constituted the logical basis of his work in cybernetics. The investments of this mode of thought can be clearly seen in McCulloch's most well-known work, the influential 1943 paper "A Logical Calculus of the Ideas Immanent in Nervous Activity," cowritten with Walter Pitts, in which the brain is theorized as a network of neurons that function like binary on/off switches.

As Peter Galison (1994) and Philipp von Hilgers (2011) have noted, the history of cybernetics is characterized by an oft-troubled interaction between abstract symbolic conceptualizations and material technologies, with both focusing on the black box as emblematic. By extending this principle beyond the black box and into the general notion of topological representations of space and distributed processing, it is easy to see how each of the spatial examples set out above serves to evoke both a material system (the network of mathematicians with telegraphs or the network of binary neurons) and a general, abstract principle of external and internal worlds as discretizable and computable. The interrelated conceptualizations of the world as totally computable and the world as a computer are thus shown to exhibit a close relationship in the emergence of cybernetic logic as a historical phenomenon. It is the underlying principle of both formulations, that cybernetic logic can be applied to the world at large as opposed to specific engineering problems, which must form the basis of any critique of the contemporary political-economic situation.

Viewed in this historical context, cloud computing must be seen primarily as describing a *management style*, in the sense that management, as the Tiqqun collective has argued, represents "the cardinal metaphor for describing not only politics but also all human activity" in postindustrial society (Tiqqun 2001:44, translation mine). For the era that Tiqqun describes—that of neoliberal governmentality, Gilles Deleuze's control society, Michael Hardt and Antonio Negri's Empire, Luc Boltanski and Ève Chiapello's "new spirit of capitalism," and Manuel Castells's "network society"—can be most insightfully defined through its roots in the cybernetic logic of operations research, game theory, cellular automata, and system dynamics, where informatic capture, sampling, optimization, statistical modeling, and simulation promise (or threaten) to map the brain and nervous system, social life, economics, and global war through an identical logic and render them identically predictable.

The capture of human behavior so that it can be modeled and simulated is a crucial practice in the political-economic formation of the present period, and cloud computing—in its promise not only to make computation practicable across all of space but also to spread the process of computation itself out in space, inviting connection through an amorphous glob of connectivity—represents an emblematic technology in this regard. In short, cloud computing promises to realize the process that Richardson dreamed of in 1922 whereby voluntary user activity discretizes all behavior and all space. Let this be a fundamental claim for the critique of informatic culture that takes cloud computing as its emblem.

THE BUSINESS OF CAPTURE

One of the most obvious political-economic critiques that cloud computing invites is the way it extends the time and space of work, plac-

ing software in contact with every space its users might occupy: not just the office but also the train or bus, not only the home office but also the sofa or the bed, not only the Internet café or hotel but also the beach. But this expansion of the space and time of labor represents only a limited picture of the way cloud computing exemplifies post-Fordist political economy, one that is confined to classical, that is to say, precybernetic, conceptions of work as valorizable activity. In addition to enabling work on the beach and the multiple forms of computer-aided design and production central to the contemporary manufacture of commodities ranging from automobiles to feature films, the cloud adds a degree of saturation to the processes whereby networked computation both (1) facilitates the conversion of human activity from complex individuated phenomena into patterns, models, or algorithms through software and (2) makes it possible to monetize these patterns of activity, extracting productive labor from discrete actions such as mouse clicks, web surfing, game playing, and mobile application data.

The key characteristics of the first of these two stages can be clearly seen in Philip E. Agre's (1994) concept of "grammars of action" into which human behaviors are cast by software-mediated labor. Agre's theorization of the systematic production of these grammars of action, organizational logics that are both necessitated and determined by computer-mediated modes of production, is premised on the notion of "capture" in contrast to the modes of surveillance that conditioned bodies, as Michel Foucault argues, in previous eras. The second of the stages detailed above is most clearly theorized by Matteo Pasquinelli, whose essay "Google's PageRank Algorithm: A Diagram of the Cognitive Capitalism and the Rentier of the Common Intellect" (2009) makes clear the centrality of this logic of distributed capture to contemporary production. Here Pasquinelli examines the ways in which the centrality of unpaid user activity to Google's vast profitability is located in the function of its basic technical methodology—a methodology that does not produce the flat ontology of total equality promised by the distributed network form but that ranks nodes in strict hierarchy based on the quantity of links and connections they receive, thus placing the motivation of constant user activity at the center of commercial web design.

Studies of how the combined function of the two stages detailed above—the capture, discretization, and conditioning of action and the monetization of patterns of behavior—is made to appear natural remain few, although Galloway's (2007: 87) description of the graphical user interface (GUI) as facilitating the "active, expressive, exploitative, ergodic, vigorous, driven materialization of measurable presence and measurable activity" points us toward a mode of analysis for the ways digital technologies stimulate, condition, measure, and monetize online behavior. If we return to the divine forms of clouds as discussed in a previous section, however—clouds that sit both above and within the world, that promise to inform and

empower, that beg to be touched and connected to, that we cannot enter but that can enter us—it is not difficult to see the role played by the conceptual disappearance of the computer and the network into such a form. To put this in crude historical terms, if the commodity media of the society of the spectacle are opiates, then digital media are stimulants. This in itself is a condition of nearly all contemporary web use, but cloud computing extends the artificially transparent, frictionless logic of the software interface by making permanent connectivity a primary service—and one thinks here of the total synchronization of telephony, e-mail, and web surfing, such as the linking of Facebook, e-mail, and telephone contacts, that is increasingly a default component of smartphone use.

IMMATERIALITY AS IDEOLOGY

Both Kittler (1997a, 1997b) and Chun (2005) have written prominently on the historical separation of software from hardware and the resultant cultural framing of seemingly immaterial software as the be-all and end-all of computation. In both Kittler and Chun clear political arguments emerge when the commercial and proprietary status of the most widely distributed user interfaces, with their intuitive graphical and sonic markers inviting and rewarding user action, comes into question. These interfaces, which present computation not as material hardware function but instead as graphics and sonics that reward and thus condition particular forms of user behavior, serve in the historical arguments of both Kittler and Chun to obscure the indifferent logical basis of computation (with its implications for cultural politics including, as Chun points out, gender and race) as well as its physical substrate.[2]

This historical process of obfuscation, to which the emergence of cloud computing clearly belongs, is accompanied by a general logic of diffusion whereby the computer becomes increasingly naturalized within the environment. This is a process that is traced in a number of theoretical and fictional texts.[3] Emblematic in this regard is McKenzie Wark's (2007: note to para. 223) claim, made in a note to the final chapter of *Gamer Theory*, that the term *cyberspace* is now "archaic" and should be replaced with *gamespace*.[4] The crux of Wark's argument, articulated throughout *Gamer Theory*, is that cyberspace corresponds to an understanding of networked computer use in which the hardware and software of the local machine are clearly distinct from both the "edges" or communication lines of the distributed network topology and from the "real" world outside the computer, whereas gamespace defines a period in which these distinctions have broken down. A general emblem of the move from cyberspace to gamespace can be found in the breakdown of the clear distinction between local machine and network, or between node and edge, that cloud computing effects. It is only necessary to look at the depictions of computer and Internet use in William Gibson's 1984 novel *Neuromancer*, in which the term becomes formalized, com-

pared to those in his more recent *Pattern Recognition* (2003) for a manifestation of the transition from the notion of cyberspace as a distinct realm of user experience to gamespace as a cloudy intermingling of "real" and "cyber" spaces.

Where the digitally mediated space of *Neuromancer* is famously described as a "hallucination" (Gibson 1993: 3), in *Pattern Recognition* it is accessed as part of a daily routine that has shaped the environment that contains it. Interior design is optimized toward incorporating the computer. The "transparent mouse" (Gibson 2004: 3) that provides the user's interface with the system goes beyond functionality and the aesthetics of the combined home-workplace in manifesting a principal ideological function of contemporary computation—the erasure of the computer's materiality and its diffusion in space. In *Pattern Recognition* the computing device is never turned off, only on standby, whereas in *Neuromancer* the process of jacking in involves the cumbersome connection of nervous system to machine, a clear expression of the divide between computing time and noncomputing time that must be physically crossed. While jacked in to cyberspace, the expert hacker Case in *Neuromancer* is detached from his body, which is "somewhere," "laughing, in a white painted loft," with "distant fingers caressing the deck, tears of release streaking his face" (Gibson 1993: 69), whereas for Cayce Pollard, in *Pattern Recognition*, the familiarity of the "friend's living room" (Gibson 2004: 3) in which she sits while online is immediately reproduced in that of the browser window. This is a relationship of growing familiarity, but it is also one of collapsing distance. Gone are the proximate programs and data, whether fancifully rendered or not, that characterize networked computation in *Neuromancer*. This is the relationship to computation that progressive developments from the GUI to cloud computing create. Users are brought closer to the instrumentality and ubiquity of their software and further from the logical and physical processes that make it possible.

The portrayal of networked computer use in the two Gibson novels, respectively, represents the 1984 and 2003 user's relationship with networked computers. The 1984 fantasy places the user into an environment within a computer, although never in contact with hardware, because, as Chun observes, the ideological separation of human from machine begins in the 1940s at the latest. The 2003 reality places the user in front of a screen and mouse that have been designed to disappear within the domestic or public environment, accessing resources wirelessly through a GUI and standardized web clients and protocols. If *Neuromancer* (and *Tron* before it) imagine the user in a virtual world that represents the functioning of the computer, and *Pattern Recognition* depicts the naturalization and ubiquity of the computer within the designed spaces of the lived world, then cloud computing represents the process, or at least the dream of a process, whereby the computer dissipates into an environment. The implications of this in terms of informatic cultural

politics are quite clear: it suggests the expansion of the cybernetic logic of informatic capture and definition to the status of *periechon* (that which surrounds) or atmosphere, the theoretical emergence of both the world-as-computer and the computer-as-world.

In contrast to the older web or rhizome model of a network that (to use the language of the mathematical discipline of network theory) presents a series of nodes (the individual computers, with their own local software and hardware) connected by edges or lines of communication, the cloud makes both hardware and software resources as well as data accessible from any device that falls within an amorphous blob or atmosphere of computability. By uncoupling connectivity from the node/edge infrastructure, the cloud suggests a dematerialization not only of computers but also of the network, and this claim is an especially important one within the critique of post-Fordist economics, because it cannot possibly be true. Nodes, or individual computing devices—be they desktop PCs, netbooks, or mobile telephones—always remain a clear material necessity. Even if computation moves to the level of a chipset embedded in the human brain, with the apparently organic and transparent interface dreamed of in science fiction, it will still be possible to count nodes by counting every person or other being equipped with such technical augmentation. Where the web-type network assures the possibility of measurement and representation by counting nodes and edges, then, the cloud eliminates the representation but not the existence of these constitutive units. Cloud computing, in the tradition of the cybernetic models of space that share its historical and theoretical roots, emblematizes an environment of total computation, a space where the material boundaries of hardware disappear while retaining the functions of capture, discretization, and valorization that suggest the opposite of amorphousness.

Remarkably suggestive in this light are the studies for the preparation of rectilinear cloud perspective set out in volume 5 of Ruskin's *Modern Painters* (1894), which, in presenting an underlying structure to be visually (but not functionally) effaced by the overlaying amorphousness of the cloud image itself, resemble nothing less than a network diagram or the type of gridded landscape presented in Richardson and the cybernetic legacy that follows him. This analogy is instructive because the cloud in cloud computing is conceptual, describing not the actual function of the service but a cultural framing of it. The cloud is a form of mediation, a representation of immateriality and smoothness that both effects and obscures the functions of a structured, striated grid that is the only representation of a world that is possible within the technical functionality of the digital computer.[5]

To return to the two classical depictions of the cloud invoked at the outset, each can now serve to foreground both a crucial aspect of cloud computing as a political-economic form and a distinct theoretical configuration of the medium. In the Aristophanes example above,

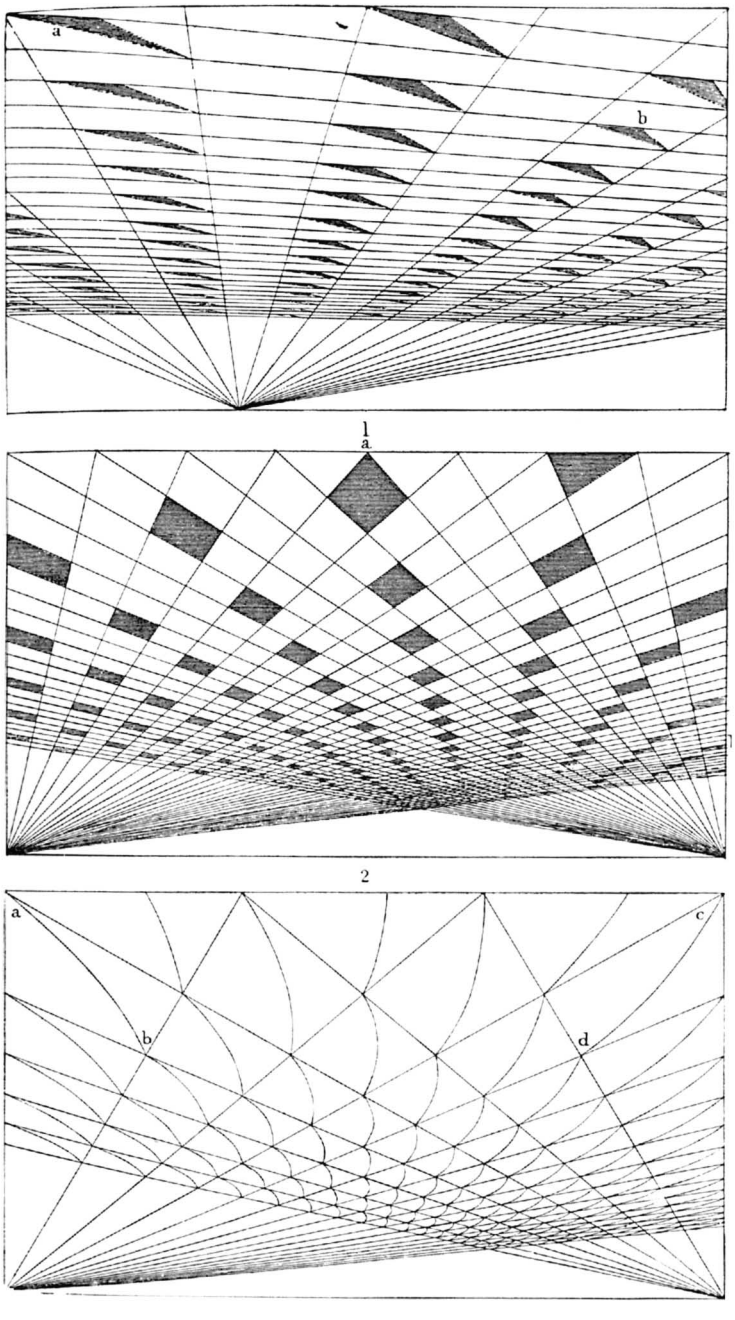

Figure 3
"Cloud Perspective: Rectilinear," 1894. John Ruskin, *Modern Painters*, vol. 5, plate 64

the ideological face of the cloud-as-informatics is presented: the cloud as a diverting interface, unchained to the limitations of the material world, thereby allowing us to get *certain* things done, to throw off the material impediments of having to be *at work* to do the work of information gathering and rearranging that is central to today's postindustrial labor market. Here the cloud is presented as a

mass medium in the sense set out in politically forceful terms by the Frankfurt school, where diversion also brings about the immersion and normalization of the subject within the mode of production. Jonathan Beller's *The Cinematic Mode of Production* represents a notable recent addition to this canon. This is also the computer presented as interface that Galloway (2009: 931) critiques in "The Unworkable Interface" with the claim that "for every moment of virtuosic immersion and connectivity, for every moment of volumetric delivery, of inopacity, the threshold becomes one notch more invisible, one notch more inoperable."

The second example, that found in Aeschylus and Ovid and depicted in Correggio, foregrounds the cultural-political implications of the cloud in cloud computing. Here the configuration of the environment as an infrastructure and the presence of a self-regulating subjectifying system facilitated by this infrastructure are the crucial elements. The outcomes can be seen in the transformative effects of the violence-as-affordance that are constituted by the user's volitional envelopment in connectivity. The spreading of distributed processing across space implied by the presentation of cloud computing intensifies the process whereby computation reduces the subject to those properties that can be informatically captured, parsed, and modeled. Here the network is presented as a specifically computational medium in the sense of a converting and obfuscating (that is to say, storing, processing, and transmitting) layer that converts the analogue mass of the world into a sampled, discretized, and optimized symbolic register. This is the conceptualization of the computer medium (as it emerges from the typewriter) found in Kittler as well as in Bernhard Siegert's concept of cultural techniques.[6] Crucially, given the apparent incommensurability of these theoretical approaches—a incommensurability that is in part driven by Kittler's open hostility to hermeneutics—both approaches play a necessary role in the function of cloud computing as an emblem of cybernetic political economy.[7] The first classical example of the cloud-as-information system describes the facilitation of specific labor relations (including the emergent framing of play as work that is facilitated by interface-centric networked computing). It also foregrounds the way the desire for greater connectivity is produced, leading into the diagram of capture presented in the second classical example. This second example, by extension, represents the critical implications of perpetual connectivity: the spread of the logic of informatic capture, command, and control over the entire world so that it conceptually conditions and transforms bodies. The logical extension of this second model is the reconfiguration of the world as a network of connectivity that denies the existence of whatever falls outside of certain thresholds, filters, algorithms, or parsers.

The practical implications of the first of these arrangements are clear enough, for who does not already understand that commercial media are (in Bernard Stiegler's terms) pharmacological, that for

every freedom they afford there exists some kind of cost? Ultimately, it is the second image, the relationship between technical systems and their cultural-political implications, that is of the most pressing concern. Deleuze, in the "Postscript on Control Societies" (1995: 179), writes of a subject who is internally divided as a product of the new forms of political economy that computers and cybernetic logic facilitate. The Tiqqun collective (2001: 237) expands on this formulation, writing of a "front line [that] no longer cuts through the middle of society" but that "now runs through the middle of each of us," between "what makes us a citizen . . . and all the rest." What Deleuze and Tiqqun write of here is the opposition between traits, movements, and behaviors that can be algorithmically captured, measured, and predicted and all other possibilities in the world. In proposing the link between volitional, perpetual computation and communication and the cybernetic redefinition of the subject in strident terms, Tiqqun (2001: 49–50) claims that the cybernetic hypothesis underpinning contemporary governmentality "calls for a radically new physical structuring of the subject whether individual or collective," a structuring that "disqualifies as a myth individual inwardness/internal dialogue, and with it all 19th century psychology, including psychoanalysis." For all the power this claim about the history of theory carries, it is the connection to the impossible promise of cloud computing that should give us pause here: immediately following the above claim, Tiqqun (2001: 50) goes on to define the ideal subject of the cybernetic hypothesis—a subject that is produced not through the removal of "traditional exterior bonds, as the liberal hypothesis had intended," but through a "reconstructing [of] the social bonds" that is effected by "depriving the subject of all substance." Under the cybernetic hypothesis that drives post-Fordist culture, Tiqqun (2001: 50, translation mine) writes, "each person was to become *a fleshless envelope*, the best possible conductor of social communication, the locus of an infinite feedback loop which is made *to have no nodes*."

Thus functions the ideal of cloud computing as an emblem of political logic: connectivity with no nodes (or individual subjects), only a shapeless bundle of edges throughout which communication can occur and thus be captured, parsed, measured, and defined. The ubiquitous, immaterial connectivity and processing emblematized by cloud computing promises mediation, but of what? It promises nothing less than to mediate the entirety of the social through the indifferent logic of computation.

NOTES

1. This interview, conducted by Laura Emmett for *Russia Today*, was released on May 2, 2011. It is archived at rt.com/news/wikileaks-revelations-assange-interview.
2. See Kittler 1997a, 1997b; Chun 2005. Chun's argument is reiterated and expanded throughout Chun 2011.

3. The notion of a total environment composed of distinct registers of objects such as computers, the built environment, and biological life on an equal footing is central to the trenchant political critique leveled at neoliberal governmentality in the Invisible Committee's *The Coming Insurrection* (2009: 50): "No material habitat has ever deserved the name 'environment,' except perhaps the metropolis of today. The digitized voices making announcements, tramways with such a 21st century whistle, bluish streetlamps shaped like giant matchsticks, pedestrians done up like failed fashion models, the silent rotation of a video surveillance camera, the lucid clicking of the subway turnstyles and supermarket checkouts, office time clocks, the electronic ambience of the cyber café, the profusion of plasma screens, express lanes and latex."
4. Note that Wark's *Gamer Theory* does not contain page numbers but instead uses sequentially numbered paragraphs.
5. For an analysis of the materiality of cloud computing focused on energy use and server traffic, see Cubitt, Hassan, and Volkmer 2011.
6. For a discussion of the historical movement from typewriter to computer, see the chapter titled "Typewriter" in Kittler 1999.
7. For a discussion of the relationship of Kittler's work to Anglo-American cultural studies, see Peters 2010: 5–8. On the possibility of integrating the so-called German media theory with the critical theory of the hermeneutic tradition, see, e.g., Parikka 2011.

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