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INTRODUCTION: OPEN SOURCE CULTURE AND AESTHETICS

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Like many phenomena that emerged parallel to that "place" we call the Internet, open source production has long been described via metaphors of spatiality, location, and presence. This trend likely started with programmer and open source software advocate Eric S. Raymond's early influential essays "The Cathedral and the Bazaar" (1997) and "Homesteading the Noosphere" (1999), both of which compare open source projects to a variety of public and private spaces, ecosystems, and architectural forms.[1] In the late 1990s and through the last decade, as discussion of the politics of open source production has shifted more explicitly toward questions of copyright, appropriation, and intellectual property, open source proponents have increasingly invoked "the commons"—noncommodified public spaces and land areas—as conceptual reference points for rethinking intellectual property rights via the long and depressing history of the privatization of such resources.[2] Without glossing over too many internal variations within these analogies, we might state that their connecting thread has most often been an emphasis on the relative novelty of open source projects, their scarcity among trends toward the increasing commodification of materials and services, and their general distinction from and counterposition to the traditional practices of capitalist economies; in other words, if open source and subsequent practices of participatory culture and voluntary collaborative labor have long been thought of as locations, it is perhaps because of their hoped-for function as some "other place": a heterotopia or utopia that is surrounded on all sides by the much larger and more familiar terrain of the global market.[3]

By contrast the contributors to this special issue on "Open Source Culture and Aesthetics" might be taken as both privileging a temporal rather than spatial approach to thematizing open source production as well as disputing its peripheral status; more specifically, they all craft their point of intervention in reference to questions of periodization, suggesting

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that a broad historical transformation is under way as the primary pragmatic principles of open source software communities—that production and distribution processes can be made both more efficient and effective by leveraging the labor, contributions, and feedback of large groups of users—increasingly seem central to, rather than a novelty within, contemporary economic and cultural production. This shift in perspective might be more properly taken as more than just an alternative framework for comparison. Rather, it marks a moment in which open source ceases to be understandable by way of comparisons to other phenomena and instead takes on its own explanatory value. And, indeed, *open source* as a term or concept has become its own analogical referent, one that links a vast field of practices moving far from its initial origins and intentions in software programming. Although we briefly detail the arc of this expansion later in this essay, we leave the final word on the importance of this origin, as well as how appropriate it is to configure it as an antecedent to what we are calling "open source culture and aesthetics," to Christopher Kelty, who reads the works of the other authors collected here through the filter of his own ethnographic research on open source software communities, and his perspective as a more-than-interested observer in how the concepts and techniques popularized there have been integrated into everything from bioinformatics to social media. For now, however, we take it for granted that constitutive features of the production model incubated in free and open source software programming have spread dramatically in three general directions:

(1) *a multiplication in what vectors can be taken to occupy the role of "source" beyond the realm of computer programming,* with genetic "code" being perhaps the most notable and literal substitution, but one followed by "open content" systems for knowledge production and reference such as *Wikipedia,* and various other endeavors encouraging the creation of alternative and nonproprietary licensing arrangements for phenomena typically recognized as intellectual property, from chemical compositions to artistic works,[4]

(2) *an even larger field of processes that leverage the distribution and organization of voluntary (unremunerated) labor* found in *crowdsourcing* (the outsourcing of portions of a larger task to an indefinite group of volunteers); *prosumption* (a consumer's participation in the production of the good or service being consumed), including the increasing prevalence of beta and usability testing on everything from software to chairs; *citizen journalism* (the contribution of nonprofessionals to the

coverage, documentation, and public discussion of news events); and participatory and social media of all types; and, finally,[5]

(3) *the aggregation of "passively" contributed demographic data, geographic positions, and consumer dispositions* to generate "just in time" advertising and messaging strategies; here we find the primary source for the mass expansion of niche and proximal marketing that has driven the "co-crafting" of both products and politicians over the last two decades.[6]

Taken together, these phenomena constitute a significant reordering of economic and communication networks, as well as systems of social power more generally. The emerging configurations in each area draw their value and function through, on the one hand, the flexible *division* of materials, processes, and tasks that might be shaped, altered, or fulfilled by leveraging the individual contributions of ad hoc communities, and, on the other hand, the broadest possible *inclusion* of individuals of all backgrounds into such collectivities. The historical positioning of open source software production as a really existing alternative (so to speak) to the traditional production processes of contemporary capitalism may seem overblown when, as Kelty suggests, the majority of work on open source software projects is performed by the paid employees of large corporations. This is at least one way in which the old spatial metaphor is still immensely useful—if open source software projects can be thought of, as Raymond sometimes does, as "neighborhoods," then they are neighborhoods that seem to be rapidly gentrifying (Kelty, in this issue, p. 471). However, the three general phenomena just outlined suggest traffic in the other direction, as well, with the methods developed in open source software production increasingly integrated with and transforming capitalist production itself. In both cases, what is at issue is the *alternative* character of such production; what seems to emerge with a generalization of "open source" is a sort of dual migration of processes that, at the very least, call on us to examine the ways both "neighborhoods" are changing.

What becomes of the other vector tied to early conceptions of open source production—that analogy called utopia—is a much thornier question and equally at issue for the authors collected here. We ourselves will return to it, but first, by way of introduction, we situate the other essays in this issue within a more explicit discussion of open source culture and aesthetics as a periodization of the present. We end with a consideration that more often comes first in analyses of recent changes in practices of production and consumption: the relationship of open source culture and aesthetics to what we used to call political economy, particularly the challenges posed to traditional conceptions of labor and profit, or, perhaps

more vulgarly, *value* itself in the contemporary moment. Before that, however, we address two other relevant, if much less discussed, categories impacted by the practices under review here, changes in the form and function of technological mediation, as well as those of at least a notable current of contemporary aesthetics. In both, we will suggest that it is quite explicitly the classifications of "form" and "function"—or media and *technics,* and representation and action, respectively—that seem to have become indiscernible, or at least strangely bounded together, in the age of open source culture and aesthetics.

From Open Source Software to Open Source Culture

As mentioned, the essays included in this special issue rely to varying degrees on the generalization of the term *open source.* Even a cursory examination of the contemporary media phylum would suggest that this term carries with it a general signification. We hear of open source politics, open source journalism, open source biology, open source music, open source education and universities, and so on. What it means to be *open* and what exactly is referred to by *source* would seem to differ in each case, while a general transformation of the activities is nonetheless imputed. The specificity and generality of any given usage would seem to depend on the distance of the modifier from its original use within software programming itself. Before situating the contributions, then, it may be useful to gauge this distance by reviewing the emergence of open source as a set of relations within software programming, with a view toward thinking the generalization of "open source" as a term or concept in the early twenty-first century.

Open source software rhetoric rather compulsively develops its own historical narratives along two major fronts. First, its historians and practitioners locate open source programming within a longer tradition in which the freedom to work on technology in general and software in particular was the standard. This approach is already present in what might be the first such narrative, Steven Levy's 1983 best seller *Hackers: Heroes of the Computer Revolution,* the epilogue of which (titled "The Last of the True Hackers") narrates the emergence of free software philosophy around the figure of Richard M. Stallman.[7] The history of computing, in this account, was *always* a history of access to and social sharing of source code, user modification of existing programs and systems, and general experimentation with technology in the service of innovation. Both Eric Raymond and Pekka Himanen feel compelled to include a similar "history

of hackerdom" in their accounts of open source and hacker communities, where that history sketches out the practices of access and sharing that developed in mid-twentieth-century technocultures, particularly within academic and hobbyist communities.[8] Stallman's own accounts and examples tend to take an even wider view, noting, among other things, that the popularity of working on and tinkering with cars contributed to the U.S. military's success in the Second World War, since so many ordinary servicemen could fix broken-down jeeps.[9] The tendency to harken back to this history of hackerdom and general tinkering, however, always contains a prelapsarian element, with the Fall represented by the onset of aggressive intellectual property restrictions, especially as they attached themselves to software through the late 1970s and early 1980s. If Stallman is already in 1983 the *last* of the hackers, it is because commercial interests have "destroyed" his "community" at MIT, which is to say, the technical capacity to access source code had fallen under restriction, while the social and economic structures that promoted sharing of code had already been affected by commodification.

Where software code, at least within an academic and hobbyist culture, may have been viewed as a public domain common resource that enabled programmers to access, learn about, and improve upon programs, it began to be treated *legally* not as a resource of scientific knowledge but a proprietary and restricted commodity, the creative product from which businesses drew value. The history of software development (and technological development in general) suggests that this narrative can be read as both accurate and partial; as Martin Campbell-Kelly and other historians demonstrate, there were always tensions and settlements between user collaboration and proprietary concerns.[10] The compulsive deployment of this historical narrative, in this sense, can be seen as an attempt to normalize free and open source programming, positioning it as the standard, or at least traditional, mode of software development encroached upon by ill-conceived and nontechnical (that is, commercial) interests.

The second historical narrative takes us to the other side of the Fall, identifying the personalities and moments of free and open source programming itself as it struggled against and negotiated with such external forces. In this narrative, free software emerged as a phenomenon and social movement during the 1980s, largely around Stallman and his supporters, in part as a response to changes in intellectual property laws and academic-business partnerships. Where Stallman tends to narrate these changes as local phenomena experienced by his "community" at the MIT Artificial Intelligence Lab, they can also be read as local effects of broader legislative and judicial decisions, among them the Dole-Bayh Act of 1980 (the

University–Small Business Patents Procedures Act), the Patent and Trademark Amendment Act of 1980, and the Economic Tax Recovery Act of 1981, as well as a number of judicial decisions stemming from the 1976 amendments to the Copyright Act. In 1984, Stallman began the GNU Project (GNU's Not Unix), developing, largely on his own, initial components for a nonproprietary computer operating system. In the March 1985 issue of *Dr. Dobbs Journal,* a magazine marketed specifically toward software programmers, Stallman published the GNU Manifesto, which stood as his *ethicopolitical* statement of purpose for the GNU Project.[11] The manifesto announced the project to the programming community while laying out its technical and political aims: Stallman sought to counter the effects of the changing intellectual property landscape in software development by building programs that would be accessible to users, who could then examine the code and modify it as they saw fit. Stallman's organization, the Free Software Foundation (FSF), would manage the project and advocate against the encroachment of intellectual property laws on software development. Stallman and the FSF's crucial social innovation was the GNU General Public License, or GPL, which was designed to prevent appropriation of public domain code by stipulating that any use of GPL-licensed code in a new program would require that that program itself be freely accessible, modifiable, and replicable.

The next major event in this narrative occurs in 1991, when Linus Torvalds, a computer science graduate student in Finland, built an operating-system kernel that would turn the components and programs the FSF had developed into a full working operating system. Since he had used a stripped-down educational version of the Unix operating system (called Minix) to aid in kernel development, he called the resulting operating system Linux. Rather than proceed with the development on his own, he released the code on the Internet, asking for improvements. The response from programmers was immediate and successful: a wide base of user-developers emerged who identified and fixed bugs, added functionality, and built the GNU/Linux operating system into a product that rivaled commercially produced software.[12]

There is certainly a Great Man feel to much historical work on open source, but one suspects that Stallman and Torvalds also function figuratively within these narratives. Stallman tends to be positioned as the ethical idealist, the activist programmer struggling against an unjust property regime. Torvalds, for his part, is the "accidental revolutionary," functioning as a kind of fun-loving hacker and thereby standing in for broader aesthetic and pragmatic approaches.[13] The historical accounts tend to focus on Stallman and Torvalds, in other words, not only because they

provided such crucial contributions to free and open source development, but also because they serve as conceptual personae, staking out the political, economic, and aesthetic territory of free and open source software practices.

The Stallman–Torvalds history of free and open source development, in any case, can perhaps be mitigated by noting that numerous businesses, organizations, and institutions that picked up on and forwarded the cause of open source; it was never quite as anarchic or personality-driven as first appearances would suggest. By the late 1990s, open source proponents and organizations had launched a number of successful rhetorical salvos, including Raymond's *The Cathedral and the Bazaar* and a number of technical and political texts emerging from O'Reilly Media, which was also busy organizing various open source conventions and conferences, and setting out definitions and licenses that would more effectively integrate open source with the then booming (and ballooning) dot-com industry. Microsoft openly (through leaked documents, in any case) worried about the quality and success of the GNU/Linux systems, which proliferated online and continued to see massive improvements developed by volunteer programmers, even if programs and projects themselves were often controlled by recognizable organizational entities.[14] Moreover, the development and licensing principles of free and open source software demonstrated that a community of volunteer programmers would improve and fix code efficiently without the direction of a firm or even without compensation, all under the protection of novel intellectual property arrangements that were rapidly being mainstreamed. Free and open source software could thus be seen to operate as a counterweight to the business model of proprietary software. But the branch of organizations and developers more associated with Torvalds, Raymond, and O'Reilly increasingly judged what it viewed as Stallman's radicalism as too restrictive and sought to reposition the movement as "open source" in order to make it more business-friendly.[15] This caused a rift between the political aims of the FSF and the open source movement, which sought the proliferation of free and open source software processes both in the public and within industry.[16]

The open source branch's rhetorical repositioning was generally successful. The actual software programs produced through free and open source software processes have gained more widespread appeal, whereas they had been previously restricted to the relatively small groups of experts. GNU/Linux-based operating systems have been mainstreamed through organizations such as Canonical, which leads the development for the open source operating system Ubuntu, and free and open source

software programs like the Firefox browser and Apache server are widely used and compete for or have even attained (in the case of Apache) market dominance. For every Firefox and Apache there are thousands of smaller projects for software programs with both recognizable and inscrutably obscure functions. Furthermore, while free and open source software communities continue to present themselves as positioned against proprietary software, the 2000s have witnessed the general acceptance of open source development in the software industry. If the debates within free and open source communities of the late 1990s revolved around the perceived purity of various versions of the GPL and open source licenses, today's discussions involve the status of contribution agreements, as major software industry partners contribute to and organize code bases and open source projects.

More striking than this fairly standard history of open source in the field of software is the prevalence of invoking free and open source software production as either a paradigmatic example or synecdoche for broader transformations in cultural and economic production. Writing from a legal (and classical liberal) perspective, Lawrence Lessig points to free and open source development to demonstrate the *correct* balance between intellectual property rights and freedom to innovate from existing cultural and technical material.[17] Yochai Benkler, writing in a similar vein, points to free and open source software as "but one salient example of a broader phenomenon" that he encourages us to view not only as a "new mode of production" but as the basis for expanding critical citizenship and reinvigorating the public sphere.[18] Comparable exemplary uses of open source can be found in the arguments of numerous other legal and cultural theorists working the intellectual property circuit. For instance, though writing in a decidedly more Hayekian tone, James Surowiecki notes that open source programming, Linux in particular, "is not all that different from a market;" it thus serves as the "surprising," but nonetheless effective, model for successful market-based decentralization.[19] In another chamber-of-commerce–friendly series of examples, Don Tapscott and Anthony D. Williams's *Wikinomics: How Mass Collaboration Changes Everything* (2006) identifies free and open source software programming as a pioneer practice that developed new and replicable production processes—processes that can now be identified and deployed in almost limitless market contexts.[20]

If both liberal legal theory and neoliberal market theory locate open source practices as exemplary, there has been no less enthusiasm from the political left. Michael Hardt and Antonio Negri turn to open source to explicate perhaps the most troublesome political question facing their

concept of a multitude, viewing "the political decision-making capacity of the multitude in analogy with the collaborative development of computer software and the innovations of the open source movement."[21] Indeed, Hardt and Negri push the figure in a direction similar to Benkler's hopes for a rejuvenated *public* sphere (we suspect both Hardt and Negri would reject *that*), positioning open source as a vehicle for "understanding the democracy of the multitude," which takes the form of "an open-source society, that is, a society whose source code is revealed so that we can all work collaboratively to solve its bugs and create new, better social programs."[22] It's certainly tempting to explore this odd synecdochal uptake of "open source" across otherwise seemingly severe political and philosophical divisions. At this point, however, it will be sufficient to observe that between the late 1990s and mid-2000s, the relatively limited practice of free and open source software programming—a rather specialized and scarce activity even today—exerted a general cultural fascination.

This effect may be owing to the location of software programming within three broad and interrelated historical shifts: the prevalence of information production, particularly as it intersected with the availability of global networks and new media forms (the *commodity form*); the legal and policy changes designed in part to stabilize value and property relationships for such production (the *value form*); and the sheer difficulty of efficiently managing such productive relations through industrial methods developed for physical commodities (the *labor form*). For each of these ostensibly period-defining formal developments, software production could be said to encapsulate fundamental tensions. At a purely technical level, source code is located, so to speak, between the *interface,* with its much analyzed metaphors (the briefcase, the file), and the *machine,* with its memory and electronic pathways; as human-readable language with its own syntax and semantics, and as instructions that shape the interface by being compiled for the machine, source code may mark an intense space or moment where representation and function become indiscernible. To the extent that the commodity form of even informational products had tended to rely on that distinction (to ground the difference between expression and idea in U.S. copyright law, for instance), software in general could become a technical difficulty for the commodity form itself, which in turn modifies value. Software programming thus becomes a key technical site of conflict in intellectual property disputes, but within existing forms of social organization that heighten those conflicts. More specifically, software, especially through the mid-1970s and early 1980s could not be disentangled from the competing values of its multiple sites of production, which included an emerging personal computer software

industry, well-established scientific and academic spaces, and historically widespread and vibrant amateur hobbyist communities. Both the juridically unstable status of source code as a technical object and the social groups that engaged in software production through the 1970s and 1980s could generate the arguments, case law, and legislation that would establish or extend broader restrictive principles, while its practitioners were similarly well positioned to devise the strategies that would subvert these principles, the GPL among them.

Finally, software programming became an important site for rethinking and reworking industrial production methods and the organization of cognitive labor. Raymond's account, for example, proposes to modify one of the classic managerial texts on programming, Frederick Brooks's 1975 *The Mythical Man-Month: Essays in Software Engineering*. The complexity of sequential debugging and the communication problems involved in making software functional meant, for Brooks, that adding "manpower" to projects could be counterproductive; indeed, the basic conceptual machinery of the Fordist assembly line failed the software project managers of the 1960s and 1970s because the communicative work involved in programming added time to the projects, which is to say, cost. Brooks discovered, in other words, that the Fordist production models that software project managers initially sought to institute had always been in the first instance particular temporal configurations that did not quite fit the activities of programming. The man-month is in this sense *mythical* because the measurable, *temporal form* of standard commodity production breaks down where the work becomes cognitive and communicative.

Raymond's response in *The Cathedral and the Bazaar* does not deny this problem but instead presents a radical solution and alternative organization of temporality, combining a core decision-making group with a larger, indefinite group of contributors. One can add "manpower" to this indefinite group while restricting coordination and communication time to the core group, thereby limiting the "full Brooksian overhead" cost of the communicative labor.[23] Considered as a concrete business problem, the open source solution is certainly novel. It may exert a force of fascination, however, because it signals a shift in incorporeal relations, a fundamental instability in the time and location of work. What Raymond does not address, for example, is the form of temporality that escapes this overhead, which itself assumes a shape as indefinite as the qualities and motivations of the large contributor group. If, as Christian Marazzi has it, the "centrality of language in post-Fordist production and the putting to work of the cognitive properties of the workforce leads to a *crisis of measurability* of single work operations," software highlights the managerial

problems inherent in this crisis while presenting innovative productive relations that seem to offer solutions.[24]

If the valorization process in industrial economies tended to operate through the tangible character of the physical commodity and the form of temporality associated with its production, software becomes an index of transformation, a site where the whole social logic of value experiences its limit. As a similar limit is experienced in other fields, however, the kinds of relations that developed in software production seem to operate in and across those other fields. Put another way, the relations through which open source operates could be said to function diagrammatically. Diagrams, as Gilles Deleuze describes them, are not fixed representations of power or ideal forms to be copied, but abstract machines that constantly evolve, "unmaking preceding realities" and developing new modes of organization.[25] Software production functions as a point of extreme saturation for sets of relationships that are solidifying and evolving across multiple spheres of activity. These multiple spheres of activity don't *copy* the relations manifesting themselves in software production, since they are already ongoing and developing independently while encountering various frictions related to their specific practices. Where activities and relations that resemble free and open source practices develop in, say, furniture design, it is not because furniture designers are simply replicating or imitating software practices. The resemblance indicates, instead, that a set of material conditions and incorporeal relationships playing themselves out in programming are also playing out, evolving, and mixing with previously existing forms in furniture design.

If we retool Michel Foucault's insight on what he called the swarming of disciplinary mechanisms, we might say that, in the maturing network society, programming—understood as a set of technical and social relationships—starts to resemble economic, political, and aesthetic phenomena of all kinds, which all start to resemble programming. But we might also better recognize Foucault's sly tautological joke in the original, where "prisons resemble factories, school, barracks, hospitals, which all resemble prisons."[26] Foucault returns to "prisons" again at the end of the clause to emphasize the multiple reinforcement of the relations as they solidify in and across actual institutions, discourses, techniques, and practices; the second resemblance undercuts the very notion of resemblance. Or, to put it in the slightly more blunt tone of Gilles Deleuze and Felix Guattari, "[t]here is no metaphor here; the factories are prisons, they do not resemble prisons, they *are* prisons."[27] It is in this sense that the movement from open source software to open source culture need not be read as either a rhetorical figure of or ideational abstraction from the concrete

practices of programming or organizing software projects. In the next sections, we turn to open source culture, understood broadly as those other sites and fields that seem to develop open source practices, both to situate the articles that follow and to examine one of the effects that open source relationships seem to produce wherever they appear: the suggestion, or even enterprise, of utopia.

The Logic of Open Source Culture

We might begin periodizing open source culture itself by introducing another work by way of contrast, one of the "greatest hits" in the genre and one written in the days when open source software production (or, more broadly *software* itself as we have come to know it) was first getting off of the ground: Fredric Jameson's *Postmodernism, or, the Cultural Logic of Late Capitalism* (1991). Our interest here, of course, is not in pointing out the various ways that this work, published in the very early 90s and based on research stretching back to the mid-80s, might fail to accurately diagnose contemporary cultural tendencies. As Jeffrey T. Nealon has recently suggested, though *Postmodernism* rightfully remains a perennial syllabus favorite and critical theory touchstone, reading it as any kind of timely diagnosis of *present day* culture would go against Jameson's own methodological axiom—"always historicize"—one we also intend to follow here.[28] In any case, it also seems that at least the fundamental observation of the work, namely, that "everything in our social life—from economic value and state power to practices and the very structure of the psyche itself—can be said to have become 'cultural' in some original and yet untheorized sense," still seems to ring very much true, even if the lion's share of work in the critical humanities and social sciences since the time of Jameson's writing has been devoted to attempting this absent "theorization."[29]

Rather, we are interested in Jameson's treatment of computing technology in the text—an awkward treatment, perhaps necessarily so, given its appearance during what we might have to call for lack of a better term the "old days" of "new media." Computers first appear in *Postmodernism* via Jameson's critique of their failure to be, or to inspire, objets d'art, as machines "whose outer shell has no emblematic or visual power" that might excite in the way that machine guns did for Moretti or automobile factories did for Rivera (37). This failure quickly becomes a productive one, however, as Jameson uses it to "represent" the difficulties of representation itself during the time of his writing; the opacity of the computer

becomes a synecdoche for the difficulty of comprehending "the whole new decentered global network of the third stage of capitalism itself," a perplex that cashes out on one side in "high-tech paranoia" and conspiracy theory (the desperate need to spin a pattern out of the incomprehensible) and on the other in the "postmodern sublime" (the celebration of incomprehensibility as its own category) (38).

More importantly given our interests here, Jameson's foray through computing technology provides a key transitional point connecting his appropriation of Ernest Mandel's periodizing move in *Late Capitalism* (1975), the division of recent history into several "machine ages" or "fundamental breaks or quantum leaps in the evolution of machinery under capital" (35), and Jameson's unique extension of Mandel's "Third Machine Age," one dominated by what we would now call *new media,* the "machines of reproduction rather than production" driving capitalism at the time of his writing (37). There is, as one might expect, a certain tension inherent in this shift. Mandel's machine ages—the eras of the steam engine (industrialization), the combustion engine (Fordism), and "electronics, automation, and nuclear energy" (post-Fordism)—themselves being an adaptation of Marx's writings on "motive machines," provide for Jameson a way to promote the relevance of Marx's nineteenth-century work in reading "the multinational or consumer capitalism" dominating late-twentieth century capitalism (36).[30] However, whereas Marx's "motive machines" referred largely to literal tools and factory hardware, and Mandel's "machine ages" mainly describe literal "engines" or energy sources for machinery, Jameson's turn to new media is an attempt to link up with these older methodological approaches while also changing the exemplary core of his analysis from *machines* to *media.* This shift is apparent in his turn from questions of technology "itself," in relation to production methods, to the ways such technologies are mediated by cultural responses (as in the aforementioned references to Moretti and Rivera). By the time a reader reaches *Postmodernism*'s chapter on "video," Jameson is signaling how the centrality of media necessitates a certain rereading of culture in general: "It is because we have had to learn that culture today is a matter of media that we have finally begun to get it through our head that culture was always that, and that the older forms or genres, or indeed the older spiritual exercises and meditations, thoughts and expressions, were also in their very different ways media products" (68).

One of the major results of the perspectival shift described here by Jameson, through which the ubiquity of media today leads us to both project and retroject its importance in producing cultural change, is noted at the very start of Alexander R. Galloway's contribution to this issue:

the vast profusion of books "on digital this and digital that" over the last decade or so that model different response to this revelation, from the rereading of cultural history as the "history of media in culture" to predictions of how new media will drastically change the future of politics, commerce, and society as a whole (377). However, as Galloway suggests, the changes in modes of production that we have been gathering around the concept of open source here seem to require something like a further rereading, perhaps one akin to the shift that introduced the *mediacentric* viewpoint in both academic and popular analysis in the first place. In particular, Galloway draws our attention to how, ten years after the publication of the central reference point of his essay (Lev Manovich's *The Language of New Media,* 2001) and about twenty years after the work we've been focusing on over the last few pages (Jameson's *Postmodernism*), it seems necessary to rethink the relationship between the intellectual concerns of critical theory that grew up parallel to the expansion of new media and the "general open sourcing of all media systems" today (383). Although new media prior to "open sourcing" was a provider of significant content for cultural and critical theory forming around questions of essence and simulation, the present paradigm "has almost nothing to do with the lingering phenomenological anxiety around presence and truth fueling post-structuralism's long obsession over sources" (383). Indeed, it seems as if at least some methods of critical analysis (and of critique as a mode of intervention) have themselves become subsumed in contemporary capitalism and its structuring technologies: "What was once an intellectual intervention is now part of the mechanical infrastructure" (384).

We might dwell for a moment on this last point—Galloway's conflation of the *intellectual* and the *mechanical* in relation to media systems—as a way to briefly suggest our own all-too brief and vulgar historical schema for periodizing open source production as it is approached in this issue of *Criticism*. In particular, we want to leverage the connection between the intellectual and mechanical made in Galloway's foregoing statement—a connection that is also, we take it, implicit in the phenomena with which we began this essay (from open author and open content online presences, to crowdsourcing and prosumption techniques, to feedback mechanisms for niche marketing and niche messaging). All of these latter processes seem to escape the confines of both Mandel's notion of "machines" that center methods of labor and production, as well as the more contemporary notion of media as the center of cultural representation and (re)production; more specifically, we might say that they combine or hybridize these two forms in a way that was orginaly hinted at in the (now outmoded) notion of *information technologies* as a category, or, even more precisely, to

use a term favored by a thinker who served as something of foil for both Mandel and Jameson, what sociologist Daniel Bell called *intellectual technologies:* techniques built around the feedback between generic human and technological capacities, particularly the ways in which technologies tend to exteriorize human capabilities while at the same time promoting cultural changes that in turn shape human *mentalité* and behavior.[31] At the risk of condensing around eight hundred years of Western culture into four paragraphs, we will suggest in the following that such a historical rereading along the lines of intellectual technologies may be the best way to put into relief the central questions of contemporary culture and social power as they are indexed against open source production and pursued by the authors collected here.

We might say that a history of this type covering the European late Middle Ages and early modernity has already been attempted, notably as a side issue in Foucault's *The Order of Things* (1966) and its focus on the ways techniques of representation and analogy were turned into the "tools" of written tables, taxonomies, and grammars. However, the most expansive and elegant treatment is likely historian Alfred W. Crosby's *The Measure of Reality: Quantification and Western Society, 1250–1600* (1997). For Crosby, the period under review is marked by a rapid increase in *pantometrics,* or systems of universal measurement within European culture, aesthetics, and economics; the rise of standardized units of measurement and systems for translating and representing them at least partially accounts for the quickening pace of technological and scientific advancement in Europe during this time. This change in ways of apprehending and representing reality, Crosby argues, also demonstrates a fundamental change in Western rationality and sensibility. As contrasted with the Greek intellectual culture, the interest in *quantity* and quantification can be clearly contrasted with Greek Antiquity's obsession with *qualities* and qualification, absolutes and essences.[32] More importantly for our purposes here, the move from absolutes to pantometrics was in very important ways enabled by the construction of technologies that functioned both as means of representation ("and mediation") and as tools for the actual performance of measuring and relating different quantities. The wide varieties of such technologies that emerged or became common from the Middle Ages to early modernity cataloged by Crosby—the popularization of "counting boards" as machines for performing and representing arithmetical operations, the construction of public clocks in town spaces to establish and regulate shared time, the expansion of gold currency and accounting books, revolutions in uniform cartography, the introduction of geometrical diagrams and methods into painting—notably perform

the dual functions of being both representations of a sort as well as technologies for establishing relationships between individuals and items, mediating economic exchanges, and establishing cultural norms.

To mark the time between the period studied in Crosby's work and the one in which we are primarily interested here (the last half-century or so encompassing the development of computing technologies), we might hesitantly posit a period between these moments wherein pantometrics gives way to (or becomes further operationalized as) *calculation*. Indeed, the end of Crosby's pantometric era corresponds roughly to the formalization of calculation proper in mathematics, leading up to the coinvention of the infinitesimal calculus by Newton and Liebniz in mid-seventeenth century. We might take one of the key concepts of the that system, *adequality* or the concept of "proximal equality," as a suturing point for a large range of subsequent cultural changes based on the assumption of likely relationships between phenomena or the results of particular processes, the turn away from methods for quantifying phenomena in the present as the primary motivating force of scientific and intellectual culture and toward procedures for predicting future states and effects. The effects of phenomena occupying a state between *mediation* and *technology* here and its impact on societal change during modernity might be found, for instance, in the increase in stock-exchange systems and early speculative markets, as well as the vectors studied by Foucault in another of his works, *Discipline and Punish* (1975), the techniques and technologies, spectacles and sign systems, used to define social roles and modulate the future behavior of individuals.

Finally, we might suggest that we currently occupy a third and only recently emergent period in this history, one defined by the dominance of what we might call, to borrow another term from mathematics, *algorithmics*. Such a category would encompass complex processes that neither suppose a universal measure nor are necessarily based on the anticipation of discrete future states, but maintain a general equilibrium by flexibly incorporating and responding to variables within a given system. Here, of course, the computer, itself conceived around the potential for algorithmic processes, is perhaps the best synecdoche for the logical form being described, but one to which we might add video games as an aesthetic and entertainment form (one that, as Galloway writes elsewhere, serves as a prime example of a "subjective algorithm" embedded in a media form); the development of parametric methods in architecture, in which structural and decorative elements are rendered within the design stage so that altering one variable will automatically make necessary changes in other affected elements; and the marshaling of massive computing power to

model everything from the diverse possible futures for climate change to the construction of "game-theoretic" scenarios for identifying the best options for a government or corporation to make in response to thousands of possible changes in the global (political) economy.[33]

However, it is the systems of production that we have been describing here as "open source" that might provide the best example of the economic and cultural impact of such processes, as well as the ways they combine functions typically divided between "media" and "technology." It is equally dissatisfying to attempt to think of the networks moderating, for example, the ways in which consumer trends or voter dispositions are collected and integrated into niche marketing and niche campaigning as either the operation of "media" or of technologies; similarly, the computing power and online presences that make possible the division and distribution of activities in crowdsourcing also seem to occupy a liminal state between these categories, or at least illustrate how their functions have become combined or confused within social media and systems of data aggregation. In this sense, the emergence of such vectors in what Crosby calls the *quantification* of Western society that seem so significant now, might be taken as not only the overturning of the emphasis on *qualification* in Greek Antiquity but also undoing the coeval division between the concepts of *logos* (denoting "truth," as well as language, accurate representation, and social commonalities) and *techne* (our root word for "technology" and referencing, among other things, the duplication of natural processes via human contrivance and the subverting of natural process through mechanical means).

Defining such "technologics" as structuring principles for contemporary culture is very much a concern for not just Galloway, who is specifically asking after the status of new media in the present moment, but for all of the authors in this issue. We might see Jameson as having already hinted at a "becoming algorithmic" of contemporary culture in *Postmodernism;* namely, the algorithmic complexity, or irreducibility of "culture" in the present—the difficulty of "mapping a totality" or of representing culture in a time wherein culture "itself" seems to have saturated all of contemporary life, including our means of representation and mediation. The contributors collected here might be taken as shifting their objective from that of representing or "mapping" culture at the moment at which it seems to be taking on the complexity of an algorithm, to an explicit tracing of the effects produced when algorithmic logics become central to culture, the ways in which, since roughly the time of Jameson's writing, these logics have restructured the ontological status of individuals and groups (Ben Roberts), the modalities

of authorship and aesthetic production (Stephen Voyce), and the ever-faster feedback loops of production and consumption as forces in the shaping of social subjectivity (Leisha Jones).

Open Source Aesthetics

Given the foregoing observations alone, we might have reason to suspect the existence of an *open source aesthetic* developing over the last few decades in at least two different ways: as, most broadly, part of a presumed larger change in human *mentalité* and sensibility during a time saturated by collective communication and algorithmic interaction or, on more familiar terrain, via the assumption that aesthetic production processes are by necessity influenced by the dominant structure of commodity production. Indeed, something of the former is suggested by Nicolas Bourriaud's influential and controversial concept of *relational aesthetics,* an attempt to thematize contemporary art that reflects "the changing mental space opened for thought by the Internet."[34] Bourriaud finds this shift evidenced in artworks that create open-ended opportunities for interactions between strangers—interactions in which the audience "is not in front of an object anymore but included in the process of its construction."[35] Examples include Rirkrit Tiravanija's *Untitled 1992 (Free),* in which the artist cooked Thai curry in a makeshift kitchen within a Soho gallery and invited visitors to serve themselves, and Liam Gillick's *The Pinboard Project* (1992), a series of bulletin boards holding advertisements, photos, and documents that can be rearranged and altered by the works' "users." For Bourriaud, works such as these continue the "emancipatory" struggle of earlier twentieth-century avant-gardes against "authoritarian and utilitarian forces," but under "quite different philosophical, cultural, and social presuppositions."[36] In particular, the "subversive and critical function" of the art Bourriaud sees as participating in relational aesthetics comes not from the direct critique of societal conditions or the positing of utopian alternatives he associaties with both modernist art and 1960s art criticism, but rather from the creation of temporary "microtopias" that materially enact small-scale deviations from the dominant structures of contemporary social life.[37]

Somewhat more schematically, we find analysis of the latter vector—the relationship between aesthetic praxis and current modes of mainstream economic production—in the ongoing study of *immaterial labor* in contemporary post-Marxist thought. Writers on this issue largely take their cue from Marx's scattered, but consistent, interest in forms of labor that result

in no material commodity or in which the "product is inseparable from the act of producing," notably that of, in Marx's time, performing artists, actors, orators, and a variety of what we might now recognize as so-called knowledge workers (teachers, physicians, clergy, etc.).[38]

Although for Marx, in his time, production of this type was "so insignificant compared with the totality of production" that it could be "left entirely out of account," contemporary autonomist-influenced thinkers such as Paolo Virno, Antonio Negri, and Maurizio Lazarrato have shaped their analyses of contemporary economic production on the vast expansion of such "immateriality" of both contemporary commodities and dominant labor practices. Although the notion that immaterial vectors such as appearance, design, and cultural currency have become important if not inseparable components of contemporary commodities is by now a familiar one, the significant innovation of work on immaterial labor has been to show rapid changes on the other side of the equation, the explosion in labor power devoted to, as Lazzarato writes, the "defining and fixing and cultural and artistic standards, fashions, tastes, consumer norms."[39] On the one hand, although the capacity to contribute to such a "defining and fixing" used to be, in Lazarrato's phrasing, "the privileged domain of the bourgeoisie and its children," the expansion of flexible structures of niche marketing and the "just-in-time" production of commodities for even small sectors of a potential market have fundamentally enlarged the number of individuals who can and do participate in this sphere. On the other hand, demands for workers to leverage their creative and intellectual capacities as a supplement to their material work has equally expanded; the former synecdoche for the rigid and unimaginative core of modern wage labor—the Fordist factory—is transformed in post-Fordism, or under "Toyotism," into a symbol for how the creative problem-solving of floor workers and their liberal communication and collaboration with management fuel continual innovation and efficiency. Virno, for example, figures the transformed scene as follow: "Thirty years ago, in many factories there were signs up that commanded 'Silence, men at work!' . . . Today, in certain workshops, one could well put up signs mirroring those of the past, but declaring 'Men at work here. Talk!.'"[40]

Thus, from the perspective of the history of capitalist labor, we see a strange shift; Marina Vishmidt observes: "[T]he axes of 'creativity' and 'flexibility' once deemed endemic to the artist as constitutive exception to the law of value" become "valorized as universally desirable attributes" in the general labor market.[41] From the perspective of the history of art proper, much modernist art looks increasingly like an eerie anticipation of these changes in labor and the commodity form; as Lazarrato writes,

a work such as one of Marcel Duchamp's readymades simultaneously "deprofessionalizes the artist's function" and emphasizes the power of aesthetic and immaterial production within capitalist economies.[42]

At first blush, Bourriaud's notion of relational aesthetics and what Lazarrato calls the "aesthetic model" of immaterial labor, though each possessing their own unique explanatory power, might seem complementary enough. Indeed, both orient their interventions around marking the ways that contemporary information and communication technologies have altered our experiences of social interaction, and both take the ad hoc collaboration of small collectivities to be the primary way in which quotidian social life can or does overlap with aesthetic experience. However, it may be more useful thinking the two together in terms of the ways they contradict or cancel each other out and therefore underscore the difficulty of identifying some recognizable change in aesthetic practice that might refract the changes wrought by what we have been calling open source culture here (or, one might say, the difficulty of identifying "an aesthetic response" in a moment wherein culture and economics as whole seems to have been "aestheticized" to some degree).

More specifically, the dominance of immaterial labor in the present moment as sketched by Lazzarato and other autonomist-influenced commentators would seem to give the lie to Bourriaud's claims that relational artists offer the chance to participate in compelling alternatives to everyday life. To reference only the aforementioned works, it is quite possible that administrators in your workplace have followed relevant literature on employee morale- and team-building efforts and thus provide community bulletin boards not unlike those constructed as part of Gillick's *The Pinboard Project*. Similarly, Tiravanija's *Untitled 1992 (Free)* may be designed to jar your average gallerygoer's notion of art's boundaries, but it might also remind them of their last corporate off-site; indeed, it's not at all unlikely that you have been afforded the opportunity to serve yourself at a makeshift kitchen as part of a "work-related" function (if you're "lucky," it may have in fact been at an art gallery). Overall, Bourriaud's claims for the oppositional qualities (however mild) of relational art as creating "spaces where alternative forms of sociability, critical models and moments of constructed conviviality are worked out"[43] seem to short-circuit in a time when "constructed conviviality" operates more as a norm of everyday social experience than as its alternative. Indeed, it is hard to see the difference between Bourriaud's descriptions of his "microtopians" and Lazarrato's characterization of the "managerial class" during the dominance of immaterial labor with its emphasis on "the eliciting of social cooperation" of small groups, or between his celebration of artworks for

which audience members "are included in the process of its production" and Lazarrato's definition of the postindustrial commodity as "the result of a creative process that involves both the produce and the consumer."[44]

Moving in the opposite direction, the limitation of leveraging theories of immaterial labor to define a contemporary aesthetic is much simpler, if no less significant. Tracking the *immaterialization* of labor against the concomitant *aestheticization* of cultural and economic production tells us an awful lot about structural transformations in the sphere of labor and the process of valorization in contemporary capitalism, but these revelations come at the expense of providing any insight into contemporary art as providing an aesthetic reflection beyond the simple mirroring of contemporary modes of production; thus, they tend to reserve for art only the role of confirming the saturation of aesthetic techniques into culture as a whole. Another way of putting this would be to suggest that the perspective on art "itself" offered in theories of immaterial labor occlude commentary on art in the present while offering ways to reread its past and predict its future. On the one hand, it becomes possible to retrace art history to capture the moments through which the tendency of artistic production methods to mirror those of the generic modes of production begins to reverse itself, leaving us to the present day, in which they become increasingly indiscernible. On the other hand, it leaves us waiting to imagine a future aesthetic that might in some way separate these modes and return art to its proper role and/or potential changes in categories of labor that would provide the necessary conditions to make such a separation possible.[45] The latter attempt might amount to a strange inversion of one of Marx's most-quoted (if poorly understood) comments about artistic production "after" capitalism: "In a communist society there are no painters but only people who engage in painting among other activities."[46] In the regime of immaterial production, the problem instead is that everyone is already expected to engage in the aesthetic mode of production "among other activities" more traditionally recognizable as labor. Thus, the concomitant wish is instead for a society wherein people *could be just* painters or art could take on a role, and artists take on a vocation, that is not already automatically subsumed within immaterial labor in general.

All of which is to say, in both cases, the sticking point is the apparent mutual subsumption of aesthetics and generic cultural production—one brought to the fore in contemporary theories of the aesthetic mode of immaterial labor and one (unconsciously) performed in the works Bourriaud identifies with relational aesthetics. When the realms of the aesthetic and everyday reality appear to entirely overlap in this way, it becomes impossible for art to fulfill its modern function of uniquely refracting rather

than merely reproducing social forms, to serve, in Theodor Adorno's memorable phrasing, as "the social antithesis of society" while not being "directly deducible from it."[47]

It bears repeating that this problematic emerges out of the ever-tighter feedback loops between production, consumption, and contribution that we have been referring to under the title of *open source culture* in these pages, the ways in which material products and intangible experiences are delivered with the expectation of further modification by, and/or designed around the existing preferences and dispositions of, their eventual "users." In this sense, it is tempting to give up and conclude that it is contemporary capitalism, not art, that has resolved what Deleuze calls the "wrenching duality" of aesthetics that provides its reflective power, its manifestations as both "a theory of sensibility as the form of possible experience" and "a theory of art as the reflection of real experience."[48] As Deleuze goes on to argue, for these two roles to be synthesized "the conditions of experience in general must become conditions of real experience" and the work of art becomes one of constant experimentation. This experiment—the making equivalent of the possible and the real—now seems to find a more appropriate home in the research and development (R&D) wings of corporations than in the "laboratories" of installation art. In any case, in a time wherein the Great Indoors retail outlet offers 1,500 different styles of drawer pulls and General Electric's plastic division houses a fully staffed Global Aesthetics Program, we have to assume some ceding of ground on the part of contemporary art.[49]

However, in his contribution to this issue, Stephen Voyce offers a compelling argument for how contemporary work in poetics that push such processes of (aesthetic) appropriation and cultural "cocreation" beyond their usual limits might reclaim art's prismatic function. Like many of the aforementioned theorists, Voyce returns to Marcel Duchamp's readymades as a pivotal moment in thinking through the potential of aesthetics today; however, rather than reading these works either as the beginning of relational art as a paradigm or as the beginning of the end of the boundaries separating aesthetic production and economic production, Voyce locates their unique position within the parallel histories of (post)modernist art, intellectual property legislation, and cultural appropriation.[50] For Voyce, such an entwined genealogy emphasizes, most generally, the crucial temporal context of appropriative art such as Duchamp's and its effects in its own time, the fact that "appropriation can be considered subversive only if a given society, and its attendant legal apparatus and cultural institution, deem it illicit" (408). More importantly, however, it provides the conditions for analyzing the aesthetics and politics of contemporary

appropriative and "collaborative" art such as the encoding of a poem into a DNA strand that will be implanted into a living bacterium (Christian Bök's *Xenotext*), the construction of a "collaborative MFA" in Creative Writing from pieces of text donated by eighty-five individuals (Rachel Zolf's *The Tolerance Project*), and a series of book proposals and writing directives combined into 830 unpunctuated lines (Darren Wershler-Henry's *the tapeworm foundry*).

Duchamp's gambit in entering a signed urinal (*Fountain*) into the 1917 Society of Independent Artists exhibition was designed around the careful calculation of the effects it would produce, given its setting—quite literally so, in a note entitled "Algebraic Comparison" included in Duchamp's *The Green Box* (1934). The equation contained in "Algebraic Comparison," as Thierry du Duve has suggested, was likely both an ironic comment on Cubists' interest in "arithmetical proportion" as well as a functional mapping of whether, in what way, and *for how long,* works such as *Fountain* could have their intended or anticipated effect.[51] More specifically, Duchamp's "Comparison" details the contextual necessities for *Fountain* to refract existing tensions between mass production and handicraft, and between the artist as creator and the artist as selector, from the general boundaries of what could constitute art to the "open admittance" nature of the Society's exhibition (one violated in spirit, if not in letter, when the jury accepted *Fountain* but hid it behind a partition during the exhibition).[52] These conditions created what Duchamp called the "possibilities" of the readymade as an intervention into the aesthetics of his time, as well the narrow window in which it could generate its anticipated effects.

Using Duchamp's "Algebraic Comparison" as a benchmark, we might categorize the artists that Voyce forwards as an incipient avant-garde for today in at least three ways. First, for all of them, as for Duchamp, poetics becomes a way to mark off transitional moments in contemporary modes of production and the various institutional systems that demarcate and regulate creative activity. Here we move from the growth of industrial mass production in Duchamp's time, and the question of aesthetic propriety, to the rise of ubiquitous computing technologies, bioinformatics, crowdsourcing, and "economies of contribution" of today and attendant questions of intellectual property (from Kenneth Goldsmith's refashioning of himself from writer to a "word processor," to Bök's integration of human language and genetic engineering, to Zolf's sourcing and distribution of adaptable poetic passages). Secondly, we might say that, for all of these artists, the force of the work emerges not so much through a calculated "operation" of its discrete and immediate effects, but through the

open and aleatory "program" of possibilities for their future modification and adaptation.

More specifically, as Voyce writes, the design of their work draws its impact precisely through its disjunctive qualities with how such variants operate in everyday culture, most specifically their function to "problematize, baffle, and defy the enclosures of intellectual property regimes" (420) by deliberately violating intellectual property legislation and more specific institutional norms for the identification and authorization of creative activity. In this sense, these poetic works grouped here might be seen as offering an update on Duchamp's "Algebraic Comparison" via something like an "Algorithmic Contrast": artistic productions that both engage and exploit the general production methods of contemporary capitalism—namely, the flexible, open-ended, and "cocreative" nature of economic production today—while also emphasizing its novel disparities and points of tension. More importantly, as Voyce emphasizes, it is this process that simultaneously constitutes both the "aesthetics" of what he deems an incipient "Open Source Poetics"—its power to refract methods of cultural production, to be the "social antithesis" of contemporary society—as well as its politics, a process that Voyce wants to forward and make more material by adapting the early organizing principles of "free" and open source software production in guiding aesthetic production.

Finally, and returning to the concepts introduced in the section on mediation in open source culture, we might also consider the ways in which these works retrofit Duchamp's commentary on aesthetics and utility in *Fountain* and certain other readymades. If Duchamp's removal of a urinal from the realm of utility and his presentation of it as a work of art in *Fountain* forced questions about the status and purpose of art and artists in the moment of mass production and standardized labor, then Voyce's chosen examples seem to be responding to similar questions during the moment of just-in-time and niche production, of immaterial labor (and commodities). In reference to the troubling of *logos/techne* distinctions outlined earlier, we might say these works engage a more specific (in)distinction—one Heidegger was fond of emphasizing—internal to *techne* itself in early Greek culture: its roles as designating both technical mastery and the creation and utilitarian tools as well its role of aesthetic production proper, or *poeisis*. In this sense, Wershler-Henry's transformation of writing guidelines and project ideas into a single-line poem, or Zolf's collection of poetic fragments that she tags with bar codes and hosts online for the use of any other writer, are perhaps the most appropriate update to Duchamp's gesture, a fashioning of items that will be both, or move back and forth between, a status as aesthetic objects in their own

right and one as tools for the use of others. As such, they both represent and perform the complexities of current modes of economic production while also functioning as a critique of the ways the benefits of these practices are unequally distributed.

It would be tempting to expand this last vector common to the artists Voyce gathers in his essay—an artwork's "quantum state" between function and form, or technics and representation—to works outside of poetics that also seem to equally engage the question of open source culture as we have defined it here. These might include, most obviously, other works in bio art, such as Eduardo Kac's participation in creating the genetically modified rabbit Alba, a "chimera" that contains genes common to jellyfish and that flouresces green when exposed to the proper lighting. As Kac himself has written, such work emphasizes the ways in which contemporary technology enables the move from "representation to reality" in artistic praxis.[53] Further, we might consider various works in "tactical media" and art activism around computing technologies, such as Steve Mann's provocations around closed operating systems and user agreements, as similarly finding their moment of critique through a conflation of use and representation.[54] Finally, and perhaps furthest afield, one might suggest that even current works that conflate classical methods of aesthetic craftsmanship with contemporary spectacle—such as Damien Hirst's *For the Love of God* (2007), a platinum cast of a skull adorned in over eight thousand high-quality diamonds, or Marc Quinn's *Siren* (2008), a sculpture of Kate Moss made out of 18-carat gold—fit within this frame. Although the political implications of these works seem far removed from the other examples, the return to labor-intensive methods of craftsmanship, and the use of materials (diamonds, platinum, gold) that are "intrinsically valuable" regardless of their relationship to the work itself, certainly seem to demonstrate an anxiety about, if not a critique of, the ways in which labor, value, and aesthetics have changed in the last few decades (including the experienced need to safeguard the value of a work in an age wherein visual art can be easily duplicated or appropriated).

Voyce, however, rightfully provides us something much more specific and significant here via his analyses of works and artists responding in more pointed and directed ways to these broad cultural and economic changes, and through perhaps the most appropriately democratic medium: poetics. In this sense, his depiction of these poets' adaptions and subversions of contemporary standards of intellectual property and immaterial labor shows them very much performing the traditional role Peter Osborne has assigned to avant-garde movements within "periodization," marking a moment of "cultural self-consciousness" that makes it

possible to conceptualize more clearly the present in relation to the past.[55] In this sense, as Voyce seems to suggest, they might also be marking out the future possibilities for not just poetics, but aesthetics as a whole, one that might be read as a positive inversion of the often degraded scheme of artistic reception that Jacques Rancière has dubbed the *ethical regime:* the consideration of aesthetic works in regards to "the question of their origin (and consequently their truth content) and the question of their end or purpose, the uses they are put to and the effects they result in."[56] Although this tradition has a rather morose history—often marked by iconicity and iconoclasm, elitism, and moralism—Voyce emphasizes how asking these questions today might affirm the acts of appropriation and collaboration constitutive of aesthetic production as a counterpoint to the catachretic leveraging of the same in contemporary culture at large. In this sense, the works Voyce identifies provide a new "end or purpose" for the political impact of contemporary poetics, even as the poets' work offers itself out to an "endless" future of adaptation and repurposing by their audiences.

The Political Economy of Open Source

We now return to a category that has, to some extent, haunted our analysis of media form and aesthetics from the outset: political economy. That the question of economy should adhere so closely to these other categories is not particularly surprising if we examine one of the central premises of open source culture: Production, which is to say, the production of value, confined in the industrial age to clearly demarcated spaces (the factory, the office, the studio, the lecture hall) escapes from its traditional sites and begins to function in spaces of consumption (the garage, the coffeehouse, the bedroom, and, with the increasing saturation of mobile devices and network capabilities, *anywhere* across the social terrain). To the extent that the closed spaces of industrial capitalism also mapped time to location, this movement outside those spaces triggers a corresponding extension of the time of production, so that production can now happen *anytime*. To be sure, these developments were already presaged by the just-in-time methods of Toyotism, to the extent that they folded the supply chain and consumer demand more fully into the production site while demanding from line workers an indefinite readiness and communicative capacity to contribute to quality improvement efforts on the shop floor. Open source culture can be said to intensify even that process, resulting in an anywhere-anytime production regime that enfolds the whole of social life while inviting contributions from an indefinite group, *someone*.

Unlike mid-twentieth-century concerns that an economic and technical rationality invades and eliminates forms of life and thought more properly approached in political or social terms—a problem that already obsessed Hannah Arendt, Jacques Ellul, and other thinkers of the Fordist era—both the problem and the promise of open source political economy would seem to be that the social retains its distinct character as it becomes productive. This phenomenon generally elicits two responses. The first response sees the insertion of sociality into production as potentially liberating, a restructuring of economic and social relations that opens paths to greater autonomy and more inclusive political culture. The second response, as might be expected, takes a somewhat dimmer view, reading the introduction of the social into production as both an expansion and intensification of the valorization process and its exploitative relationships.

The first view could be said to ground the economic analysis in Yochai Benkler's oft-cited *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (2006). Benkler argues that the social sphere is relatively unchanged in terms of its basic operations; what changes, rather, is the "relative salience of social sharing and exchange as a modality of economic production."[57] The everyday social interactions and nonmonetary motivations that once happened outside the time and space of work have, in this view, "come to play a substantial role as modes of motivating, informing, and organizing productive behavior at the very core of the information economy."[58] It should be noted that the availability of this changed role, has, for Benkler, roots that can themselves be analyzed in economic terms, where the "capital costs of effective economic action in industrial societies" moved the kinds of social sharing and contribution we see today to the "economic peripheries—to households in advanced economies," while the "restructuring of capital investment in digital networks . . . are in part reversing that effect."[59] The result of this distinctly historical transformation is the increasing importance of nonmarket motivations within the valorization process, such that many producers would be motivated primarily by states like satisfaction or enjoyment (just for fun, as Torvalds insists) rather than the wage or some monetary return on investment. Of course, market rewards must continue to operate, but the old closed firms will have to rethink both their internal organizational structures and their social role, in part because "users cannot be ordered around like employees."[60]

We might take as an example one of the darlings of similar discourse, the T-shirt company Threadless, for which users submit and score T-shirt designs, the winners of which scoring are then produced and sold through the website. Read through Benkler's lens, people contributing

T-shirt designs certainly seek to have their shirts printed, which would gain them some monetary reward, but they also seek the comments, feedback, praise, and companionship they might receive on the scoring engine; similarly, those who just score and comment on shirts are contributing value to the company and could be said to be incentivized, so to speak, merely by a feeling of community.

The porousness of the closed sites of production increases, with social motivation entering into the expanded production site and coexisting with the old market relations. It might be added, however, that Benkler's reliance on incentives structured around "emotional and psychological needs for companionship and mutual recognition" already explicitly performs the move in the other direction, enfolding within the process of valorization the cognitive, affective, and communicative dimensions in their totality, all of which end up analyzable in economic terms. At that point, Benkler's proviso that we need not assume any "fundamental change in the nature of humanity" is itself unnecessary to recognize the ontological claim lurking in the method. The historical problem of industrial capitalism was in this view its limited ontological outlook; it was, in its refusal of nonmarket incentives for production, never quite capitalist enough. In any case, while Benkler presents a largely economic prospectus, the changes he describes promise social returns of near hedge-fund (or even Madoffian) proportions, where "producing information, knowledge, and culture through social, rather than market and proprietary relations" can create "opportunities for greater autonomous action, a more critical culture, a more discursively engaged and better informed republic, and perhaps a more equitable global community."[61]

As we've seen, a major strain of critical discourse addressing the general transformation of production can be located in the Italian autonomist tradition, which has occupied itself with the movement of production "outside the factory" (and the corresponding insufficiency of grounding valorization in the temporal form of industrial production) since the 1960s and 1970s.[62] One of the most pressing concerns from the perspectives that can be roughly grouped under this banner is that the introduction of social, cognitive, and communicative qualities into production raises the problem of unremunerated labor. In open source culture, this problem can be considered in very concrete terms as distinct productive activity resulting in profit for a business while the activity goes unpaid for, as Tiziana Terranova argues in "Free Labor: Producing Culture for the Digital Economy" (2000).[63] Of course, the usual models provide some compensation for selected productivity. One could not say of Threadless, for instance, "My T-shirt design sold ten thousand units, and all I got was

this lousy T-shirt." To follow out Terranova's implications, however, one might note that all the losing T-shirt submissions constitute the value of Threadless as much as the winning submissions, as do the freely contributed comments and ratings. At a more abstract level, Paolo Virno develops the problem of unremunerated labor outside specific productive activities. Not unlike Benkler, Virno notes the historical shift that allows "generic human faculties" that had been excluded in industrial capitalism to be "included fully within the time-space of production."[64] While this arrangement transforms the extraction of surplus value, however, it does not eliminate it. Rather, Virno suggests that surplus value is now found where social cooperation becomes generally productive, in a gap that opens between "production time (which includes non-labor, its own distinct productivity) and labor time."[65] In this sense, it is not merely that specific activities are unremunerated but rather that when the time of (social) life and the time of (directly productive) labor collapse into each other, we are left with "unremunerated life."[66] Given this view, we can begin to see what drives the cost savings on the "full Brooksian overhead" trumpeted by Eric Raymond.

Analysts in the autonomist tradition have sought to determine where such a surplus—which begins to look very much like primitive accumulation—actually goes. Terranova, in her more recent work, has sought an "abstract line that crosses the 'new New Economy' of the web 2.0 and the mass financialization of the 1990s through to the new millennium."[67] Christian Marazzi is more explicit:

> The relationship between accumulation, profits, and financialization is reinterpreted on the basis of the salient characteristics of post-Fordist production processes. The increase in profits fueling financialization was possible because, in biocapitalism, the very concept of accumulation of capital was transformed. It no longer consists, as in the Fordist time, of investment in constant and variable capital (wage), but rather of investment in apparatuses of producing and capturing value produced outside directly productive processes.[68]

If, in other words, the recent financial crisis was driven in some part by a "giant pool of money" seeking greater returns, the recent autonomist-inspired work begins to draw the lines between the bit, the brick, and the balloon, which is to say, between the rise of unremunerated social production in "networked information economies" and financial outlets of the

surplus in the housing and securities markets.[69] Certainly, this is a very different result flowing from the revenue stream of open source cultural production than the potential political returns projected by Benkler.

While Benkler and Virno's depictions of social production differ, however, they may be said to share a common narrative or schematic. Both accounts posit, more specifically, a radical historical change that begins to leverage *existing* social resources. The characteristics of this resource, of course, also differ; Benkler grounds them in the psychosocial needs of individuals, and Virno (perhaps more carefully than some of his critics even in the autonomist tradition give him credit for[70]) posits preindividual common characteristics, the "generic human faculties" that are put to work, but the structure of contemporary economic subjects and collectivities seems—in both cases—to function as essences, while the forces that either liberate or constrain them come from outside. It is on this point that Ben Robert's contribution seeks to intervene. While the majority of his critical attention is focused on Benkler's economism, which is deemed "too static and asocial," the force of the analysis falls on the problem of the concrete emergence or genesis of new social forms as such. Benkler's argument, as Roberts has it, serves only to "explain how a particular mode of production can functionally compete with the market without really being able to account for how this change has come about" (385). The difficulty with positions like Virno's, by contrast, is that they similarly exclude the genetic work of politics by, as Alberto Toscano puts it in the essay from which Roberts draws some key concepts, developing a "speculative optimism which would look at the preindividual as the *preindividual-of-humanity,* the latency of a collective life which is always already possible, and precisely not as something that leads us towards politics by its very 'inhuman,' unconscious, and properly unliveable aspect."[71] If Virno's analyses of contemporary political economy tend to end on rather gloomy, or at best "ambivalent," notes, it is because they seem to be grounded in fundamental social traits that cannot themselves be programmed or activated. The social force of open source culture must, for Roberts, be properly *political,* viewed not as "some force prior to" contemporary political economy "that is in the process of being unharnessed," but as a "process" in which new social entities take shape (401). The social cannot be viewed "from the perspective of the individual or the collective as an a priori" (401). Dispensing with the *a priori* as Roberts suggests might allow us to get a better handle on the subjective transformations wrought by open source culture, and the particular relationship developing between social and economic rewards.

The Web 2.0 business gurus have managed to studiously avoid connections between networked information economies and financialization,

while concentrating rather effectively on the more limited problem of particular free labor: if all this user contribution is exploitative, it doesn't seem to come with that old alienation; indeed, people seem to derive all manner of satisfaction from such productive participation, even if it is unpaid. This defense is already implicit in Benkler's more careful construction of nonmarket motivations, which would posit satisfaction and other psychological and social rewards (like fulfilling the need for companionship) as the remuneration itself, or as what might be called *affective returns*. Following Roberts, we could first seek a genealogical basis for such developments rather than viewing them as the pure leveraging of existing qualities. Foucault, for example, detects the emergence of a discourse on affective returns in a series of early neoliberal theoretical arguments. Rethinking the conceptual position of both consumption and labor as grounded in exchange, emerging neoliberalism sought to recast both the worker and the consumer as an *enterprise,* a kind of investor, or entrepreneur of the self:

> The man of consumption, insofar as he consumes, is a producer. What does he produce? Well, quite simply, he produces his own satisfaction. And we should think of consumption as the enterprise activity by which the individual, precisely on the basis of the capital he has at his disposal, will produce something that will be his own satisfaction.[72]

Certainly, the conceptual transformation of the consumer from a partner of exchange to an investor seeking affective returns differs somewhat from that other figure dominating the contemporary discourse of open source culture, the prosumer deriving social satisfaction from making actual products. At the same time, if the subjective space for the prosumer's emergence in practice was already prepared in the doctrinal statements of mid-twentieth-century economic neoliberalism, it is at least necessary to rethink Benkler's suggestion that preexisting social desires become economically productive when restructured capital relationships open up network information economies.

We might further historicize the enterprise subject and social remuneration through the work of Franco Berardi, who, in *The Soul at Work: From Alienation to Autonomy* (2009), explores both the subjectivity of the entrepreneur of the self and the kinds of molecular social genesis pointed to by Roberts. For Berardi, alienation does indeed disappear among particular kinds of cognitive workers, while "enterprise and labor are less opposed in the social perception and in the cognitive worker's

consciousness."[73] If cognitive workers, for Berardi, "invest their specific competences, their creative, innovative and communicative energies in the labor process," an investment that is both economic and psychological, the value at risk must also be calculated across those domains. Berardi can thus attribute various psychopathologies to what might be called an open source mode of production (panic, depression, "catastrophic overturnings of the investments of collective desire"); at the very least, such a move introduces the other side of the ledger, so to speak, for the much vaunted social remuneration and affective returns.[74] The asymmetry between the production of (market) value remunerated by satisfaction and other social rewards was always, in this view, a way of keeping two sets of books, since it never accounted for the affective losses that might occur in such a process. If prosumption is recast as an investment activity resulting in affective gains, what Berardi shows us is that the risked "capital" and losses of the entrepreneurs of the self may themselves be affective rather than purely market-based. The prosumers of open source culture who contribute so freely—and who might, from the perspective of an enterprise society, be better thought of as contripreneurs, or contributors-entrepreneurs—don't merely expend time in exchange for social remuneration. The figure of the prosumer is still too old economy in this regard. Rather, they invest psychosocial capital, so to speak, and perhaps even at scary levels of leverage. The proponents of social production are fond of looking to satisfaction as way to swerve around the disappearance of the wage; they seem less inclined to conduct a risk analysis of affective investment. If such a transformation of the social requires a kind of therapy, Berardi, like Roberts, turns to "the processes of transversal formation of those unstable, varying, temporary, singular aggregates that are called subjectivities."[75]

Leisha Jones explores an instance of such processes in her contribution, "Contemporary Bildungsroman and the Prosumer Girl." Stitching together the old media circulation of the paper *Twilight* novels, the social production that could be said to constitute YouTube's economic model, and transversal girl subjectivities, Jones lays out in detail one complex site where media form, political aesthetics, and economies of contribution produce a deeply ambiguous network of relationships. In part, these relationships demonstrate how well Benkler's lessons on structuring prosumer activities have been learned and integrated into production; for example, Jones writes that "[t]he Prosumer Revisited 2009 conference held in Frankfurt, Germany, featuring a cast of international interdisciplinary prosumer scholars, was actually sponsored in part by eBay" (449). The publishers of the *Twilight* novels, for their part, readily recognize "girl prosumption of the *Twilight* franchise functions as free viral advertising"

so it "is permitted to exist without prosecution for copyright violation" (451). We can see here—and in countless other cases, to be sure—the eventual settlement between the so-called content industries and similar prosumer activities as it hovers on the horizon. From the perspective of the valorization process, the prosumer girls of Jones's account can be said to derive both individual and social satisfaction while also generating the surplus for any number of market-based concerns.

But Jones, like Roberts, is after other quarry: in the midst of these political-economic functions, the girl prosumers of her account reshape the interiorizing function of the bildungsroman, transforming it into a process that does something other than produce Subjects while pulling the gendered expectations of the novels apart into new and unexpected aggregates (451). The operations that Roberts suggests for producers of free software are, in this sense, actually accomplished by Jones in the case of girl fans; in the process, she demonstrates both the girl prosumers' distance from "the male-dominated realms of computer-based technology and organized fandom" and the general capacity for shaping and reshaping subjectivities. We might turn, then, to Jones's claim that "the lines between the Web prosumer, the corporate-sponsored prosumer poseur, and the professional cultural producer blur" (449). The discussion of political economy in open source culture will perhaps be located there, and it may even be far more likely to be located in those blurred lines than on the terrain of intellectual property. If the political economy of open source culture has lessons for us, as Roberts and Jones indicate, they are bound up in the peculiar relationships between the social and production, in the affective and economic effects of multiple forms of capital circulation, and, perhaps above all, in our capacities to generate novel aggregates.

At the risk of collapsing yet another distinction in an essay that has already engaged some familiar ones (between production and consumption, or labor and leisure) and argued for the recognition of some new ones (between mediation and technics in culture, representation and action in aesthetics), we conclude here by suggesting one more. One of the more difficult lessons presented by the political economy of open source may be this: if it gives us both the *utopian* hopes for participatory cultural and economic production and the more *dystopian* analyses that detect some parallelism between expanded participation and expansive exploitation, both views have turned out to be equally correct. On the one hand, open source and cocreative methods have made both economic and cultural production more flexible and efficient and transparent while also rendering production more responsive to the "needs and desires" of a much larger number of individuals. On the other, these methods can be said to

have introduced novel and increasingly elusive forms of expropriation, the expansion of capital's domain into once reserved psychosocial spaces, and perhaps even dangerous forms of accumulation. Another way of saying this would be that while open source culture is by no means what we hoped for, it is in fact precisely what we wanted. The complexity of open source culture certainly calls on cultural criticism to reexamine its theoretical approaches, particularly where they drag along a conceptual apparatus perhaps more appropriate to previous forms of social organization and production. It also requires that we multiply the sites of entry, study, and critique—particularly where these have been perhaps too enthralled by the spectacle of the copyright wars. The essays collected here have contributed in both these areas and thereby provided some code snippets, so to speak, for an expanding critical program. That is, at least, the spirit informing this special issue on "Open Source Culture and Aesthetics."

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NOTES

1. Both essays can be found in Eric S. Raymond's *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary* (Cambridge, MA: O'Reilly, 2001). Raymond has continued to edit and alter these essays in the forms hosted on his website: *The Cathedral and the Bazaar,* www.catb.org/~esr/writings/homesteading/.
2. For the association of open source and "the commons," see Lawrence Lessig's *The Future of Ideas: The Fate of the Commons in a Connected World* (New York: Random House, 2001), 19–23, available as a free download at the Future of Ideas, www.the-future-of-ideas.com/.
3. For a recent and fairly literal example of this trend of thought, see Erik Olin Wright's reference in *Envisioning Real Utopias* to *Wikipedia* and the open source development of Linux as two key examples of "the anti-capitalist potential of information technology in general and of the internet in particular" (*Envisioning Real Utopias* [London: Verso, 2010], 194).
4. Like software, biotechnology came under the sway of the intellectual property regime, largely through the same developments in patent and copyright law, combined with transformations in the way scientific research communities hooked into proprietary business interests. One of the more noteworthy ventures in "open source" biology is the BioBricks Foundation, which oversees open technical standards for genetic sequences. The case for an open source biology is further explicated in Janet Hope's *Biobazaar: The*

Open Source Revolution in Biotechnology (Cambridge, MA: Harvard University Press, 2008). See also Eugene Thacker, "Open Source DNA and Bioinformatic Bodies," in *Signs of Life: Bio Art and Beyond,* ed. Eduardo Kac, Leonardo Book Series (Cambridge, MA: MIT Press, 2007), 31–42. On open source aesthetics, see Voyce (in this issue).

5. For an in-depth discussion of crowdsourcing, see Jeff Howe, *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business* (New York: Crown Business, 2008). For prosumption, see Jones (in this issue). For citizen journalism as a phenomenon and business model, see Thomson Reuter's CEO Tom Glocer's "Old Media Must Embrace the Amateur," *Financial Times,* 7 March 2006.

6. For more on microtargeting in social media advertising and as part of political campaigning, see Jeff Pruchnic and Kim Lacey, "The Future of Forgetting: Rhetoric, Affect, Memory," *Rhetoric Society Quarterly* 44, no. 5: 472–94.

7. Steven Levy, "Epilogue: The Last of the True Hackers," in *Hackers: Heroes of the Computer Revolution* (New York: Doubleday, 1984), 413–30.

8. Raymond, *The Cathedral;* and Pekka Himanen, *The Hacker Ethic and the Spirit of the Information Age* (New York: Random House, 2001).

9. Richard M. Stallman, "Free Software: Freedom and Cooperation," in *Free Software, Free Society: Selected Essays of Richard M. Stallman,* ed. Joshua Gay (Boston: Free Software Foundation, 2002), 155–86, quotation on 164.

10. Martin Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry,* History of Computing Series (Cambridge, MA: MIT Press, 2003).

11. Richard Stallmann, "The GNU Manifesto," *Dr. Dobb's Journal of Software Tools* 10, no. 3 (1985): 30–35; updated version available at GNU, www.gnu.org/gnu/manifesto.html.

12. Glyn Moody, *Rebel Code: Linux and the Open Source Revolution* (New York: Basic Books, 2001), 42–54.

13. Linus Torvalds and David Diamond, *Just for Fun: The Story of an Accidental Revolutionary* (New York: HarperCollins, 2001).

14. For coverage of the so-called Halloween documents, including Microsoft's internal assessment of Linux as competition for Windows, see, for instance, Bill Snyder, "Leaked Memo Has Linux Companies Rising," *Street,* 5 June 2003, www.thestreet.com/story/10091808/leaked-memo-has-linux-companies-rising.html.

15. Glyn Moody, *Rebel Code,* 260.

16. Richard M. Stallman has recently rehearsed this history and provided his contemporary take on the difference between these terms (*open source* and *free software*) and their attendant connotations in his "Why Open Source Misses the Point of Free Software" [Viewpoints], *Communications of the ACM* [Association for Computing Machinery] 52, no. 6 (2009): 31–33, also available without subscription at GNU, www.gnu.org/philosophy/open-source-misses-the-point.html.

17. Lessig, *The Future of Ideas,* 53–58; and Lawrence Lessig, *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity* (New York: Penguin, 2004), 278–80. *Free Culture* is also available for free at www.free-culture.cc/.

18. Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (New Haven, CT: Yale University Press, 2006), 5.

19. James Surowiecki, *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economies, Societies and Nations* (New York: Anchor, 2005), 73.

20. Don Tapscott and Anthony D. Williams, *Wikinomics: How Mass Collaboration Changes Everything* (New York: Portfolio, 2006).

21. Michael Hardt and Antonio Negri, *Multitude: War and Democracy in the Age of Empire* (New York: Penguin Press, 2004), 339.

22. Ibid.

23. Eric S. Raymond, *The Cathedral,* 35.

24. Christian Marazzi, *Capital and Language: From the New Economy to the War Economy,* trans. Gregory Conti, Foreign Agents series (Los Angeles: Semiotext[e], 2008), 43.

25. Gilles Deleuze, *Foucault,* trans. Sean Hand (Minneapolis: University of Minnesota Press, 1988), 35.

26. Michel Foucault, *Discipline and Punish: The Birth of the Prison,* trans. Alan Sheridan (1977; repr., New York: Vintage, 1995), 228 (originally published in French in 1975).

27. Gilles Deleuze and Felix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia,* trans. Robert Hurley, Mark Seem, and Helen R. Lane (New York: Continuum, 2004), 408.

28. Jeffrey T. Nealon, "Periodizing the 80s: The Cultural Logic of Economic Privatization in the United States," in *A Leftist Ontology: Beyond Relativism and Identity Politics,* ed. Carsten Strathausen (Minneapolis, MN: University of Minnesota Press, 2009), 54–79, quotation on 55.

29. Fredric Jameson, *Postmodernism, or, the Cultural Logic of Late Capitalism,* Post-contemporary Interventions series (Durham, NC: Duke University Press, 1991), 48; hereafter cited parenthetically in the text.

30. Ernest Mandel, *Late Capitalism,* trans. Joris De Bres, 2nd ed., Verso Classics Series, no. 23 (London: Verso, 1998), 258. Jeffrey T. Nealon provides a very useful chart of Jameson's appropriation and extension of Mandel's schema in his *Foucault beyond Foucault: Power and Its Intensifications since 1984* (Stanford, CA: Stanford University Press, 2007), 59.

31. Daniel Bell, *The Coming of Post-Industrial Society: A Venture in Social Forecasting,* special anniversary ed. (1976; repr., New York: Basic Books, 1999), 116.

32. Alfred W. Crosby, *The Measure of Reality: Quantification and Western Society, 1200–1650* (Cambridge: Cambridge University Press, 1997), 12–15.

33. Alexander R. Galloway, *Gaming: Essays on Algorithmic Culture,* Electronic Mediations series, no. 18 (Minneapolis: University of Minnesota Press, 2006), 12. On architecture, see, for instance, Tomoko Sakamoto and Albert Ferré, eds., *From Control to Design: Parametric/Algorithmic Architecture* (Barcelona: Actar, 2008); and Kostas Terzidis, *Algorithmic Architecture* (Maryland Heights, MO: Architectural Press, 2006). For the general impact of massive computing power on mathematical simulations and proofs, see Brian Rotman, "Technologized Mathematics," in *Becoming Beside Ourselves: The Alphabet, Ghost, and Distributed Human Being* (Durham, NC: Duke University Press, 2008), 57–79. For a recent example of game-theoretic simulation of this type in political science research, see Bruce Bueno de Mesquita, "A New Model for Predicting Policy Choices," *Conflict Management and Peace Science* 28, no. 1 (2011): 65–85.

34. Nicolas Bourriaud, *Postproduction: Culture as Screenplay—How Art Reprograms the World,* ed. Caroline Schneider, trans. Jeanine Herman (New York: Lukas and Sternberg, 2002), 13–14. Here Bourriaud is explaining the shared focus of this work and the earlier *Relational Aesthetics* (see note 36). Notable critiques of Bourriaud's work include Claire Bishop, "Antagonism and Relational Aesthetics," *October* 110 (2004): 51–79; and Stewart Martin, "Critique of Relational Aesthetics," *Third Text* 21, no. 4 (2007): 369–86.

35. Nicolas Bourriaud, "Public Relations: Bennett Simpson Talks with Nicolas Bourriaud," by Bennett Simpson, *ArtForum,* April 2001, available at CBS Interactive Business Network, http://findarticles.com/p/articles/mi_m0268/is_8_39/ai_75830815/.

36. Nicolas Bourriaud, *Relational Aesthetics,* trans. Simon Pleasance and Fronza Woods (Dijon, France: Les Presses du Réel, 2002), 12.

37. Ibid., 31.

38. Karl Marx, "Results of the Immediate Process of Production," in *Capital: A Critique of Political Economy,* trans. Ben Fowkes, 3 vols. (New York: Random House, 1977), 1:943–1084, quotation on 1048; cited in Paolo Virno, *A Grammar of the Multitude: For an Analysis of Contemporary Forms of Life,* trans. Isabella Bertoletti, James Cascaito, and Andrea Casson, Foreign Agents series (Los Angeles: Semiotext[e], 2004), 69, available at Generation Online, www.generation-online.org/c/fcmultitude3.htm. On autonomist-influenced studies of immaterial labor, in addition to Virno's *Grammar* and Lazzarato's "Immaterial Labor" (see note 39), see also Antonio Negri, *Art & Multitude,* trans. Ed Emery (Cambridge: Polity, 2011); and the "dossier" section "Art and Immaterial Labour," in *Radical Philosophy* 149 (2008): 17–45. Contributions included in the "dossier" by Lazarrato and Negri are also cited below.

39. Maurizio Lazzarato, "Immaterial Labor," in *Radical Thought in Italy: A Potential Politics,* ed. Paolo Virno and Michael Hardt, Theory Out of Bounds series, no. 7 (Minneapolis: University of Minnesota Press, 1996), 133–47, quotation on 133, available without subscription at Generation Online, www.generation-online.org/c/fcimmateriallabour3.htm.

40. Paolo Virno, *Grammar of the Multitude,* 90–91. For a look at these changes in labor strategies from the perspective of "management," see, for example, Matthew E. May, *The Elegant Solution: Toyota's Formula for Mastering Innovation* (New York: Free Press, 2007).

41. Marina Vishmidt, "Precarious Straits," in *Mute* 29 (2005): 93–95, quotation on 93, available without subscription at www.metamute.org/node/416/clustercontent.

42. Maurizio Lazzarato, "Art, Work and Politics in Disciplinary Societies and Societies of Security," *Radical Philosophy* 149, May–June 2008, 26–32, quotation on 27, available without subscription at www.radicalphilosophy.com/default.asp?channel_id=2369&editorial_id=2675.

43. Bourriaud, *Relational Aesthetics,* 44.

44. Lazzarato, "Immaterial Labor," 138, 142.

45. Karl Marx and Friedrich Engels, *The German Ideology,* www.marxists.org/archive/marx/works/1845/german-ideology/ch03l.htm#c.1.2.5.2.3.2.

46. For examples of the latter conclusion, an investment in awaiting or planning for a future aesthetic that might effectively respond to contemporary immaterial labor, see, for instance, Antonio Negri, "Metamorphoses," *Radical Philosophy* 149, May–June 2008, 21–15; and Maurizio Lazzarato, "Art et Travail," *Parachute* 122 (6 April 2006), www.parachute.ca/public/+100/122.htm.

47. Theodor Adorno, *Aesthetic Theory,* trans. Robert Hullot-Kentor, ed. Gretel Adorno and Rolf Tiedemann, Theory and History of Literature series, no. 88 (Minneapolis: University of Minnesota Press, 1997), 8.

48. Gilles Deleuze, *The Logic of Sense,* trans. Mark Lester with Charles Stivale, ed. Constantin V. Boundas (New York: Columbia University Press, 1990), 260.

49. These examples taken from Virginia Postrel, *The Substance of Style: How the Rise of Aesthetic Value Is Remaking Commerce, Culture, and Consciousness* (New York: HarperCollins, 2004), 41–43, quotations on 1–3.

50. Duchamp is a frequent reference for Bourriaud. For Duchamp in discussions of immaterial labor, see, in addition to Lazzarato's "Art, Work and Politics," the same author's "The Aesthetic Paradigm," in *Deleuze, Guattari and the Production of the New,* ed. Simon O'Sullivan and Stephen Zepke, Continuum Studies in Continental Philosophy Series (London: Continuum, 2008), 173–83; and Sonja Lavaert and Pascal Gielen's suggestion, in their conversation with Virno, that Duchamp's entry of *Fountain* in the Society exhibition marked the symbolic "commencement" of immaterial labor (Paolo Virno, "The Dismeasure of Art: An Interview with Paolo Virno," by Sonja Lavaert and Pascal Gielen, *Open* 17 [2009], available at Foundation for Art and Public Domain [SKOR], www.skor.nl/article-4178-en.html).

51. Thierry de Duve, "Algebraic Comparison," in *Kant After Duchamp,* October Books series (Cambridge, MA: MIT Press), 99–101.

52. See Duchamp's reflection on this not-quite-rejection in Pierre Cabanne, *Dialogues with Marcel Duchamp* (New York: De Capo, 1997), 44–45.

53. Eduardo Kac, "Transgenic Art," *Leonardo Electronic Almanac* 6, no. 11 (1998), available without subscription at www.ekac.org/transgenic.html.

54. For an overview, See Rita Raley, *Tactical Media,* Electronic Mediations series, no. 28 (Minneapolis: University of Minnesota Press, 2009), reviewed by Jodie Nicotra in this issue. For his description of his work in tactical media and art, see Steve Mann, "Existential Technology: Wearable Computing Is Not the Real Issue!" *Leonardo* 36, no. 1 (2001): 19–25, also available without subscription at www.eyetap.org/papers/docs/id_leonardo_36_1_19_0.pdf.

55. Peter Osborne, *The Politics of Time: Modernity and Avant-Garde,* Radical Thinkers Series (London: Verso, 1995), viii.

56. Jacques Rancière, *The Politics of Aesthetics: The Distribution of the Sensible,* trans. Gabriel Rockhill, 2nd ed., Continuum Impacts series (London: Continuum, 2006), 20–21.

57. Benkler, *Wealth of Networks,* 92.

58. Ibid.

59. Ibid., 121.

60. Ibid., 125.

61. Ibid., 92.

62. For a discussion of the early history of Italian workerism and autonomist thought, especially on the question of the "social factory," see Steve Wright, *Storming Heaven: Class Composition and Struggle in Italian Autonomist Marxism* (London: Pluto Books, 2002). The problem of time in the traditional Marxist understanding of value is discussed in Antonio Negri, *Time for Revolution,* trans. Matteo Mandarini, Athlone Contemporary European Thinker series (New York: Continuum, 2003).

63. Tiziana Terranova, "Free Labor: Producing Culture for the Digital Economy," *Social Text* 63 (vol. 18, no. 2) (2000): 33–58.

64. Virno, *Grammar of the Multitude,* 103.

65. Ibid., 105.

66. Ibid., 103.

67. Tiziana Terranova, "New Economy, Financialization and Social Production in the Web 2.0," in *Crisis in the Global Economy: Financial Markets, Social Struggles, and New Political*

Scenarios, trans. Jason Francis McGimsey, ed. Andrea Fumagelli and Sandro Mezzadra, Active Agents series (Los Angeles: Semiotext[e], 2010), 153–70, quotation on 154.

68. Christian Marazzi, *The Violence of Finance Capitalism,* trans. Kristina Lebedeva, Interventions Series (Los Angeles: Semiotext[e], 2010), 55.

69. "The Giant Pool of Money," *This American Life,* Chicago Public Radio Chicago, IL: WBEZ, 8 May 2008, available at www.thisamericanlife.org/radio-archives/episode/355/the-giant-pool-of-money.

70. For a discussion of Virno's philosophy in which this point is debated, see the exchange between Antonio Negri and Cesare Casarino, "On *Multitude,*" in *In Praise of the Common: A Conversation on Philosophy and Politics,* ed. Cesare Casarino and Antonio Negri (Minneapolis: University of Minnesota Press, 2008), 99–133, quotation on 127–29.

71. Alberto Toscano, "La disparation: Politique et sujet chez Simondon," *Multitudes* 18 (2004): 73–82. See also Alberto Toscano, "The Disparate: Ontology and Politics in Simondon" (2007), at After 1968, www.after1968.org/app/webroot/uploads/Toscano_Ontology_Politics_Simondon.pdf.

72. Michael Foucault, *The Birth of Biopolitics: Lectures at the Collège de France, 1978–1979,* ed. Michel Senellart and Arnold I. Davidson, trans. Graham Burchell (New York: Palgrave Macmillan, 2008), 226.

73. Franco Berardi, *The Soul at Work: From Alienation to Autonomy,* trans. Francesca Cadel and Giuseppina Mecchia, Foreign Agents series (Los Angeles: Semiotext[e], 2009), 55.

74. Ibid., 139.

75. Ibid., 123.