FIGURES OF UBICOMP: CONCEPTUALIZING AND COMPOSING ACTIONABLE MEDIA

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Since the rise of ubiquitous computing (ubicomp), a growing contingency of scholars from various fields have all attested to the need for new critical categories to help us understand the ways in which digital data now interlocks with physical space. Responding to this need, I propose five rhetorical figures specific to ubicomp interfaces, and, on the basis of these figures, attempt to outline a whole new class of media emerging at the margins of social, mobile, and locative media. For instance, GPS navigation devices are mobile and locative, but these qualities do not begin to account for the technology’s most radical affordance: the capacity to sync with (i.e., generate multimedia in response to) the actions of human and environmental actants in real-time.

My term for this emerging set of technologies and techniques is actionable media. Drawing on the military phrase “actionable intelligence,” actionable media describes the compelling ways media can be designed to hinge upon what we are doing while we are doing it. In more theoretical terms, drawing on Bernard Stiegler’s notion of grammatization, actionable media concerns the modalities by which the flux of the Web gets broken down into gramme for acting upon in real-time, as well as the processes by which media break down the continuous movements of actant-networks into networked
Taking GPS navigation, RFID tags, and AR browsers as paradigmatic examples of actionable media, I ask how we might extrapolate from these commonplace scenarios to imagine further possibilities for digital writing and audiovisual media that fully exploit the features of ubicomp platforms. Throughout the work, I comment specifically on actionable media practices implicit in innovative projects done by digital artists, writers, and cultural institutions around the world.

Ultimately, I argue that the value of ubicomp projects coincides with their potential to perform in the capacity of actionable media. That is, while the technical phenomena associated with mobile devices, geoinformation, and digital-physical convergence are often astonishing at first glance; the historical worth of these basic mechanics will have been measured by the advent of compelling cultural practices that we are just beginning to glimpse.
For media theorists and technologists, “ubiquitous computing” marks the paradigmatic horizon of current innovations in mobile media, locative networks, wearable devices, augmented reality, and smart objects. As an umbrella term, ubiquitous computing (ubicomp) typically signifies the onset a third wave in the history of the modern computer. Ubiquitous systems promise to break from the PC era and the models of computing that defined it, creating as many new possibilities and new problems as the shift from mainframe computers to PCs initiated during the 1980s. By virtue of this pending transition, the Internet is also said to be entering a third stage often referred to as Web 3.0. Commentators who forecast this scenario—which many people are already starting to experience—claim that the Web will be all around us, always on and accessible via smartphones, tablets, televisions, cars, and many other everyday items.

No humanities scholar can deny the profound changes undergone in the study of writing, rhetoric, and media in the wake of personal computing and Web 2.0. In the midst of societies characterized by permanent technological innovation, many leading scholars are variously engaged in building theories of the present. They share an aim to understand current digital developments in reference to existing disciplinary terms in order to speculate on the language of new media, the rhetoric of Web writing, or the culture of digital tools. Another common endeavor is to comment on the transformation of traditional spheres of practice in the digital age (e.g., democracy, journalism, literature, cinema, economics, ethnography, historiography, surveillance, and so on). Each year of the new millennium has contributed even more new devices and software
than the previous year, and every year more humanities scholars turn at least some of their attention to the digital. We have amassed a wealth of vital research dealing with the cultural and rhetorical implications of digital media qua personal computing and Web 2.0. While this kind of research will of course remain relevant, some scholars currently generating theories of the present are now turning to the unique affordances of ubicomp, conceptualizing it as a technocultural paradigm in its own right.

Ubicomp, as Mark Weiser made clear, seeks to do much more than simply extend personal computing. Pioneering ubicomp in the early 1990s, Weiser and his colleagues at Xerox PARC prototyped entirely new categories of mobile, wearable, and embedded devices designed to bring the virtuality of computation into the physical world. The smartphones and tablets that dominate today's mediascape are all conceptually bound to the *tabs, pads, and boards* outlined in Weiser's famous 1991 essay "The Computer for the 21st Century." In that paper, Weiser defines ubicomp in opposition to the virtual reality of the desktop screen, specifically the demands the latter makes of people: to stop whatever activities they might otherwise be engaged in, in order to interact—stationary and isolated—with clunky and conspicuous computers via specialized commands and technical jargon. Instead, Weiser envisions fluid networks of hundreds of tiny computers—sometimes hidden from plain view—that perform operations in response to a certain set of movements and behaviors. As such, computing comes to function in the background of everyday life: objects become smart objects, and environments become smart environments. Smart environments sustain a real-time feedback loop based on sensing and actuating; for example, when a sensor embedded into a door identifies authorized personnel by tracking a microchip
embedded in their wearable ID badge, the data processed by the sensor prompts or actuates a programmed action: in this case, unlocking and opening the door when authorized personnel approach. In such cases, computational media syncs with the action of humans and other actants, performing actions in response to real-time activity—not (only) in response to explicit “user commands.” With ubicomp, then, we come to interact less with personal computers (conspicuous desktops and laptops) as more everyday objects come to possess computing capabilities.

Ultimately, the rise of ubicomp beckons parallel developments in the ways we understand and create new media projects. If we aim to write and design for ubiquitous platforms, we must attend to their most characteristic processes. Since the turn of the century, many scholars writing about mobile and locative technologies have agreed that the most transformative aspect of the ubicomp paradigm is the unprecedented degree of interlocking occurring between networked media and physical space. Several descriptors for this phenomenon continue to circulate among current scholarship: augmented space, hybrid space, scripted space, physical computing, digital-physical convergence, and augmented reality. While no term is ever perfect, these terms are hardly adequate. For instance, nearly all of the scholarly explications of these terms rely on constructions that pair the digital and the physical, in order to indicate a continuum or merger between the two realms, effectively signifying by means of the very opposition supposed to be supplanted or obsolesced by the phenomenon in question. In other words, whenever critics appeal to concepts like hybridity or augmentation to name the kind of space that emerges in the wake of so-called digital-physical convergence, they inevitable reinforce the categories of an ontology that divides nature from culture,
technology from society, media from materiality, and supplements from subjectivity. One could argue that it is precisely this quality that makes such terms useful, at least in a transitional sense. Articulating the new phenomenon through a paradoxical reconciliation of an established binary opposition at least calls attention to the phenomenon’s disruptive force. In showcasing disruption, however, the reconciled binary puts its own conceptual limits on display as it retains a long list of inherent contradictions. At best, the reconciled binary is a discursive placeholder, beckoning the invention of a new term.

My project proposes a new term: actionable media. Drawing on the military phrase “actionable intelligence,” actionable media describes the compelling ways media can be designed to hinge upon what we are doing while we are doing it. That is, more precisely, the modalities by which the flux of the Web gets broken down into gramme for acting upon in real-time on location, as well as the processes by which media break down the continuous movements of actant-networks into networked gramme. Actionable media, in this sense, names the situations of ubicomp emerging at the margins of mobile and locative media and the critical discussions that center around those terms.

My approach can be understood as an effort of grammatology, which essentially aims to theorize emerging media parallel to the history and theory of writing (broadly conceived to include acts of technical inscription like painting and cinema). A growing number of leading scholars across the humanities today are invoking the term and positioning their inquiries at the intersection of alphabetic writing and digital media. Leading the way, the recent philosophical writings of Bernard Stiegler effectively revive
the central concerns of a litany of grammatological thinkers during the 1960s to the
1980s: classicists and historians of writing (e.g., Leroi-Gourhan, Havelock, Goody),
French philosophers and literati associated with Tel Quel (e.g., Derrida, Barthes,
Kristeva), and North American media theorists (e.g., Ong, McLuhan, Ulmer).

Following Derrida’s logic of supplementarity, Stiegler argues that time, memory,
and modes of economic and political organization are all cultural techniques constituted
in conjunction with the technical evolution of organized inorganic matter. History, for
Stiegler, is most aptly characterized as the “history of the supplement,” in which each
period becomes defined by its processes of grammatization. Grammatization involves
the “breaking into discrete elements of [a] flux;” alphabetic writing, for example, breaks
down the flux of speech into a finite system of recognizable characters that are, on the
one hand, iterable and modular, and on the other hand, capable of orthographic stability
(“Memory” 70). The history of the supplement can thus be charted on a grammatological
basis of incremental stages informing the general course from early, preliterate writing
to digitization.

Informed by Stiegler’s framework, my project asks after the grammatization
processes that constitute ubicomp—the emerging stage of the digital supplement. I aim
to theorize these processes as rhetorical figures for conceptualizing and composing
actionable media. Throughout the work, I also specify actionable media practices
apparent in a number of contemporary digital art projects, as well as cutting-edge
projects managed by civic and cultural institutions around the world.

Chapter Outline. With the study of new media and the rate of technological
change both increasing at unprecedented rates, the question of techno-human relations
has become a major issue in theoretical discourse across the humanities. Many scholars are starting to become more aware of the assumptions and first principles that define our conceptions of technology and its status relative to biological and cultural evolution. Moreover, media theorists and writing theorists are starting to identify and think critically about the correlation between our theories of techno-human relations and our respective approaches to the study of media, new and old, from digital computing to alphabetic writing. Just as specific technologies create specific affordances, certain conceptions of technology support certain ways of studying media. Chapter 2 examines several enthymematic appeals concerning techno-human relations that have circulated from the modest institutional growth of media studies to the arrival of digital humanities—from technological determinism to contemporary technogenesis. After critiquing the dialectical and instrumentalist underpinnings of N. Katherine Hayles’ conception of technogenesis, I turn to the field of grammatology, particularly the recent work of Bernard Stiegler, for an alternative account of technics and techno-human relations.

Chapter 3 centers on Stiegler’s philosophy of technology and highlights its relevance for contemporary research on new media and digital rhetoric. Premised upon the Derridean notions of originary technicity and the logic of the supplement, *grammatization*—Stiegler’s core concept—offers a highly nuanced theory of techno-human relations, which breaks from the static, ontological opposition of humanity and technology that still haunts other accounts. Technicity stands as the essential dimension of the human in Stiegler’s theory, marking the generative tissue with which we always negotiated the grounds and horizons of our becoming, in accidental increments.
Moreover, the historical framework that Stiegler constructs on the basis of epochs of grammatization creates an orthographic continuum along which one may theorize digital media parallel to key moments in the evolution of alphabetic writing, industrial machines, and other landmark grammatization processes. Finally, I explicate the significance of this approach relative to other process terms in new media studies (e.g., remediation, augmentation, etc.), ultimately concluding that Stiegler’s framework is uniquely equipped to support inquiry into the most unprecedented aspects of ubicomp.

Chapter 4 describes ubicomp as a process of grammatization and as an emerging stage in the history of digital culture. First, because recent humanities scholarship tends to reduce the ubicomp to mobile devices, contemporary theorists need to revisit Mark Weiser’s invention of ubicomp—as a technology and a discourse—in order to realize the broader scope of ubicomp’s revolutionary potential as a distinct technocultural paradigm. Gregory Ulmer’s heuretic framework provides a method for reading ubicomp at the level of its invention. Engaging with Weiser’s work in this fashion enables us to see current technologies from the perspective of Weiser’s pointed critique of personal computing, his subtle allegiance with existential phenomenology, and the crucial ways in which he regarded alphabetic writing as the ideal medium to orient the future of computing. Next, I consider what has been, by far, the most sustained line of inquiry into ubicomp within the arts and humanities disciplines. Since 2004, architectural and cultural theorists interested in the transformation of urban environments have formulated a series of related concepts intended to explain the spatiality of ubicomp (digital ground, augmented space, hybrid space, scripted space, etc.). Now that Weiser’s vision has manifested, at least partially, with the spread of locative
technologies (and more ubicomp prototypes in development), new media scholars are quick to declare the convergence digital data and physical space. And yet, the majority of these critical conceptions of ubicomp’s spatiality touch on computational operations and multimedia production only to the extent that these technologies and techniques reconfigure social space. In other words, while scholars congeal around the idea that ubicomp produces a new kind of space, very little work attends to the grammatological constitution of ubicomp interfaces, and even less addresses the question of how to produce multimedia for the writing spaces of ubicomp. Furthermore, before I take up these two issues in chapter 5, I challenge the “digital-physical” assertions on which all of these spatial characterizations of ubicomp so consistently rely. I point out the conceptual contradictions evident in such constructions, but also, more importantly, I argue that so-called digital-physical convergence does not actually emphasize the most exciting and unique affordances realized in the most compelling ubicomp projects: the grammatization processes of multimedia designed to hinge upon the action of actants in real-time.

I propose, in Chapter 5, that media theorists and digital rhetoricians need to invent new categories and figures commensurate to ubicomp interfaces. We can no longer rely solely on models inherited from personal computing and the desktop metaphor. Since the 1980s, the famous acronym “WIMP”—windows, icons, menus, pointers—has served as an essential framework for understanding and learning to navigate the graphical user interface. Examining numerous contemporary post-desktop scenarios, I outline a new acronym that I term “ATLAS”—apps, tags, layers, actuators, and sensors. The transition from WIMP to ATLAS, which I contextualize with analogies
drawn from the history of writing, highlights the rise of what I call actionable media, an avant-garde array of technocultural practices emerging at the margins of social, mobile, and locative media. Reminiscent of the machines described by Simondon and Stiegler's notion of a techno-geographic milieu, actionable media qua sensors and tags sync with the actions of actants, effectively assigning a variety of rhetorical and/or aesthetic operations to the real-time movements of humans, non-humans, and even geographical flux. Additionally, actionable media qua apps, layers, and actuators break down the flux of the Web to suit experience economies specific to particular situated actions. After outlining the ATLAS framework and actionable media in general, I give an in-depth discussion of layers, which is intended to suggest how each of the ATLAS terms may serve as a critical category and a rhetorical figure.

Finally, I address the question of how we (e.g., scholars, artists, students, cultural organizations) might design, compose, and write for layer projects. Two broad areas hold special promise for arts and humanities faculty looking to formulate a preliminary set of rhetorical and aesthetic principles to help orient multimedia production in the age of ubicomp. We can assemble such principles from cutting-edge practices apparent in contemporary digital artworks and groundbreaking public exhibits curated by cultural institutions, as well as from relevant avant-garde movements in select artistic, literary, and cinematic traditions. To illustrate this approach, I perform a comparative study of recent augmented reality (AR) projects and French impressionist painting at the end of the nineteenth century. Impressionists painters, spurred on by mobile inventions like paint tubes and the box easel, developed the first aesthetic systematically tailored around painting en plein air. Similarly, AR beckons artists, writers, and designers to
create multimedia projects that break with the logic of the studio and the lab: the virtual reality (VR) paradigm that has dominated popular computing since the 1990s. Beyond the *en plein air* analogy, I identify several aspects of the impressionist aesthetic (e.g., techniques of observation and principles of composition) that are helpful for emphasizing the unique affordances that distinguish AR’s translucent surface of inscription from the VR paradigm. By way of conclusion, I suggest several other avenues of research for this comparative mode of generating actionable media practices tailored around other iterations of ATLAS that pervade contemporary mediascapes.
CHAPTER 2
THE SPECTER OF TECHNOLOGICAL DETERMINISM

Throughout the twentieth century, media theorists had to exercise caution when writing about the social, cultural, and existential impacts of technology. On one hand, such impacts were becoming increasingly apparent as each succeeding decade saw more frequent and more staggering advances—delivered to more of the world’s population—than the last. From radio to the Internet, entirely new mediums cropped up on a regular basis, each of them being upgraded if not reinvented constantly. Few people who lived through it would deny the magnitude of this technological change and the differences it made in their lives. And yet, on the other hand, perhaps even fewer people—especially humanities scholars—regarded media and communication technology as anything more than tools that, though powerful when used effectively, held no agency or effectivity on their own. If societies transformed in the midst of new technology, it was because people had used technology as a means to help them achieve various anthropocentric ends, for better or worse.

Such attitudes are flagrant in the critical reception of now canonical works of media theory. For instance, while Marshall McLuhan declared media to be the artificial extensions of the human sensorium, his writings frequently hinged upon phrases and constructions implying the technological modification of humanity. One continues to be struck by his shorthand typology of man (“preliterate man,” “electronic man,” “typographic man,” “Gutenberg man,” etc.) and his stylistic tendency to compose sentences in which the technology (as subject) of the printing press or Xerox “impelled” humanity (as object) toward certain ends (“Global Theater” 49-50). Statements like these became cited by detractors as the basis for objections to his entire oeuvre and the
work of related thinkers—objections that entire disciplines recited as a universal justification to ignore such arguments. The name for these objections was technological determinism.

The tradition of objecting to various media theories in the name of technological determinism persists as a stand on behalf of humanity, a habitual refusal of any frameworks that suggest an inkling of technocracy or the idea of machines churning to the clank of their metal. At its core, technological determinism relies on a polarization between humans and technology. In this respect, it is a concept that reflects most philosophers’ views on technology since Plato’s condemnation of writing in The Phaedrus, Aristotle’s distinction between episteme and techne in Nicomachean Ethics, and Rousseau’s theoretical fiction of originary man in the Discourse on the Origins of Inequality.

Several consistencies of this tradition can be traced. A finite set of qualities, capacities, values, drives, and desires (e.g., spirituality, reason, empathy) are thought proper or even innate to human beings. These virtues and tendencies constitute humanity’s natural essence, which—though circumstance may demand the aid of tools and other technical guises—can only be tarnished or ill-represented by artificial supplements. Artificial supplements (e.g., writing, weapons, farming tools) are therefore discarded from the study of nature and self-examination, as they are but the inferior-exterior shadows of the superior-interior life of the mind and other transcendental forces. Humans, perhaps through divine inspiration, invent technologies in their own image; a technology is a mechanical extension of some human capacity designed as a means to help people achieve their own ends, effectively enlarging the power and
character of their own wills without fundamentally altering them. Agency lies resolutely on the side of human consciousness. The tool sits passive and inert, with no ontological import of its own, owing its material existence to a creator. From this vantage point, evocations of the technological determinism objection serve as a defense mechanism to guard against the loss of human agency, human nature, and human values. Any attribution of ontological or social influence to the materiality or techno-logics of media and communication technology is consequently viewed as a loss from the human, in the manner of a zero-sum game. This kind of framing yields the popular dystopian visions of futures in which technical machines operate and evolve without regard for human suffering, or futures where machines have developed autonomous sources of artificial intelligence that enable them to aggressively control and exploit humans, thus marking a new, horrific stage of the master-slave dialectic.

If McLuhan’s alleged technological determinism is not without a certain optimism, then Friedrich Kittler’s critical concern over the technological determinism evident in his portrait of computerized society perhaps best represents the dystopian nightmares still looming over current media innovations. Kittler aptly scrutinizes a decisive shift manifest in the transition from nineteenth century media (e.g., gramophone, film, typewriter) to the modern computer. He does not lament over technological determinism in general, which he acknowledges as a principle fact of life: “Media determine our situation” (xxxix). The cause of Kittler’s concern is the disconcerting gap emerging, at the time of his writing, between human perception and machinic processing. Whereas these earlier modes of technical recording operated on an analog basis that captured and transmitted media by techniques that mimicked human perception and thus remained legible to us, the onset
of digital machines inaugurated a category of “languages” and ideographic notations systems designed to be processed and acted upon by machines, while remaining incomprehensible if not utterly alien to the vast majority of human readers. For Kittler, this technical scenario can only mean trouble for the political relations that had constituted power and social exchange throughout modernity. How could anything on the level of a public sphere survive when citizens are no longer able to participate in, let alone understand, the primary social apparatus? Surely, forecasting the limits of this trajectory, authority would transfer exclusively to the few technologists able to instruct the apparatus, if not eventually to the digital machines themselves. Kittler is, of course, not alone in his diagnosis.

At least until the rise of personal computers in the 1980s, technological determinism commanded two major lines of thought concerning the question of media technologies and their limited study across the humanities. As a common objection, it fortified a faith in humanity in spite of rapid technological innovation and adoption that might otherwise suggest human dependence on or deferral to the increasingly awesome powers of technical objects. Moreover, as a dystopian inevitability, technological determinism embodied the devil of an impending hell on earth—an (un)becoming of man after the anticipated fall into machinic technocracy. The humanistic objection generally fed off of anxieties induced by dystopian visions, in an effort to reinforce a critical resistance to not only new technology but also more aggressively to retain a worldview in which human culture presides distinctly over technical evolution.
The Humanistic Study of Media

Theoretical discourse on historical and contemporary media, which now reverberates across a wide range of more traditional humanities fields, has long been searching for a transdisciplinary enthymeme in the specter of technological determinism, which we may now remember as the founding challenge that long bracketed technology from more established disciplinary concerns. The institutional growth of media studies in the recent past can be attributed to crucial work of the first acknowledged “media critics” who both deconstructed the very basis of frameworks premised upon a dialectical master-slave portrayal of techno-human relations and, just as crucially, problematized the habitus by which scholars justified their routine neglect of technological matters in favor of issues that were presumably more meaningful from a social, cultural, or human standpoint. In other words, these early critics forged a place for the humanistic study of media by refuting technological determinism as an ill-founded conception of technology’s relation to culture and as an ill-founded objection to the “infiltration” of technology into the study of culture.

Jonathan Crary’s renowned 1990 book, *Techniques of the Observer*, attests to the intellectual tension facing humanities scholars who wrote about technology while media studies was in its infancy as an academic field, especially in American higher education. The book considers the history of vision during the early nineteenth century, and Crary ultimately argues that this period gave rise to “a sweeping transformation in the way in which an observer was figured in a wide range of social practices and domains of knowledge” (7). Optical devices and technologies of visual representation play an especially crucial role in Crary’s account of this transformation. Furthermore, he presents several of these devices (e.g., the camera obscura, the stereoscope) as critical
emblems suggestive of particular techniques of observation that prevailed in a respective century. At a crucial point in laying out his methodology, however, Crary takes a preemptive stand against readers who may mistake him for a technological determinist. Here, Crary insists that technologies are simply material objects; he pins their significance on the Foucaultian premise that they act as vital sites of power/knowledge relations. Referencing his own position, Crary launches into a critique of historical narratives that, in his view, over-emphasize the role of technological change:

Clearly, this is to counter many influential accounts of the history of photography and cinema that are characterized by a latent or explicit technological determinism, in which an independent dynamic of mechanical invention, modification, and perfection imposes itself onto a social field, transforming it from the outside. On the contrary, technology is always a concomitant or subordinate part of other forces. (8)

Hence, if technology seems to play a major role in social and ontological transformations, it does so only in the capacity of a vehicle that is actually driven and fueled by “other forces.” Lacking any internal drives or logics, technologies observe or conform to anthropocentric conventions, ideas, and practices.

Such were the early enthymemematic arguments for negotiating the humanistic study of technics. In fact, after these introductory remarks, Crary’s writing sheds itself of these kind of cautious, qualifying statements. He posits that the camera obscura “assume[d] a preeminent importance in delimiting and defining the relations between observer and world,” and that it “perform[ed] an operation of individuation; that is, it necessarily defines an observer as isolated, enclosed, and autonomous within its dark confines” (39). His footnotes give an even more assertive perspective on the formative capacities of new technologies.
With rise of media studies as an autonomous intellectual discipline, leading scholars seeking to establish the field’s history have consistently tried to reclaim the “founders” of the field from allegations of technological determinism. For instance, media historian Adrian Johns, in his forward to Walter Ong’s book on Peter Ramus (heralded as “one of the crucial founding texts of modern media theory”), qualifies Ong’s persistent linkage between the rise of printing and the cultural pedagogy of Ramism. Johns celebrates what he calls Ong’s “refusal to countenance a technologically driven narrative,” as he insists that Ong “took care to identify Ramism and printing as byproducts of the more fundamental history of Western attitudes to space” (xi). In other words, Johns identifies new scientific ideas about space as “the real cause” of the cultural change associated with Ramism, and that the mechanisms of printing were but its “symptoms, or perhaps…catalysts” (xi). And yet, one is hard pressed to square up Johns’ reasoning here with arguments made by Ong in his later works, namely that writing (as a technology) restructures consciousness.

Indeed, in cases like this the evident pressure felt by commentators to clear media theories from all charges of technological determinism ultimately seems to create more confusion than clarity. The radical reconfiguration of techno-human relations loses out, in critics’ commentaries, to a conservative acquiescence of disciplinary norms. Johns appears to have decided against explicating this vein of Ong’s work—that communication technologies restructure the epistemological basis of cultural practices (which is no doubt a point of emphasis in *Ramus*)—in the anticipation that this “restructuring” thesis would be brushed aside for its perceived resemblance to the determinism polemic.
To consider a more recent example, in introducing their 2010 collection *Critical Terms for Media Studies*, W.J.T. Mitchell and Mark Hansen come to McLuhan’s defense as they aim to justify the unprecedented scope and consequence he attributed to media:

Because he portrayed the media as technical devices that interacted with the human sensorium, the physical world, and the sphere of social life, [McLuhan] has often been accused of being a ‘technical determinist,’ but in truth his more common strategy was to examine the complex dialectics of technical invention. (“Introduction” xvii)

This apology for McLuhan becomes an occasion for Mitchell and Hansen to present a broadened notion of media, which at once speaks to *particular historical mediums* and to the *existential condition of mediation* at the core of human becoming. Under this framework, to discuss the importance of media is to address the human question; how can technology be thought to determine the fate of humanity if human being is already and inescapably enmeshed in technical systems? As I suggested above, we might understand the necessity to overcome the technological determinism objection—and the conception of technology that it implies—as the central challenge endemic to the intellectual-institutional establishment of media studies as a humanities discipline. As the insights of media studies continue to be taken up by scholars in more traditional disciplines, those disciplines often change the way they regard technology relative to more established objects of study (history, rhetoric, literature, etc.). Furthermore, in addition to reconsidering the importance of technology, scholars from fields that previously disregarded media are marshaling the resources unique to their disciplines in a collective effort to invigorate the transdisciplinary study of media, in all of its historical and contemporary forms.
Now, even deeper in the midst of societies characterized by permanent technological innovation, many scholars across the humanities are variously engaged in building theories of the present. They share an aim to understand current digital developments in terms of existing disciplinary terms in order to speculate on the language of new media (Manovich), the rhetoric of new media (Brooke), or the culture of digital tools (Hawk et al.). Another common endeavor is to comment on the transformation of traditional spheres of practice in the digital age (e.g., democracy, journalism, literature, cinema, economics, ethnography, historiography, surveillance, and so on). Each year of the new millennium has contributed even more new devices and software than the previous year, and every year more humanities scholars turn at least some of their attention to the digital.

With the study of new media and the rate of technological change both increasing at an unprecedented rate, the question of techno-human relations has become a major issue in theoretical discourse. We are starting to become more aware of the assumptions and first principles that define our conception of technology and its status relative to biological and cultural evolution. Moreover, we are starting to identify and think critically about the correlation between our theories of techno-human relations and our respective approaches to the study of media, new and old, from digital computing to alphabetic writing. Just as specific technologies create specific affordances, certain conceptions of technology support certain ways of studying writing, media, and culture.

Judging from the present state of the field, technological determination, this once uber-valid objection, appears to be approaching the status of a logical fallacy. Its
grounding assumptions are being unearthed and ruthlessly interrogated by scholars in various disciplines, many of whom align their research with posthumanism and/or the digital humanities. While the average self-respecting humanist of the twentieth century might have worried that the computerization of society would lead to man versus machine conflicts like those dramatized in *The Terminator* or *The Matrix*, a growing body of scholarship now asserts the inherently technological dimension of culture, as if it were already a routine matter. Assertions of technology’s preeminence have moved up from the footnotes of scholarship; now they appear in support of an article’s primary thesis and adorn many books’ back cover descriptions. More than any other terms, technological terms regularly factor into popular descriptions of contemporary revolutions: the computer revolution, the digital age, government 2.0, the Twitter revolution, etc. Even the most technophobic of scholars now acknowledge that techno-human relations have always been much more intricate than any invocation of technological determinism lets on. Social theorists Manuel Castells’ influential writings on networked society suggest the palpable sense of tiresomeness with which many thinkers now seem to regard this suddenly outdated perspective:

*Technology does not determine society.* Nor does society script the course of technological change, since many factors, including individual inventiveness and entrepreneurialism, intervene in the process of scientific discovery, technical innovation and social applications, so the final outcome depends on a complex pattern of interaction. Indeed the dilemma of technological determinism is probably a false problem, since technology is society and society cannot be understood without its technological tools. (5)

Castells’s sentiments resonate with the latest work of leading thinkers from a variety of fields. Today, with the humanistic study of media alive and thriving, a transdisciplinary enthymeme seems to have arrived: *technogenesis*. In her book *How We Think: Digital Media and Contemporary Technogenesis*, N. Katherine Hayles
asserts that “contemporary technogenesis through digital media is indeed a dominant trend in the United States” (82). She cites a wealth of cognitive scientists, paleontologists, psychologists, and philosophers who all marshal their respective disciplinary resources to support the idea that humans and technology co-evolve. In the context of the humanities, especially in the specter of the historical sentiments outlined above, technogenesis functions discursively as a new theoretical enthymeme, in that it buttresses the research agendas of scholars seeking to incorporate the study of new technology into their research on more traditional areas of inquiry such as epistemology, subjectivity, or cultural politics. In this sense, we may understand technogenesis as a dialogical moment of synthesis ushering the field past the master-slave dialectic of technological determinism.

**Technogenesis: The Humanities’ New Enthymeme**

Building off her previous work on distributed cognition and embodiment, Hayles points to scientific studies of embedded and extended cognition in order to suggest that “a change in the environment results in a change in the technological unconsciousness” (98). As case in point in contemporary technogenesis, one of her primary theses about the impact of digital media is that our regular use of these technologies is changing the ways we read texts. For Hayles, close reading is a technologically and institutionally situated practice intimately related to the “deep attention” that print media makes possible and literacy education cultivates. The proliferation of audiovisual electronic media and digital networks are fostering a new mode of “hyper attention,” which correspond to hyper-reading strategies rooted in scanning and skimming, sometimes with computer-aided searches (i.e., machine reading). Hayles views hyper reading as a necessary *adaptive* response to information intensive digital environments. She
concludes that close, hyper, and machine reading are each essential to the “scholar’s toolkit” and that each way of reading should be taught in the 21st century classroom.

Sitting the validity of her recommendations aside, I will return to Hayles’ mobilization of technogenesis at relevant points below. Here, it is important to note the correspondence she draws between technological evolution and human evolution, particularly her fetishization of human attention as the ultimate site of techno-human intercourse. Also of note, Hayles’ usage of the term technogenesis regularly connotes the co-evolution of humans and technics, doing so with an apparent neglect of the word’s etymology, which denotes the birth and evolution of technology without reference to the human. That said, while she is clearly not the first proponent of technogenesis as a concept, Hayles’ writing effectively formalizes a set of theoretical inclinations at work—sometimes as truncated syllogisms—in recent media theory and research in composition and rhetoric, such that commonalities among these related fields are now more apparent, including overlapping insights and assumptions about techno-human relations.

Emblematic of the technogenetic dialogic—departing from the master-slave dialectic of technological determinism—Lev Manovich’s notion of a “computer layer” and a “cultural layer” remains one of the more compelling ways to conceptualize the ‘complex pattern of interaction’ driving the alleged co-evolution of humans and technology in the digital age. On the one hand, hardware and software undergo continuous transformation as cultural artifacts within societies committed to permanent innovation, and this innovation is often oriented by interface metaphors borrowed from cultural artifacts that precede digital computing (e.g., desktop, file, database). Once
transcoded into the computer layer, however, these figures take on a new digital life and in turn effect a “process of ‘conceptual transfer’ from the computer world to the culture at large” such that pervasive forms of media supply new cultural logics, as in the case of the database, to mention Manovich’s chief example (Language 47). Also grappling with the relationship between technology and culture in the late 1990s, Steven Johnson argued that cultural critics should “think about the elements of modern interface design as though they were the cultural equivalents of a Dickens novel, a Welles film, [or] a Rem Koolhaas building” (8). Understood in this fashion, emerging media become imbued with the promise of humanistic significance; our scholarly and pedagogical task is to bridge the gap between our traditions of interpretation and composition and the new technologies of cultural production.

The ideal cultural critic in Johnson’s schema would aim to do for contemporary interfaces what Roland Barthes did for the dominant media of his era; among other pursuits, Barthes asked after the rhetoric of the advertising images that had come to propagate every channel of communication, and he meticulously analyzed the film stills of Sergei Eisenstein as if they were the paintings of a great master. In retrospect, the famous notion of the punctum forwarded in Barthes’ reflections on photography has been explicated as “an affect essential to the photographic experience” and as “photography’s essential phenomenon” (Stiegler, Technics and Time 2, 18-9). Moreover, if, as Vilem Flusser claimed, “A changing consciousness calls for a changing technology, and a changing technology changes consciousness,” then a focal point for the humanistic study of emerging media is to identify and articulate how changing technologies change consciousness, and by extension, the social and existential
conditions of contemporary life (17). Manovich calls such projects a “theory of the present,” distinct from futurist predictions and après coup historical investigations.

Scholars who study writing and rhetoric have also been keen to theorize the co-evolution of humans and technology. Arguments abound in the spirit of Hayles’ work on distributed cognition. Often citing Hayles’s work, writing and rhetoric scholars posit an inherit technological dimension to both of these phenomenon as they model authorship and consciousness on a dialogical basis. Akin to Hayles’s assessment of the print-based ideology of close reading, rhetorician Collin Brooke contends that authorship and rhetorical invention are much more networked activities than traditionally purported by composition theories that anchor writing in the intentional processes of individual writers. Moving away from expressivism and process pedagogy, Brooke refers to changes evident in digital writing technologies and, on the basis of these changes, he develops the notion of “proairetic” invention to support rhetorical thinking in the context of digital networks, where the erasure of the print-based separation of author and reader facilitates the creation of media ecologies in which users co-produce aspects of the interface as they encounter it. Brooke suggests that, when we “author” or design (amidst) dynamic interfaces, we should “focus on the generation of possibilities, rather than their elimination until all but one are gone and closure is achieved” (86). The desire for hermeneutic closure manifest in thesis-driven approaches to invention is tied to the discursive economy of print in the same way that Hayles ties close reading to the deep attention economy of print. Thesis writing and close reading are not made obsolete in digital environments, of course, but from Brooke and Hayles one gathers that contemporary interfaces reveal the technological foundations of rhetoric and reading,
and that the shift from print to digital media must be accompanied by critical reflections, validations, and developments of alternative methods for engaging with texts, images, audio, video, and code.

Also informed by Hayles’ research on distributed cognition, Alex Reid discusses writing technologies in terms of the profound role they play in the production of subjectivity and the (re)formation of consciousness and cognition. Reid states, “Technologies expand my cognitive functions, or more accurately they expand and shape my cognitive functions” (10). That is, embodiment is paramount to cognitive functioning; thought occurs only through being-in-the-world, amidst the pervasive medium of the lived body. Acts of perception and communication yield further materials of media and instances of mediation. Being is thus always in the middle of things—the body, writing technologies, archives, audiovisual equipment, etc. One thinks and senses only by means of various media. Reid criticizes scholarship on writing and rhetoric that “views technology as ancillary to human thought” and refuses to regard thought and composition as embodied, material processes (7). In retaining a mind/body split and teaching writing as an internal process, the traditional scope of composition studies bars itself from ever accounting for what Reid clearly presents as the co-evolution of writing technologies and human consciousness. Reid insists that, even after engaging postmodern theory, “[rhetoric and composition studies] has never been able to account for the radical exteriorization of the subject or the rhizomatic distribution of the compositional process.” (24). Reid turns to distributed cognition to address this lack. For proponents of distributed cognition, the philosophical notions of the disembodied mind (e.g., the Cartesian cogito) have become something of a cultural-historical optical
illusion, which effectively blinds us from “understanding human cognition as a fragmentary process incorporating multiple mechanisms that are both internal and external to the body and brain” (Reid 76). Indeed, media theorists like McLuhan and Gregory Ulmer contend that this seemingly natural form of identity experience—the isolated, individual self—is and has always been hand in glove with the development of alphabetic writing, literacy, and print cultures. In this sense, distributed cognition as a theoretical framework seems to be consistent with the organizational logic of the network, which has steadily manifest as a pervasive ideational basis for institutional relations and social practices over the course of the twentieth century.

More recently, the spread of technogenetic theories of techno-human relations has enabled scholars within composition and rhetoric to wage decisive critiques of the discipline’s normative tendencies pertaining to issues of writing and technology. Such critiques, as will become clear below, resonate with arguments made by theory-driven digital humanists against the instrumentalist stance of current work in humanities computing. Referencing Hansen’s early writing on technogenesis and technesis, Sidney Dobrin seconds Hansen’s motion to think of “technology as a co-determinant in the evolution of the human and of all the world’s systems” (Postcomposition 71). Emphasizing the latter part of this equation, which displaces humans from the master role in the traditional dialectic, thus encourages us to attribute a substantial degree of ontological autonomy to technology. While technologies obviously depend on the acts of human initiative that organize them into being, technologies in turn reconfigure the material conditions of the world beyond human concerns; the general consequentiality of technology cannot be measured only in terms of its anthropocentric use value.
And yet, for Hansen, many modern and contemporary philosophers continue to assimilate technology to thought, in that they “repeatedly invoke [technology] as a means of historicizing theoretical claims, of stamping them with the indelible mark of historicizing of the empirical” (Technesis 71). A case in point here would be Sigmund Freud’s famous essay on the Mystic Writing Pad. Freud, who preceded McLuhan in treating recording technologies as extensions of human capacities, saw the Mystic Pad as a solution to a material problem that had long plagued writing technologies (which he thought of as memory-aids). Whereas practically all prior surfaces for writing either retain permanent traces at the expense of being receptive to future traces (e.g., stone) or receive unlimited traces at the expense of preserving any traces permanently (e.g., chalkboard), the Mystic Pad “provide[s] an ever-ready receptive surface and permanent traces of the notes that have been made upon it,” which conveniently approximates Freud’s model of “the structure of the perceptive apparatus of the mind” (209-10). After making this initial connection, Freud proceeds to discuss the technology of the Mystic Pad only to the degree that it serves to illustrate his conceptual model of the psyche. Hence, technology is invoked to illustrate and perhaps attach a sense of contemporary relevance to a theorization of an allegedly non-technical set of interior, mental processes.

We see this exact tendency at work in much scholarship dealing with new media in the context of composition and rhetoric. Over the past several years, scholars in the field have come to rely on the term “digital tools” when discussing writing and new media. That the term routinely occupies the title of conference panels, books, and chapter titles suggests a growing sort of “matter-of-factness” surrounding its use in the
field. As such, “digital tools” represents an object of study—the pragmatic equivalent of
digital media or new media, which both seem to leave too loose a relation to writing.
Contrary to this trajectory, we might regard digital tools scholarship not as a topic or
object of study but as a position with regards to that object—a certain way (and certainly
not the only way) of occupying digital media.

Emblematic of digital tools scholarship, the 2010 collection *Digital Tools in
Composition Studies* implores the field “to consider the use of specific digital tools and
their relationship to various composing processes and practices” (Walker and Hawk ix).
As the editors introduce the collection, they claim that one of the more provocative goals
of digital tools research is to conduct a theoretical investigation on how the user’s use of
a particular tool affects the user. Given the terms by which the human-technology
relationship is expressed (i.e., user and user’s tool), it comes as little surprise that few of
the essays in the collection actually articulate how writers or writing becomes
transformed in digital writing environments. The human writing subject, as a user of
digital tools, is treated as a fairly stable foundation; tools may affect the user to a
degree, but to call something a tool is to consider it only in terms of its use value to “the
user”—itself a narrow construct. In this sense, the user is always more or less the same
user, since the term “tool” maintains a safe distance between the subjectivity of the user
and the operations of a given writing technology. More often than not, the essays create
a dialogue between certain technical features relevant to their pedagogical use of a
digital tool and certain themes from various institutionalized rhetorical traditions, all in
order to cultivate that tool’s disciplinary exchange value and to offer teachers a few
pedagogical tips on how to realize that value in their own composition courses.
In the grips of this logic, the primary means for considering and evaluating digital media consists in asking how common uses of a given program or application promote common rhetorical theories and conventional pedagogical aims. At least one condition for the digital tool mode of embracing digital media becomes evident here: the digital medium is “good” insofar as it can be shown to extend the reach and relevance of the rhetorical theories with which many compositionists are already fluent, and thus in turn strengthen the case for the institutional preservation/expansion of composition and rhetoric into the twenty-first century. In this respect, digital tools scholarship is an exercise in technesis; the digital becomes reified as an array of Mystic Writing Pads whose value is measured by the degree to which it serves to illustrate and add contemporary legitimacy to institutionalized rhetorics.

For example, the explicit thesis of Keith Dorwick’s chapter in *Digital Tools in Composition Studies* is that MOO programming should be taught in writing courses because it satisfies the pedagogical agenda of current-traditionalist rhetoric (i.e., the Scottish School). For current-traditionalists, good writing is writing that conveys the rhetor’s thoughts in the purest and simplest form possible; writing that is linear, logical, and free from distraction. Good writing, they insist, acts as a window to the writer’s mind. Programming demands this current-traditionalist brand of good writing, so much so that any deviation from the conventions of computer logic is not even recognized by the computer as writing (Dorwick 83). In subjecting programming to the litmus test of current-traditionalist rhetoric, however, Dorwick assimilates the digital so as to render it amenable to familiar constructs such as the rhetorical triangle. In his depiction, the scene of digital writing differs little from previous rhetorical situations. The computer is
the audience, the programmer is the author, and the programmer’s message must be
sufficiently tailored to the computer’s worldview in order to induce it into performing
certain actions. While this analogy is perfectly logical, Dorwick’s overall conception of
digital writing actually appears to shelter students from some of the most profound
transformations occurring in digital writing environments. Most obviously, the current-
traditionalists’ ethos of causal linearity seems to bracket the non-linear potentialities of
hypertext and multimedia authoring, which has inspired much innovative work in digital
rhetoric and media theory. And by valorizing the skill required in the act of programming
over the effectivity of the programmed artifact, Dorwick keeps the scene of writing
centered around alphanumeric text—keeping images, audio, and video at the margins
of rhetorical attention. As such, Dorwick’s pedagogy effectively removes from the
rhetorical situations of computer programming any sense of a public whatsoever. The
scene of writing inscribed by the essay centers on the electronic writing space without
even acknowledging the rhetorical ecologies of hypertextual networks.

Representative of a larger trend in digital tools scholarship, Dorwick’s essay
embraces aspects of digital media in the image of institutionalized rhetorics, under the
condition that the act of writing remain anchored in a Cartesian or enlightenment view of
the subject. Indeed, Dobrin observes that tendencies like these pervade the field:

One of the failures of composition studies in recognizing the significance of
the role of (information) technologies upon subjectivity is its continued
adherence to ideas that writing technologies are somehow independent of
subjectivity and that they serve as functioning tools for the production and
distribution of writing. (72, my emphasis)

The target here, similar to Reid’s critical remarks, is the disciplinary tendency to locate
writing within the interiority of the individual subject and to define it as a disembodied,
prediscursive, and non-technical process. By asserting the primacy of the individual
writer/user—by clinging to the augmentation model of techno-human relations—digital tools scholarship endorses an instrumental view of writing that seems to be incapable of registering the dissolving border that (supposedly) once separated humans and technology. Dobrin argues that the emergent developments of our posthuman age call for nothing short of a paradigm shift in writing studies, and particularly “a realignment of focus not upon the individual as producer/originator of writing, but upon the complex systems in which the posthuman is located, endlessly bound in the fluidity and shiftiness of writing” (102).

Federica Frabetti establishes a critical link between writing and technology, as she attests to the importance of theories of both to current digital humanities debates. According to Frabetti, most digital humanities scholarship over the past decade has neglected theories of technology, and few share (much less understand) the perspective summed up in the notion—more radical than Hayles’ contemporary technogenesis—of “originally technicity”: that technologies constitute the conditions and rhythms of human experience, acting as the generative tissue within which horizons of our becoming manifest. (I explicate this concept at length in Chapter 3 on Bernard Stiegler.) Instead, the bulk of digital humanists are driven by quantification (mining data in order to identify patterns on a massive scale), visualization (crafting representations of trends and findings for apprehension at a glance), and instrumentalization (building “digital tools” to aid scholarly research). Whereas Aristotle, arguably the godfather of modern humanities, endorsed a separation of techne and episteme (granting the theoretical study of epistemology/knowledge superiority over the practical arts involving technologies/crafts), the humanities computing contingent of digital humanists clearly
advocates and practices an inversion of Aristotle: they engage digitality in terms of 
*techne* at the expense of *episteme*. As Frabetti’s argument makes abundantly clear, the 
emergent institutional space of the digital humanities offers a chance to rethink techno-
human relations in accordance with a reconfiguration of *techne* and *episteme*. That is, 
we counter the traditional neglect of *techne* in favor of *episteme* not by a swift reversal 
(i.e., *techne* at the expense of *episteme*), but by a thoroughgoing deconstruction of their 
very opposition.

Furthermore, we can elaborate, as Frabetti begins to, a rigorous network of 
historical and theoretical connections between the deconstructive analysis of 
philosophy’s neglect of technology and the expansion-erasure of writing at the heart of 
the grammatical project. Frabetti insists, “The devaluation of technology in Western 
philosophy goes hand in hand with the devaluation of writing” (4). Writing is a 
technology, perhaps the prototypical technology, along with fire. Hence, the history and 
theory of writing constitutes a broadly insightful vehicle for moving beyond—or at least 
elsewhere than—humanities computing, as well as the digital tools scholarship in 
composition and rhetoric. For Frabetti,

> The question to be posed at this point is: if digital technologies exceed and 
destabilize the concept of instrumentality, do they not also destabilize the 
concept of writing? And what would the consequences of such a 
destabilization be for the digital humanities? (4)

In order to seriously consider the question of whether digital technologies “destabilize” 
the concept of writing, one would need to account for the concepts and institutional 
processes by which the concept of writing has been stabilized in various eras. Derrida 
has of course done much work on the way philosophers and linguists stabilized writing 
by condemning it along the phonocentric leanings of the metaphysics of presence. One
could continue this work by examining the disciplinary formation of composition studies in the mid-to-late twentieth-century, namely how compositionists have used rhetorical theory to stabilize an institutional conception of writing across American higher education, in the face of rapid technological change.

While the large scope of this institutional critique is beyond my theoretical focus here, one can see how digital tools scholarship stabilizes the concept of writing in the image of certain rhetorical traditions, just as humanities computing strives to maintain an instrumental relationship with digital media by building tools designed to augment humanistic inquiry on traditional objects of study. In this latter scenario, scholars race to digitize print documents so they may be searched more efficiently and on a larger scale. Of course, the quantitative, machine reading or “distant reading” methods that such scholars pursue are bound to lead to important critical insights; however, these methods do not aim to generate theoretical knowledge about digital technologies and certainly do not destabilize the concept of instrumentality. Their view of computers closely resembles that of Vannevar Bush in his famous 1945 article “As We May Think;” the computer is of interest for its potential to make researchers more productive.

At crucial points in How We Think, Hayles seems caught between two irreconcilable positions, in spite of her characteristic attempts at conflict resolution: humans and technics are not in conflict, they co-evolve; it is best to combine digital humanities and print humanities under the banner of comparative media studies; close, hyper-, and machine reading can all co-exist. For all that, Hayles clearly reverts to an instrumental, anthropocentric stance not too far off from the familiar master-slave dialectic. For example, if ways of reading (and writing) are immanently bound to modes
of attention, which are themselves co-constituted by certain media ecologies, then what accounts for Hayles's conclusion that "people are the ones driving [the momentous transformations associated with digital technologies] through myriad decisions about how to use the technologies" (17-8)? That is, in spite of acknowledging a technological dimension crucial to acts of attention, cognition, and even the unconsciousness; Hayles repeatedly draws hierarchical oppositions between humans and technology, insisting that humans ultimately control technical evolution by their patterns of usage and the focus of their attention.

Granted, the cultural status of a given technology significantly impacts how people are likely to engage with it. Likewise, our possible relationships with any technology emerge from the various ways we work and play with that technology; rhetorics and poetics are not technologically determined, even though technologies and other vibrant matter certainly massage, constrain, and variously enable invention processes. After expounding dialogical propositions of co-evolution, however, Hayles expresses no reservations in categorizing "networked and programmable machines" as "useful tools" (90). Against Gilbert Simondon, she takes tools—"artifacts used to make other artifacts"—to be synonymous with if not representative of technics in general (90). In equating the anthropological definition of tools with Simondon’s usage of the term, Hayles completely misses the more consequential connotation at work in Simondon’s comments on technical objects. Namely, that the term “tool” signifies an instrumental, anthropocentric mode of engaging technical objects. Simondon distinguishes between technical objects and *mere tools* because he is chiefly concerned with situations in which technics exclude consequences beyond their acknowledged use value for
humans. Indeed, he adamantly affirms the idea that axes and hammers are embedded within larger technocultural networks. That Hayles indirectly chides him for excluding “tools” from his philosophy of technics—just after she finishes summarizing his example of the stone ax as a technical object—seems to signal that something has gone awry at this point in her analysis.

Hayles’ tool-based understanding of technics limits her technogenetic understanding of digital media to the paradigm of augmentation and to what Gregory Ulmer calls an “instrumental and technicist view of writing,” which has dominated the history of Western metaphysics. In spite of her assertions that humans and technics co-evolve, her anthropocentric conclusions and her hasty assimilation of theoretical terms to ordinary language suggest that she conserves traditional ideas about humans and technology, albeit in a more fragmented or distributed manner. If we regard digital technology as a highly evolved set of tools that is currently affecting human evolution, we are still imagining that technologies are exterior to and separate from our capacity for attention, perception, or communication; the technological exterior affects our human interior and co-evolves with it, and vice versa—but nowhere does this dialogical framework address the very constitution of the inside and the outside, the split between humans and technology.

In this respect, the dialogics of Hayles’ technogenesis merely duplicates the augmentation-oriented relationship depicted in the master-slave dialectic of technological determinism. Symbiosis is nothing more than mutual determinism. To articulate techno-human relations in ways other than determinism, we need a new image of technology. Instead of holding on to a conception of technology founded upon
the image of a tool, I take up Frabetti’s initiative to rethink techno-human relations and, consequential, digital technologies by substituting writing as the prototypical technics.

**Orality Literacy Electracy**

More than any other field or approach within the transdisciplinary matrix variously committed to studying writing and media, grammaticology supplies a rich tradition of historical and conceptual analysis linking writing and electronic/digital technologies, both of which the grammaticologist regards as primary generators of culture, metaphysics, and social practice. In addition to the more infamous French strand of grammaticology, which I discuss in detail during Chapter 3, significant advancements in this often overlooked field were made by a crucial contingent of Canadian and Anglo-American classicists, writing historians, and media theorists. Grammatology forwards a theory of techno-human relations oriented around major shifts evident in the history of writing systems and communication technologies.

About forty years prior to Hayles’ commentary on technogenesis, classicists Eric Havelock and Jack Goody each garnered historical evidence to support their general theses that the early development of technologies and techniques of linear, alphabetic writing in Ancient Greece brought on a full-scale cultural revolution. In ancient Greece, what was called poetry was in fact the only verbal medium for collective memory, prior to the eventual, limited spread of alphabetic writing and literacy. Poetry, in this sense, designated the whole of rhythmic speech in a variety of context not limited to the literary genre with which the term has come to be associated. Oral poetry, as Havelock explains in *Preface to Plato*, was a kind of makeshift memory technology. It required constant, emotionally intensive recitation qua public performances and private rituals. Education—the transmission of cultural traditions and values—depended on these
processes of oral memorization as well. Before Plato, Greek education was largely the memorization of the great epic poems; Plato claimed that Homer had functioned as the chief educator of Greece. The introduction of alphabetic writing furnished the Greeks with a new form of tertiary retention (or technical memory), and hence a new medium for educational practices. The literate students of early manuscript cultures (an elite group, to be sure) could inscribe the word into relative permanence, and do it without emotional identification, regular recitation, or harmonious/mimetic style (the essential technics of oral poetry).

Writing the words on paper (or papyrus) made apparent a general separation of knowledge from the knower, and Plato develops philosophy definitively on the basis of the knower as subject who desires to know the objects he encounters—objects that exist apart from him but whose essences and attributes he may understand. In Havelock’s masterful depiction, philosophy in its infancy—at the dawn of alphabetic writing—was in effect an informal lab whose thought experiments cultivated the basic categories and practices native to literacy and analytical reasoning. Alphabetic writing and philosophy were both born through processes of abstraction. The alphabetic characters were abstracted from earlier, more intricate and cumbersome writing systems; the logos that drives the invention of philosophy was abstracted and eventually contrasted from the mythos of oral epics. Sharing the burden of memory with alphabetic writing materials, literate thinkers were able to move from acts of recitation to processes of abstraction.

Marshall McLuhan complicates the question of this epistemological shift, however, in his description of so-called manuscript culture, which shows that the literate
societies before print still relied largely on oral traditions. His *Gutenberg Galaxy* claims that the ancient and medieval rhetoricians of manuscript culture generally taught writing as a method for cultivating oratory skills (117). The majority of civic and academic discourse still occurred through public speaking, given the extremely low literacy rates of the age, as well as the relative scarcity of writing materials and limited copies of books. Writing was regarded as a preparatory supplement to aid rhetorical processes—especially memory—on the way to oral communication. (This was in fact how teachers were able to justify the teaching of writing in Europe’s first universities.) Public *recitation*, by the author or a professional orator, was the conventional mode of publication in manuscript cultures (McLuhan, *Gutenberg Galaxy* 106). The written document did not circulate very widely, if at all (equivalent to the dynamic between screenplays and movies today). Hence, much like the philosophers and linguists Derrida critiques in *Of Grammatology*, pre-Gutenberg rhetorics engaged with writing always in subordination to speech—any writing not destined to be spoken was of little consequence. Even the scribes spoke the words aloud as they made written copies. In manuscript culture, according to McLuhan, the visual had not yet been fully intensified, abstracted, and severed from audible-tactile experience—as it eventually would be in print cultures.

Goody, on the other hand, goes further back to examine writing before the development of literacy. He shows how the Greek development of science, history, logic, rhetoric, and metaphysics was actually prefigured by and intimately related to the pre-alphabetic invention of “figures of the written word” (e.g., the list), which transformed one’s relation to spoken language and incited a radicalization of recording, classification, and knowledge-building. Though he indicates some social impacts of
apparatus shift, Goody’s account of tables, lists, formulas, and receipts focuses largely on their epistemological or cognitive implications—how these early written forms (still) underwrite the growth of knowledge and the organization of information in literate societies. For Goody, writing technologies and communication practices “are not only the manifestations of thought, invention, creativity; they also shape its future forms” (9). Goody formulates his argument in opposition to canonical social theorists like Durkheim and Weber, who directed the study of societies away from issues of materiality and technology, as they defined “the social” apart from those factors. Goody’s premise is that modes and means of communication are the key difference engines that promote and support particular habits of mind and patterns of social interaction. Goody’s grammatical account of cultural-historical differences challenges dichotomous frameworks popular in structural anthropology, linguistics, sociology, and philosophy—especially Levi-Strauss’s central dichotomy: savage vs. domesticated. The people of literate societies are not born with a desire and capacity for systematic classification, nor are people of oral societies inherently tribal. The so-called domestication of the savage mind, as Goody shows, is a matter of writing and its gradual manifestations in everyday life.

Written lists—the most consistent figure of Goody’s attention—become especially crucial to the formation of literate knowledge, so much so that the list functions for Goody as a cipher for the potentials of literacy in general. Starting with the earliest Mesopotamian writings on record (~4000 B.C.), Goody discusses the uses of written lists in quasi-literate/scribal cultures, describing three major types of lists: administrative lists, event lists, and lexical lists. Administrative lists crucial to the development of the
newly agrarian Mesopotamian political economy, event lists became the basis for historical consciousness and scientific calculation, and lexical lists “raise problems of classification and…push at the frontiers of a certain kind of understanding”—thus inspiring reflection on categories, classification systems, and the nature/order of entities in the physical world (94). Hence, list writing, as an act of orthographic recording, ultimately becomes a metaphysical activity of organizing, classifying, and creating knowledge of the world. The most sophisticated operations of literacy (dialectic, scientific method, etc.) all hinge upon an axiomatic principle—the category—that emerges from list writing (especially playing with lexical lists in scribal training) and the other early “figures of the written word” that Goody identifies. I will return to Goody’s notion of grammatological figures in Chapter four, where I elaborate and initiate the central task of my project: to develop an initial set of figures for composing and conceptualizing media designed to circulate across ubiquitous computing platforms.

Reading Goody reminds us that, despite the unprecedented speed of technical invention today, we are in all likelihood at the very early stages of what promises to be centuries of exponential innovation spurred on by the invention of binary code, the internet, and an array of other developments fundamental to modern computing. And yet, the lesson of Goody’s work is that the nuclear traits of the new apparatus emerge in its early iterations. The categorical principles of literacy and the desire for systematic classification of knowledge via orthographic recording were operative in pre-alphabetic writing, even before the Greeks. Of course, the Greeks further develop writing and categories, as Plato founds conceptual thought and Aristotle composes treatises establishing the terminology and cognitive jurisdiction of the core intellectual disciplines.
of the Western tradition. But, as Goody and Havelock make clear, the intellectual achievements of the literate revolution in Greece owe everything to the habits of mind associated with the earliest figures of the written word. Without the written list, history would have no archives, science would have no data sets, and philosophy would have no concepts. Writing enables critical reflection, and list writing inspired early scribes to reflect on and play with the systematic classification of information—and to invent the category. Moreover, the systematic classification of information via categories characterizes the literate apparatus regardless of media-specificity; categorical thinking only intensifies as writing moves from clay tablets to papyrus to paper to print.

Noting the cultural transformations precipitated by the invention of specific forms of literate writing, Ong and McLuhan initiated similar efforts to understand the emergent media of their time, most notably television. A keen student of both print and electronic media, McLuhan extends Ong’s thesis that writing restructures thought to gauge the effects of various media on the human sensorium. McLuhan insists that media effects affect the sensory ratio, such that while sight may have been the privileged sense in the public spheres of print culture, hearing becomes the chief currency of the global village supported by twentieth century electronic media. Both of these thinkers, for that matter, preferred to envision the spread of electronic, audiovisual communication as a kind of progressive return to pre-literate life, which they called “secondary orality.” While secondary orality does enable description of some salient features of important mediums in the mid-twentieth century (e.g., radio/TV broadcasting, teleconferencing, video, etc.), the term has since proved ill-equipped to address the rise of personal
computing, the Internet, social media, mobile devices, and other technologies at the expansive core of today’s digital paradigm.

The “media ecology” vein of McLuhan’s work—out of which his ideas on the shifting sensorium arise—forward an influential theory of technical evolution. Media ecology, according to McLuhan, considers the relations various media have with one another and contributes to “arranging various media to help each other…to buttress one medium with another” (*Understanding Me* 271). In doing so, the properties of a given medium (e.g., film) become more important as an object of study than any single instance (e.g., *Casablanca*) that serves as the medium’s transmitted content. More recent definitions of the field extend McLuhan’s early adoption of the orality-literacy research, foregrounding “the idea that technology and techniques, modes of information and codes of communication play a leading role in human affairs” (Strate 1).

These concerns of media ecology resonate with research in grammatology, and especially with Gregory Ulmer’s project of electracy, which combines orality-literacy studies with heuristics in order to theorize the digital apparatus across a continuum involving “the interdependence of technology, social institutions, and individual identity formation” (xii). Where Ong and McLuhan saw the technological developments of the twentieth century as a complex remediation of orality, Ulmer’s project more readily asserts the novelty of electronic-digital media and culture. Moreover, Ulmer offers a more nuanced account of what happens during an apparatus shift. The emergence of video or blogs, for example, becomes framed in terms of multiple streams of invention, none of which is absolutely determinate. The technological affordances of the new equipment may imply certain usages, but to valorize these (obvious) uses and
extrapolate from them the so-called essential properties of the medium is to neglect the potential realization of future uses that inevitably emerge when such technologies enter into—affecting and becoming affected by—various embodied social contexts, which themselves are never stable. Lest we forget, the inventors of some alphabetic writing systems merely wanted a way to keep track of their grain supply; it was only after centuries of experimenting and playing with the affordances of alphabetic writing that we saw the functions of writing evident in the sonnets of Shakespeare or the United States Constitution.

By framing inquiry around links and tensions between McLuhan and Ulmer’s respective projects, we can be attentive not only to the new relations among previously separate media; contemporary grammatologists can also ask how emergent media and writing ecologies impact identity formation, such as to affect a significant historical shift in the way we experience thought and subjectivity. For example, McLuhan writes that, “One of the most fascinating phenomena of our age…is the way in which the Western mind is changing its mind” (Cliché 5). Provocative and prophetic as this statement is, like much of McLuhan’s work, it has thus far proven more amenable to general media theory than to scholarship in rhetoric and composition. On the other hand, Ulmer’s work—familiar to many computers and writing scholars—provides a framework for engaging McLuhan’s pronouncements that is perhaps more systematically rooted in the history and theory of writing. Writing scholars may be better positioned to grapple with the significance of McLuhan’s observations about media’s impact on the Western mind when they are situated alongside Ulmer’s schema of identity formation from orality to literacy toward electracy. (More generally, the figures postulated by recent media
theorists—such as network and database—may be productively grounded in grammatology’s broad historical framework, as I will demonstrate in Chapter five.)

Prior to the invention of alphabetic writing systems, Ulmer—standing on the shoulders of Havelock, Goody, and Ong—asserts that people in oral societies experienced their identities in terms of spirit (“thought experienced as the voice of a god or spirit”) (xxiii). Only after the spread of alphabetic writing practices and the institution of the academy/school (eventually intensified by print technology) did individuals begin to experience their identity as selfhood. While I, following Ulmer, do not mean to claim that everyone experiences thought in exactly the same manner, many of us clearly share the (literate) notion—which theories of distributed cognition challenge—that thinking is typically a silent meditation or dialogue with one’s self, located in the brain. An icon of philosophy and the act of thinking, Auguste Rodin’s 1902 sculpture The Thinker—a highly regarded masterpiece of Western art—depicts precisely this picture of thought, as do each of its many appropriations throughout the twentieth century. A powerful twenty-first century appropriation of The Thinker would be to place a smartphone into the figure’s bottom hand.

**Toward a Grammatology of Ubicomp**

Eric Havelock’s discussion of oral-poetry-as-a-cultural-medium verses poetry in the modern/literate sense (i.e., specialized artistic practice) is enormously suggestive for thinking about the history (and future) of personal computing and the Internet. That is, the apparent trajectories of computing seem to be developing in a fashion exactly inverse to the plight of poetry from orality to literacy; once relegated to isolated, immobile settings and “techie” subcultures, computing is fast becoming a “total cultural medium,” much like poetry was for oral Greek culture, constituting the primary basis for
collective memory, education, economic transactions, decision-making, and communication of all kinds—before becoming a relatively marginal activity relegated to specialists in the arts. To outline its path to becoming a total cultural medium, we could posit five defining periods over the last thirty years in the evolution of computing’s hardware, software, and cultural status: (1) mass marketing of personal computers with a mouse and graphical user interface; (2) development of the World Wide Web & Web browsers; (3) powerful, affordable web and multimedia authoring programs; (4) Web 2.0 and social media; (5) ubicomp: mobile devices, locative media, augmented reality, nano-technologies, etc. This periodization is of course partial, and many other outlines would be possible and productive. Nonetheless, this schema is useful for the way it both situates and differentiates emerging mediascapes in relation to the cumulative and still vital effects of the previous paradigmatic developments.

As we already see with rise of mobile media, ubicomp extends computing beyond “computers” (e.g., desktops and laptops); smartphones and smartTV’s are early indicators that computing will continue to seep into the majority of electronic devices and even previously non-electronic objects that we use or encounter on a daily basis. The less codified the activity of computing becomes, the more urgent is our need for techn(ont)ological categories to support theoretical inquiry and media production specific to ubicomp scenarios. It is precisely in this sense that my project addresses the becoming-ubiquitous state of digital media and networked computing, which many technologists and media professionals have begun to label as “the next big thing” that will have shaped the history of computing and the Internet over the coming decade.
Though new media scholars and tech journalists readily point out the potential significance of ubicomp platforms, current intellectual discourse remains at a level of phatic expression. The first reactions of pioneering critics, most notably Adam Greenfield, have amounted merely to a collective outcry against the erosion of personal privacy (and other “human values”) that can accompany the implementation of ubiquitous systems. Recent scholarship on mobile and locative media raises critical questions about the extension of the Web and Internet access, but only a few scholars address how these new models of computing actually transform, and not merely extend, the Web. More generally, we see proclamations announcing that fundamental social changes will occur—the sort of claims that have been recycled every year throughout computing’s history—but no full-length work has been devoted to exploring the unique character of this moment and its implications relative to digital writing and rhetorical thinking. Scholarship in relevant disciplines has generated little insight since Lev Manovich established the issue of ubicomp, particularly the question of digital-physical convergence, on the media studies research agenda in his 2002 essay “The Poetics of Augmented Space.” Of course, by many estimates, the technologies supporting the most thoroughly digital-physical, augmented spaces are only in their infancy (though on the brink of widespread adoption). And yet, Manovich proved able to speculate quite shrewdly about the complexity and novelty of this emergent phenomenon even before smartphones hit the market. His method, very effective, was rather simple: to examine (and sometimes imagine) the cultural implications of interrelated strands of technical invention by reflecting on their historical and theoretical connections with traditional practices and recent experiments in architecture and the visual arts.
Manovich’s approach can be understood as an effort of contemporary grammatology, which essentially aims to theorize emerging media parallel to the history and theory of writing (broadly conceived to include acts of technical inscription like painting and cinema). While Manovich does not overtly label his research as grammatology, a growing number of leading scholars across the humanities today are invoking the term and positioning their inquiries at the intersection of alphabetic writing and digital media. In his essay and book chapter “Extreme Inscription,” Matthew Kirschenbaum sets out to articulate a grammatology of the hard drive, asking “what...are the essential characteristics—the grammatological primitives, as it were—of the hard disk drive as inscription technology?” (101). Lydia Liu also turns to grammatology in her commentary on the ideographical turn of alphabetic writing and its post-phonetic digital life (11). Following the trailblazing work of McLuhan, Ong, Kittler, Derrida, and Ulmer; a growing contingent of scholars view the history of literacy and print culture—which has grown considerable in its own right—as a vital, analogical source for theorizing contemporary technology and technocultural developments.

In relation to these efforts, I want to suggest that the French philosopher Bernard Stiegler is the most important figure of contemporary grammatology. His recent theoretical texts effectively revive the central concerns of a litany of grammatological thinkers during the 1960s to the 1980s: classicists and historians of writing (Leroi-Gourhan, Havelock, Goody), French philosophers and literati associated with Tel Quel (Derrida, Barthes, Kristeva), and North American media theorists (Ong, McLuhan, Ulmer). Extending Derrida’s logic of supplementarity, Stiegler argues that time, memory, and modes of economic and political organization are all cultural techniques constituted
in conjunction with the technical evolution of organized inorganic matter. Of all the technics and streams of technical evolution at work in the world, Stiegler privileges writing and communication technologies. He refers to these technologies under banner of “grammatization.” History, for Stiegler, is most aptly characterized as the “history of the supplement,” in which each period becomes defined by its processes of grammatization. Ultimately, Stiegler enriches the grammatological field with a more robust theory and history of techno-human relationship and he clarifies the ways in which all manner of technics may be reimagined as forms of iteration of a generalized writing.

The focal point of Chapter 3, Stiegler’s notion of grammatization is the key concept underlying his theory of technics and writing. Grammatization also marks the methodological potential of Stiegler’s vast historical-theoretical project; in other words, it constitutes a point of emphasis from which scholars of digital writing and new media can practice a new approach to studying emerging technologies—an approach associated with an understanding of techno-human relations that differs radically from technological determinism, augmentation, and symbiotic co-evolution. In simplest terms, grammatization processes involve the “breaking into discrete elements of [a] flux;” alphabetic writing, for example, breaks down the flux of speech into a finite system of recognizable characters that are, on the one hand, iterable and modular, and on the other hand, capable of orthographic stability (“Memory” 70). History—the history of the supplement—can thus be charted on a grammatological basis of incremental stages informing the general course from early, preliterate writing to present-day digitalization. In order to understand the social and ontological reconfigurations occurring at a given
historical moment, Stiegler maintains that our questions must foreground the role of grammatization as a constitutive force; that is, as an ongoing process formative of crucial aspects of our experience—aspects which previous generations tended to regard as natural, transcendental, a priori, or otherwise unaffected by the material life of technics.

What if we were to conceive of ubicomp’s coupling of networked multimedia and material flux as an unfolding set of grammatization processes? Designed and practiced under the affordances of ubicomp, what becomes of medial interfaces constituted by the lauded interlocking of digital media and physical space? What interactive modalities (will) shape ubicomp culture? Furthermore, what are some social and ontological implications of these modalities, and how can they be mobilized in community media practices by cultural and civic institutions? These are the guiding questions of my project. Before we explore the mediascapes of ubicomp, and before I propose a set of critical-creative figures for conceptualizing and composing media relative to ubicomp platforms, I devote Chapter 3 to a rigorous explication of Stiegler’s theory and its relevance to the study of writing, rhetoric, media, and culture. The framework I construct from Stiegler’s work will thus provide a historical inventory of grammatization processes leading up to the digital turn, as well as a conceptual basis for specifying ubicomp as an emerging stage relative to recent developments of the digital supplement.
CHAPTER 3
GRAMMATIZATION: BERNARD STIEGLER’S THEORY OF TECHNICS AND
WRITING

Bernard Stiegler may easily be misread as a technological determinist, simply
because he attributes more ontological import to technics than perhaps any other
contemporary philosopher. For Stiegler, technogenesis does not designate a symbiotic,
reciprocal dialogic of co-evolution between humans and technology. Not only is the
genesis and evolution of the human a thoroughly technical process; beyond this,
Stiegler believes that technics has its own genesis, its own logics and tendencies. And
further still, he claims, “techno-genesis is structurally prior to socio-genesis” (Technics
and Time 2, 2). In other words, contrary to Hayles, Stiegler refuses to concede any
afterimage of the master-slave dialectic where humans still maintain control over
technics on account of their habits of usage. In fact, he insists that the very question of
techno-human relations must be posed differently; it is not a matter of asking whether
the human controls technology or whether technical evolution determines human
evolution. Working within these questions and coming to the conclusion of co-evolution
qua mutual determinism produces no insights into the originary constitution of the
human. First principles on the human and on technics remain unchallenged, since their
origins as separate and separable entities are taken for granted.

In his account of the Prometheus/Epimetheus myth, Stiegler posits that humans
are fundamentally without qualities. Only with the Promethean gift of fire, which is
conditioned on the Epimethean act of forgetting, do humans come into being. Fire in the
myth is an obvious symbol for technics. Our being, as humans, is and has always been
a being-in-default-to-technics. To support this reading, Stiegler refers to the
paleontological work of André Leroi-Gourhan, whose empirical and scientific findings on
the evolution of the cortex indicate that the structural advances in the brain followed landmark moments in the fabrication of the first prosthetics, such as flint, which Stiegler calls “the first reflective memory, the first mirror” (*Technics and Time 1*, 142).

Encompassing an enormous historical scope, Stiegler’s theory treats not only technical and social *evolution*, but also aims to account for the *co-originarity* of technics and humanity. Whereas most proponents of contemporary technogenesis propose that technology affects humans (and vice versa), Stiegler’s work consistently casts suspension over this very distinction as he theorizes a technicity that is essential to the human. Being in default, humans have no essence, which is also why the technicity essential to them is essentially accidental. That is, technical evolution is accidental because humans—as essentially technical beings with no innate essence—do not control the evolution of technics, as if they existed over and apart from technics. If one grants that all human capacities are founded out of play with technics, then it is impossible to claim that humans invent and use technics as *mere tools*. For none of the capacities involved in the fabrication of technics can be said to be anything other than technical. One of Stiegler’s most succinct explanations of techno-human relations comes in his introduction to the second volume of *Technics and Time*:

> Technics and humanity are bound together in a relationship that Gilbert Simondon calls the ‘transductive’ (a relationship whose elements are constituted such that one cannot exist without the other—where the elements are co-constituents): humanity and technics are indissociable. (2)

By means of this representative passage, we can see that Stiegler pursues the question of the techno-human relationship in an altogether different way than most current scholars, so much so that the thought of something like technological determinism completely foreign to his framework. The concept of technological determinism is only
tenable, either as a thesis or an objection, on the grounds of an a priori separation between humans and technics. Those who accuse Stiegler of technological determinism would be projecting onto his work this very opposition that he rigorously deconstructs.

In what follows, I argue that Stiegler's work marks the leading edge of current efforts to rethink techno-human relations in light of digital culture. In particular, his writing on “grammatization” opens up lines of flight unthinkable on the basis of technogenesis, symbiosis, augmentation, remediation, transcoding, convergence, and other canonical terms that have oriented the study of new media and writing technologies across the humanities. As one of the earliest American readers of Stiegler, Mark Hansen has gone so far as to claim that Stiegler’s project “has the consequence of transforming cultural studies into technocultural studies” (“Technocultural Studies”). And yet, because Stiegler’s major texts have only recently appeared in English, his work remains a relatively untapped source for contemporary media theory, and researchers in composition and rhetoric have published next to nothing about him at the time of writing. One of the supreme benefits of Stiegler’s still expanding oeuvre is that it can help humanities scholars reconcile the great dilemma that has hampered the humanistic study of technology ever since the inception of media studies. According to Stiegler’s framework, to study media and technics is to attend to the constitutive forces that condition the possibilities of human becoming, which are always shifting from epoch to epoch, especially in eras witnessing the rise of a new paradigm in memory and communication technology.
The Technics of Writing

Stiegler’s realignment of techno-human relations thus puts writing and media at the epicenter of contemporary and projected social and ontological transformations. He does not point to a spontaneous, underlying change in human attitudes toward some non-technical phenomenon. He never delimits the domain of technics in favor of a fundamental confidence in the agency of human attention. For Stiegler, “the question is no longer properly of the human but of experience and its transmission in conditions where genetics and epigenetics are at work out of a certain default of being, an eidetic default” (Technics and Time 2, 161). Note the difference of Stiegler’s stance from that taken by adherents of distributed cognition. Experience, not only cognition, is written and rewritten in default to technics—and not only distributed so as to affect and be affected by surrounding environments. Technics are not (only) a part of the environment humans live amidst and experience; technics constitute our experience on every possible level, from retention to anticipation, and from cultural history to genetics. Mediation is reality. Attending to experience demands a joint focus on the essential technicity of human becoming and on the accidental becomings of technics. Humans, as a species, were not born into the world already equipped with the capacity for experience; these capacities developed over time in a transductive relationship with Neolithic technics and they are still developing today relative to the essential accidents of contemporary technics. The question of experience and the conditions of its transmission beckons the study of writing, which Stiegler’s focus on grammatisation has the potential to redefine.

Grammatization is above all a process term. The processes it names can be associated with the vital tradition of technocultural processes signified by critical terms
in media studies (augmentation, remediation, technogenesis, and the like). Similar to these terms, grammatization applies to discussions of different media throughout history; it hypothesizes a plane of immanence, inaugurated at the dawn of orthographic writing, that proceeds in incremental stages and culminates (at least for us) in the current epoch of digitalization, defined so far by the industrialization of audiovisual media, the spread of global information networks, locative mobile computing, and the emergence of nanotechnologies. Before elaborating on Stiegler’s characterization of digitalization, we need to consider in detail exactly which processes he collects under the term grammatization, as well as why he attaches so much historical and theoretical significance to these processes in the context of contemporary technics. Later in Chapter 3, succinct portraits of the processes that comprise each of Stiegler’s “stages of grammatization” (understood as epochs in the history of the supplement) will also serve to distinguish grammatization from the more canonical process terms now endemic to the humanistic study of new media in various disciplines.

On the Derridean basis of originary technicity and arche-writing, we may cast an initial description of grammatization as follows: grammatization names the processes by which a material or sensory flux becomes a *gramme* for writing, which—taken in the broad sense of arche-writing—includes all manners of technical gestures that maintain their iterability and citationality apart from an origin or any one particular context. Grammatization processes underwrite the essential technicity of becoming. Technics signifies not only technology, but also the domain of techniques, as suggested by the Greek word *techne*. Grammatization accounts for the necessity of thinking technologies and techniques together. As processes of grammatization break down an otherwise
continuous flux, certain gestures or traces become detached from the initial continuity and form a technology capable of managing certain techniques or functions independently of any supposed point of origin. Alphabetic writing, for example, breaks down the flux of speech into a finite system of recognizable characters that are, on the one hand, iterable and modular, and on the other hand, capable of orthographic stability (“Memory” 70). In merging speech with writing, alphabetic grammatization manifests technologies and techniques that separate meaning from sound (McLuhan, Gutenberg Galaxy 61), which thus makes it possible to separate knowledge from the knower—a necessary condition for the philosophical invention of the subject/object duality that underlies Platonic notions of the thinking subject (see Preface to Plato).

As I have just indicated, however, Stiegler’s idea of grammatization is profoundly indebted to Derrida’s early grammatological texts on writing. The complexity of these Derridean terms merits closer attention, especially because they are not the more canonical buzzwords associated with deconstruction. Furthermore, since I believe grammatization to be the key concept of Stiegler’s theory of techno-human relations, a more than superficial familiarity with Derridean grammatology will prove integral to the task of developing a critical-creative approach to ubicomp on the basis of Stiegler’s insights.

**Stiegler and Derrida**

Following Derrida, Stiegler asserts that “the static oppositions of Western metaphysics must be replaced by dynamic compositions: one must think in terms, not of hierarchies or totalizing systems, but of processes” (“Memory” 69). In other words, beyond the dialogical sense of co-evolution that technogenesis conveys, the way forward is to abandon the persistent opposition between humanity and technology that
commentaries on technogenesis still employ. The focus must shift to studying the constitutive processes that underwrite so-called humans and technologies before we consider them as separate, constituted entities. Stiegler’s philosophy of technology initiates this very shift as he rethinks techno-human relations on the premise of an originary, ongoing series of dynamic compositions that effectively write under erasure the static opposition of humans and technology. Hence, I argue that Stiegler’s theory of technical evolution can enrich scholarly invocations of technogenesis, in that he supplements this general position with a rigorous ontological account of becoming that thoroughly refutes the master-slave dialectics at the heart of technological determinism and anthropocentric instrumentalism. Moreover, that writing, media, and communication technologies play a formative role in his account of becoming bodes especially well for burgeoning perspectives in the digital humanities, technocultural studies, and computers and writing.

In addition to the above instruction which he takes form Derrida, who was his teacher, Stiegler’s project throughout his Technics and Time series (which is still unfolding) can be introduced through an examination of two key notions he borrows from Derrida: originary technicity and arche-writing. Much has been made of the tension between the two philosophers’ respective viewpoints, which is no doubt evident in Stielger’s interview with Derrida in Ethnographies of Television. The scholarship pitting Derrida and Stiegler against one another is productive and revealing, and in a later section I address what might arguably be the most vital point of tension raised by such scholars. My primary concern here, though, is to explicate Stiegler’s theory of techno-
human relations in the context of its Derridean basis, and to indicate its ultimate value for those studying (new) media and writing across the humanities.

Originary technicity and archi-writing serve as focal points for grasping Derrida’s formative influence on Stiegler’s research agenda and his conception of technics. Just as one might study photography or television against the backdrop of alphabetic writing (as Stiegler does), comparative analyzes of Derrida and Stiegler attest to a general continuity of shared concerns and tactics that envelops commentators’ assertions about the theoretical specificity of their respective positions. Different as they are in certain respects, reading Stiegler apart from Derrida would be like studying digital writing apart from the history of print or audiovisual media, which would bespeak a form of presentism antithetical to grammatology. Many of Stiegler’s insights occur in passages where he revisits the same authors Derrida famously deconstructed in his major works, including Plato, Rousseau, Husserl, Heidegger, and Leroi-Gourhan. Like Derrida, Stiegler thinks from the position of classic myths relevant to the issues he takes up. Furthermore, Stiegler’s critique of philosophy’s historical repression of technicity closely mirrors Derrida’s handling of writing, and Stiegler’s invocations of generalized notions of technology (e.g., arche-cinema) find their precedent in Derrida’s generalization of writing. What above all links Stiegler’s work on technics to Derrida’s theory of writing is a quintessentially Derridean rationale that propels both of their projects: the logic of supplementarity. As we will see later, it is also this issue of supplementarity that marks what some critics have recently identified as Stiegler’s break from Derrida.

**Originary Technicity**

To begin then with originary technicity and its centrality to Stiegler’s work, one may look at the myths that dominate the scope of *Technics and Time*. The most
important of these—the myth of Prometheus and Epimetheus—is lifted from Plato’s Protagoras; Stiegler’s appeal to this myth and his method of generating from it a theory of techno-human relations corresponds precisely to Derrida’s treatment of Plato’s Phaedrus in his deconstruction of the relationship between speech and writing.

Recasting emphasis on the “crucial but neglected figure of Epimetheus,” Stiegler contends that the fault of Epimetheus—his forgetting to dole out an essential quality to human beings—illustrates a basic ontological circumstance (reinforced by Leroi-Gourhan’s paleontology) that Western philosophy has long ignored. Namely, as Lydia Liu also argues frequently in her discussions of writing, that the development of humanity and human civilizations are inseparable from (and would have been impossible without) the processual development of so-called prostheses. That is to say, more precisely, that technical inventions are not prostheses in the sense of a secondary support that augments an a priori human nature (Stiegler, Technics and Time 1, 152).

For instance, Derrida concludes that writing is not (only) a secondary support system rationally developed to extend the reach of spoken language, but instead that writing is an “originary supplement”—an exteriority that “shapes the interior of speech, as its trace, its reserve, its interior and exterior differance: as its supplement” (Of Grammatology 315). The technics of writing, when reconceived in this manner, defies the orientations of classical thought, particularly the habit of defining things in terms of essence and accident. Derrida claims, “It is the strange essence of the [originary] supplement not to have essentiality” (314).

Stiegler amplifies the logic of the originary supplement in his thinking about all kinds of technics, which he typically defines as “organized inorganic matter.” Coupling
Derrida’s insight with the fault of Epimetheus, Stiegler develops originary technicity a step further with his formulation of the “essential accidentality” underlying humanity’s techn(ont)ological becoming. Technocultural evolution “must be understood as awkward, accidental history whose result would be an essential-becoming of the accident—but which would also require speaking of an accidental-becoming of the essence” (Stiegler, Technics and Time 2, 30). Thus, whenever Mark Hansen summarizes Stiegler’s position, claiming that technology is “the essential dimension of the human,” we must recall the essential accidentality of this dynamic, for that is precisely what distinguishes originary technicity from technological determinism and, to a lesser though notable degree, from Hayles’ view of technogenesis. The organized inorganic matter that comprises all manners of supplements (or technologies) does not determine anything, for the supplement has no essence of its own to impose and it in fact depends on human acts of anticipation to fashion it into being. And yet, human anticipation is itself a capacity founded upon the temporal relations that the earliest technics open up (Stiegler, Technics and Time 1, 143). Furthermore, the organization of inorganic matter exceeds and preconditions human intelligence, which can no longer be thought to exist before, over, and apart from the material flux of technics. Echoing Stiegler, Hansen and Mitchell insist that “media specify the givenness of time and space, and thereby comprise the very conditions of possibility for our experience” (“Time and Space” 111). The conditioning of technics is essential to human becoming, but the trajectory of those becomings remain, always already, a matter of accidents. In Stiegler’s understanding of techno-human relations, mutual determination yields to essential accidentality.
The general title of Stiegler’s pet project, *Technics and Time*, provides another succinct way of appreciating the decisive role of originary technicity in his overall argument, particularly the way his project hinges on a rigorously ambivalent reading of Heidegger’s *Being and Time*. In sum, Stiegler’s principle objection to Heidegger’s account of the history of being is that Heidegger posits a primordial, non-technical temporality that he believes to be more authentic to Dasein than “the fall” into modern technics (e.g., *the vulgar time of the clock*). While Stiegler agrees with Heidegger’s intuition that time is the constitutive element of Dasein, Stiegler contends that all temporal relations are conditioned and effected by the “already-there” that is technics. “Technics” replaces “Being”: all ontology is technological and all technology is of ontological import. This maneuver, of course, mirrors Stiegler’s earlier deconstructive analysis of “originary man” in Rousseau and “non-technical intelligence” in Leroi-Gourhan.

Working within the vocabulary of Rousseau’s myth of originary man, Stiegler redirects Rousseau’s premises to an inverse conclusion: man, not a transcendental state of being, is always in de-fault of essence—he becomes “man” by deviating from any natural equilibrium, by becoming-other, by pursuing life by means other than life. In a word: by technics. Furthermore, as I have already indicated, Stiegler develops his theory of techno-human relations in conversation with Leroi-Gourhan’s palenontology of humanity. Stiegler is quick to criticize Leroi-Gourhan, however, the moment in his account of the passage from genetic memory to non-genetic memory when Leroi-Gourhan announces a “second origin” of humanity denoting the birth of *Homo sapiens* proper. This turning point in Leroi-Gourhan’s narrative “assign[s] a determining role—so
severely criticized earlier—to the brain.” And so, from this second origin onward, Leroi-Gourhan relocates the genesis of life in the spontaneous formation of what he calls “non-technical intelligence,” thereby downplaying the earlier emphasis on the technological organization of inorganic matter, and the premise that the human body and psyche develop only qua structural couplings with the technical. Stiegler writes off Leroi-Gourhan’s turn to non-technical intelligence as a kind of rise out of technics that inverts but nonetheless mimics the fall into technics imagined by Rousseau: both of these narrative breaks speak to an alleged gap separating humanity and technics. According to Stiegler, this unexplained and contradictory moment leads Leroi-Gourhan “to restore and repeat Rousseau’s gesture even as he displaces it” (Technics and Time 1, 84).

Technics and Time proceeds to theorize techno-human relations without recourse to anthropocentrism; Stiegler condemns Leroi-Gourhan’s “second origin” only to reinforce and extend Leroi-Gourhan’s earlier premises and claims, which he himself abandons. Thus, whereas Leroi-Gourhan goes on to chronicle rational and symbolic activity as the non-technical inventions of a creative human consciousness (which now, having developed a sophisticated cortex through technics, commands technics in its own image), Stiegler maintains that all of these so-called non-technical, human capacities are still constituted through the experimental organization of inorganic matter. If there is a historical turning point here, it is not the birth of non-technical intelligence to technical intelligence (not the emergence of the human proper from its technical womb); rather it is the formulation of mnemotechnics—technical systems that retain inscriptions—the emergence of the grammé. Consciousness develops during a stage in the history of life “out of which emerges the possibility of making the grammé as such” (Stiegler, Technics
and Time 1, 138). For Stiegler, the production of gramme conditions the possibilities of consciousness; intelligence and symbolic activity are always already inseparable from the technics of writing and other mnemotechnologies.

Stiegler’s coupling of technology and ontology is also informed by Derrida’s writing on technicity and temporality, though Derrida’s statements tend to resist the level of specificity toward which Stiegler eventually orients them in his readings:

It is necessary that the temporality of immanent lived experience be the absolute commencement of time’s appearance, but it appears precisely as absolute commencement thanks to a ‘retention’; it is inaugurated only within a tradition; it is created only because it has a historic heritage. (Derrida in Stiegler, Technics and Time 2, 188)

We can summarize this passage by means of another one of Derrida’s famous claims: the archive produces the event. Archives, thought in the broad sense of a historical record, are not just passive receptacles for storing accounts of events whose structuration it does not contribute to. Writing and other media of technical recording constitute the basis of all our temporal relations—even that which we regard as the “now” of the present moment. Orthographic mnemotechnologies preserve the exact records of a past we have not lived, but they also underwrite our own sense of futurity, by which we may anticipate the legacy of the events we do live and the circulation of the writing and media we generate (as its producer or its subject matter). We relate to our lived experience by the technical retention of a historic heritage and by the anticipation that the record of our own activities may be adopted to some extent, and that those retentions, in this life apart from us, will belong more or less to what will have been a tradition for a people yet to come, for whom our technical recordings will mark parts of the past they have not lived. Thus, we are shaped both by the historic modes of recording that condition our access to preserved cultural heritages and by the
contemporary modes of recording by which we anticipate (and often participate in) the archiving of our own lives.

Thinking about the etymology of “archive” leads Derrida to reflect on Freud’s use of the Mystic Writing Pad as an artifactual illustration of his theory of psychical memory. Ultimately, Derrida critiques Freud’s analogy—which retains the Mystic Writing Pad as a secondary support, in keeping with Western metaphysics—and comes to argue instead that advances in archival technology “[constitute] the very structure of the psychic apparatus” (Archive Fever 16). That is, the archive is never a mere representation of the psyche’s essence; each new archive establishes conditions for memory and communication that can bring about “an entirely different logic” (16). Hence, Derrida proposes that the discourse on psychoanalysis would itself have developed quite differently had Freud and his colleagues corresponded via email rather than the postal service. To the extent that Freud treats the Mystic Writing Pad as a secondary supplement, his thought remains continuous with the restricted conceptions of writing that Derrida deconstructs throughout Of Grammatology—the book that also features Derrida’s most poignant remarks on what I have indicated as our second focal point here: arche-writing.

**Arche-Writing**

In his essay “Signature Event Context,” Derrida’s notion of “ideology” (quite different than its usual connotation in critical theory) becomes the basic differentiator between traditional philosophical-rhetorical-linguistic attitudes toward writing and a grammatological study of writing. This distinction is intimately related to Of Grammatology and his reformulation of writing as arche-writing, or writing in general. Ideological models of writing such as those found in classical rhetoric and Western
metaphysics are built upon a hierarchy that prioritizes interior thought (“the life of the mind”) as the site and origin of ideation (Derrida, “Signature Event Context” 6). After arriving at an idea in thought, one verbalizes this idea in the form of speech so that it may be transmitted to others as meaningful communication. If needed, writing comes in at the end of this process, taken up as a sub-species of communication in general, one that is regarded to be instrumental for the purposes of extending the spatiotemporal reach of a speaker’s initial idea.

In descending this hierarchy, however, one pushes the initial idea into further levels of representation, with writing being the most derivative form of representing the thinker’s presence. In effect, these ideological or ideocentric models define writing in terms of an alleged representational function, doing so at the expense of a more general account of its functioning (Sanchez 99). How do these models of writing pull this off? By enveloping every given utterance in a determinable context against which to fix, denote, and assign literal meaning. This imperial deployment of context—be it one of production or reception—overcodes the structural absences of the written sign and renders a schema of writing wherein writing appears merely as a modification (e.g., derivative representation) of presence. In critiquing “context,” Derrida is at once asserting the necessary absences that structure writing and permit for its functioning.

As another case in point, Derrida shows how Saussure’s linguistics opposes writing to experience on the basis of an ideocentric hierarchy. Saussure believes writing, as a secondary support, is inevitably inadequate for re-presenting the presence of interior experience, primarily on account of the medium’s derivative nature: an exterior/additive twice removed from mental experience, a sign of a sign of experience,
a “fallen” mode of signification laying outside the natural bond between speech and thought. To write, for Saussure and for Rousseau, is to invite contamination into signification, for such an artificial means of representation (characterized in Saussure’s “arbitrariness of the sign” thesis) cannot do justice to experience in its natural/essential/original form. Along these lines, Saussure concludes that “letting go of the letter” is “a first step in the direction of truth,” and that clinging to writing is a “pathological mistake” (Derrida, Of Grammatology 38). Saussure’s position, which shapes the paradigm for modern linguistics (e.g., the linguistic/phonetic signifier as the pinnacle and chief representative of all communication), is therefore even more dismissive of writing than Rousseau, who nonetheless believes, like Plato, that writing can be, if nothing else, a virtuous source of enjoyment to the extent that it may be pressed into the service of reactivating a past-present, especially the memories of youth that one might otherwise forget in old age.

Reversing the ideological hierarchy, then, one might claim that the communication of ideas is not the essence or purpose of writing; instead, writing proceeds and exceeds both communication and thought. Raul Sanchez claims, “Derrida’s theory allows us to suppose not only that knowing is an effect or product of writing, but also that the idea of knowing is a discursive effect or product of writing” (35). To be clear, Derrida does not simply flip the ideological model (i.e., thought → communication → writing) on its head. He generalizes writing beyond the narrow definition assigned to it in the ideological model. From a grammatological stance, writing, understood as arche-writing, is always already “orphaned and separated” from any hermeneutical authority, and it functions via spacing, iterability, citationality,
dissemination, and difference—which Derrida refers to collectively as “nuclear traits” of all writing (Derrida “Signature Event Context” 8). No signification, not even communication via spoken language, would be possible without functioning as writing—without being capable of becoming orphaned and separated from any single signified referent or the horizon of any single author’s/reader’s experience (Derrida “Signature Event Context” 9).

Each of these nuclear traits of arche-writing play a part in Stiegler’s definition of grammatization processes in general and his descriptions of particular epochs of grammatization, as we shall explore later in Chapter 3. Stiegler understands technics in the image of arche-writing when he observes the structure of non-presence at work in all manner of technical recording and machinic production. Rather than regarding media as forms of re-presentation that extend the presence of interiority—and thus contrary to all media theorists who subscribe to McLuhan’s “media as the extensions of man” maxim (and Engelbart’s goal of “augmented human intelligence”)—Stiegler asserts that mnemotechnical systems come into being precisely by breaking down (meta)physical gestures into grammes. Comprised of grammes, technical ensembles like the typewriter or the factory machine operate in the ways they do because of their “capacity to be formed and to function as a reference that is empty or cut off from its referent” (Derrida “Signature Event Context” 11). Just as Derrida posits that writing’s functioning is contingent upon its capacity to remain readable or iterable apart from any determined context, Stiegler defines industrial machines and computational programs in terms of what he calls “the indetermination of the machine’s functioning” (Technics and Time 1, 168). Where other thinkers see inert mechanisms of precisely calculated automation,
Stiegler sees technical objects as being radically open to and generative of accidental becomings.

Moreover, Derrida argues, “Without a retention in the minimal unit of temporal experience, without a trace retaining the other as other within the same, no difference would do its work and no meaning would appear” (Of Grammatology 62). This passage stands out as a critical hinge for discussing arche-writing, which holds true in Stiegler’s understanding of the act of technical recording: it is the retention of the other as other within the same—the differance of the already-there that occurs “before all determination of content”—“the pure movement which produces difference…It does not depend on any sensible plentitude, audible or visible, phonetic or graphic. It is, on the contrary, the condition of such a plentitude” (Of Grammatology 62). Technical retention, non-genetic memory, the gramma—this hollow structure of non-presence makes it possible to differ because it makes it possible to defer.

At this point we can summarize two definitive implications of arche-writing, even if the term can never by defined once and for all. First, arche-writing implodes conventional boundaries that regularly limit the number of activities that count as writing, in contrast to the restricted concept of writing that only recognizes linear, phonetic, alphabetic script. Commencing his analysis of writing before the letter and after the book, Derrida famously extends the scope of writing:

And thus we say ‘writing’ for all that gives rise to an inscription in general, whether it is literal or not and even if what it distributes in space is alien to the order of the voice: cinematography, choreography, of course, but also pictorial, musical, sculptural ‘writing’…All this to describe not only the system of notation secondarily connected with these activities but the essence and the content of these activities themselves. (Of Grammatology 9)
If the three absences Derrida specifies mark the nuclear traits of arche-writing, then we might say that the gramme stands as the basic unit of arche-writing, consistently at play among its diverse “forms of iteration.” (Indeed, Gregory Ulmer has already ventured this proposition, and I return to his work on grammatology below in the course of further remarks on Stiegler’s notion of grammatization.) As such, the gramme marks the points of interrelation between techne and episteme. I have already suggested this second sense of arche-writing in the above remarks on the constitutive force of the archive and the figure of the originary supplement. To reiterate briefly, arche-writing in this sense evokes a writing before, within, and beyond speech that also founds cognition, perception, memory, and other topics traditional to metaphysical inquiry. Conceived as arche-writing, Derrida insists one must discuss writing without recourse to the (literate) metaphysical hierarchies, which necessarily limit writing in terms of presence, speech, logos, etc. That is, one must do more than simply emphasize and valorize, in the manner of a dialectical reversal, the exterior/inferior state that was previously condemned (e.g., the revaluation of writing over and above speech). To think the movement of writing as an “originary supplement” is to “think writing beyond good and evil,” such as to think writing in conjunction with a logic of differance, which is unthinkable “within the classical logos, within the logic of identity” (Of Grammatology 314).

**From the Logic of the Supplementarity to the History of the Supplement**

Raul Sanchez suggests that writing theorists may explore “the relation between arche-writing and narrow writing” by “intentionally blurring the difference between the two” (8). One can point to writing, its material circulation in the world, as an empirical entity; however, in doing so, one must also—if a grammatological approach is to be
maintained—recognize that “writing itself underlies all the conceptual, theoretical, philosophical, and even rhetorical activity habitually brought to bear on writing” (Sanchez 7). I contend, in fact, that this willful blurring is precisely what Stiegler performs throughout his generalization of technology, which is predicated on his understanding of writing as the technics *par excellence*.

Derrida himself comments on the close relation of writing to technics: “a certain sort of question about the meaning and origin of writing precedes, or at least merges with, a certain type of question about the meaning and origin of technics” (*Of Grammatology* 8). Hereto, the scope of writing has traditionally been defined in instrumental and ide/o/phono-centric terms as a technical (e.g., inert, derivative) support system in the service of spoken language. As *Of Grammatology* makes clear, there is a restricted notion or repression of the technical at work in the very same metaphysics that has evidently restricted and repressed writing. For Derrida, philosophy’s condemnation of writing is of preeminent consequence, and he is inclined to demonize the technical in its restricted sense in order to differentiate his notion of a general writing. In the wake of Derrida’s deconstruction of what Ulmer calls the “instrumental and technicist view of writing,” Stiegler sets out to forge from arche-writing a path for a new theory of the technical in general. In other words, for Stiegler, Derrida’s theory of writing is not a step beyond technical matters, but a stepping-stone for a grammatological theory of technics. Throughout *Technics and Time*, Stiegler appeals to writing as arche-writing, trace, and differance in an effort to ascribes to all media of technical recording the logic of supplementary. The technical, as indicated above, becomes the essential dimension of the human in Stiegler’s theory, underwriting the
evolution of civilization and ontology in accidental increments. Technologies, taken to be forms of iteration of arche-writing, constitute the conditions and rhythms of human experience, acting as the generative tissue with which we negotiate the grounds and horizons of our becoming.

As such, Stiegler’s usage of “writing” is akin to but more concretely delineated than Derrida’s deployment of the term. Derrida associates linear and phonetic writing with a specificity—a historical narrowness—that must be overcome in favor of an arche-writing that encompasses not only other systems of empirical notions (e.g., hieroglyphics) but also processes that seem much less tangible (e.g., differance). Stiegler refers to writing always in the context of a grammatization process (e.g. linearization, alphabetization, etc.) that attests to its historical and technical character. He does not share Derrida’s desire to undermine the linear/phonetic monopoly over the concept of writing, in large part because Derrida’s critique has been so successful. Stiegler maintains that arche-writing and the logic of supplementarity sufficiently displace the restricted concept of writing, such that one may now inquire into the historicality and technicity of a writing system without necessarily limiting its scope to that of a secondary support system (which is exactly what Derrida saw as a common shortcoming the first histories of writing).

All concrete writing systems manifest the logic of supplementarity, but they do so in historically and materially different ways, as Stiegler emphasizes. If Derrida generalized writing beyond its traditional status as a technical support system, Stiegler works from the premise that orthographic writing, more than fire or flint or “mere tools,” is the paradigmatic figure of technics. He understands all manner of technics on the
basis of the logic of supplementarity, but, beyond Derrida, he also believes we can build theoretical knowledge about specific technics through comparative studies of specific historical stages in the technical evolution of supplementarity. Working between Derrida and Stiegler, one might generalize writing (in all its manifestations) to be operative at the apparently more general level of technics. That is to say, there is a technics of writing and it is of profound import to ancient, modern, and contemporary technics in general—even as the latter found forms of inscription that exceed the restricted (literate) concept of writing.

Federica Frabetti suggests that Stiegler’s “fundamental point of departure from Derrida’s theory” is the former’s tendency to discuss supplementarity in terms of its history and writing as an emblem of technics in general (15). Grammatization accounts for a set of concrete processes collectively understood on the grounds of arche-writing. With the notion of grammatization, Stiegler historicizes arche-writing without diminishing the logic of supplementarity. Writing as a technics par excellence both supplies the logic of Stiegler’s general theoretical framework, and he in turn situates writing—its various concrete systems—as stages in his history of the supplement, which proceeds incrementally from the first neolithic markings to present-day digitalization on the basis of an orthographic continuum, thereby including all manners of mnemotechnologies of exact recording.

The issue of supplementarity has become a pivot point in commentators’ debates about Stiegler’s intellectual relationship with Derrida, as well as an apparent source of tension in the published conversations between the two thinkers. Like Frabetti, Mark Hansen offers a positive assessment of Stiegler’s historical, materialist appropriation of
Derrida’s generalization of writing. According to Hansen, “Stiegler relativizes what he calls the ‘quasi-transcendental’ field of differance or arche-writing in relation to the material infrastructure of its appearance and efficacy in the world at any given moment in time” (“Technocultural Studies”). On the other hand, Derridean critics such as Geoffrey Bennington see this crucial dimension of Stiegler’s work as its tragic flaw. Bennington argues that Stiegler deploys “technics” in the traditional manner of a philosophical concept, which thus

condemns [Stiegler] to a certain positivism, itself grounded in the mechanism of transcendental contraband whereby the term supposed to do the critical work on philosophy (here tekhnē) is simply elevated into a transcendental explanatory position whence it is supposed to criticise philosophy, while all the time exploiting without knowing it a philosophical structure par excellence. (184)

Furthermore, in their conversation in *Ethnographies of Television*, Derrida questions Stiegler’s entire enterprise when he postulates that it may be impossible to study technics as an object of theoretical knowledge, given the premise—which they both share—that technicity conditions the very possibility of critical reflection. How can one presume to know the very conditions that make knowledge possible? Noting that Stiegler fails to respond to Derrida’s point during the *Ethnographies* interview, Ben Roberts provides a detailed critique of Stiegler’s reading of Derrida, wherein Roberts insists that Stiegler’s writing also does not face up to this issue: “Technics and Time never really explicitly poses the question of how the theory of technics or a history of the supplement is possible” (“Stiegler Reading Derrida”). Moreover, while Derrida (and Derridean critics) objects to Stiegler’s ambition to approach technics as an object of theoretical knowledge, Stiegler in turn finds it problematic that Derrida opposes arche-
writing to artifactual notation and valorizes a logic of the originary supplement all the while claiming that conditions of its emergence and inherence are inaccessible.

In the specter of technological determinism and the ascent of technogenesis, the question that Derrida puts to Stiegler is arguably the most fundamental question for media theory today. Now that a critical mass of discourse—both in scholarly and popular contexts—admits as a basic axiom the formative role of media and communication technologies in cultural and cognitive evolution, theorists must offer rationales to support the collective desire to know how various forms of media constitute, transform, and effect us. Stiegler’s work suggests that a crucial avenue for generating theoretical knowledge on the social and ontological dimensions of media is to study the processes of grammatization elemental to different historical epochs. If Derrida’s logic of supplementarity furnishes the general insight that technics (techne) condition the possibility of theory (episteme), then Stiegler’s history of the supplement proposes that we can study this very process and build knowledge of technics in general by comparing different stages of media and mnemotechnologies. If alphabetic writing reconfigured the epistemological conditions for people living during the apparatus shift from orality to literacy—as demonstrated by Havelock, Goody, and Ong—then we can extrapolate from such studies to speculate about the epistemological implications of contemporary media. Obviously, we have every motive to try to gauge the impacts of contemporary technics as they unfold.

Contrary to Robert’s assertion, the long opening chapter of Technics and Time 2 could be read as Stiegler’s most poignant response to the aporia with which Derrida confronts him. Stiegler’s answer may not be as direct as Derridean scholars wish, but to
answer a Derridean aporia with a succinct refutation would be futile. Indeed, Stiegler’s response strategy takes the form of a Derridean deconstruction of Derrida’s own statements about writing in *Of Grammatology*. Taking the Derridean critique of phonocentrism as a focal point for his own critique of Derrida, Stiegler outlines a set of investments and tendencies evident in Derrida’s project that lead Derrida to neglect the specificity of linear writing, even as he stipulates that the phonetization of linear writing preconditions *episteme* and “the structural possibility of philosophy” (*Technics and Time* 2, 28). For instance, he identifies in Derrida’s grammatological work an “essential tendency” to guard against the “always-immanent return” of phonocentric impulses, which in turn creates the impression that it is “impossible to state any specificity that would not immediately claim superiority [for the *phone* over the *gramme*]” (30).

Furthermore, Stiegler extracts what he calls the “heuristic principle” driving Derrida’s grammatology, which can be broken down into a pair of interdependent imperatives: to establish “the question of arche-writing...beyond the restricted concept of writing;” and to “disturb and *destabilize* linear writing’s specificity” in an effort to “efface all metaphysical privileging accorded to speech, through the very writing that is truest to it [i.e., the phonocentric, restricted concept of writing as alphabetic writing]” (30). In other words, Derrida blurs the specificity of linear writing and tries to circumnavigate the phoneticization of writing because of his resolve to equate phonetic writing with the logocentric metaphysics of presence. He wants to overcome phonetic writing and the metaphysics of presence by theorizing arche-writing and the logic of supplementarity.

Stiegler devotes more positive attention to this immensely significant connection between phonetization and metaphysics, to which Derrida’s work nevertheless attests.
Stiegler commits his project to the specificity of linear writing and the concrete outcomes of its phonetization, as well as to particular operations of more recent orthographic recording technologies, within the context of a generalized writing (i.e., arche-writing). Both Derrida and Stiegler argue that writing—and more generally all mediated retention—configures temporality, including the so-called immediacy of the present moment. Derrida insists that “[the concept of history] appears at a determined moment in the phoneticization of script and it presupposes phonetization in an essential way” (*Of Grammatology* 88). Rather than elaborating this point further, however, Derrida sets up lines of flight from phonetization and its monopoly over writing within the history of metaphysics. He deconstructs Saussure and Rousseau’s respective phonocentric characterizations of writing, making strategic detours to “writing before the letter,” in order to conjure a broader notion of writing beyond the letter, in spite of the alphabet’s reign over the past two thousand years. Since Derrida bounds the concept of history to the phonetization of writing, he calls into question the work of modern historians of writing, like I. J. Gelb (from whom he appropriates the term “grammatology”), on the grounds that “most of the conceptual oppositions [of Western metaphysics]...continue to function there securely” (83). Derrida imagines an alternative grammatology, which his early writings no doubt inaugurate:

> Through all the recent work in this area, one glimpses the future extension of a grammatology called upon to stop receiving its guiding concepts from other human sciences or, what nearly always amounts to the same thing, from traditional metaphysics. (*Of Grammatology* 83)

Hence, for Derrida, to assemble histories of writing that privilege the alphabet’s phonetization of writing as so-called true writing is to, from the outset, reduce the
question of writing to the binary oppositions of a metaphysics that its operations exceed
if not completely elide.

If writing is an originary supplement—constitutive of the historian’s relation to a past s/he has not lived—then we cannot undertake the study of writing’s history in the same way we might approach the history of the automobile or the history of the United States. Histories of writing must acknowledge the indebtedness of historical consciousness and critical reflection (so-called interiority) to the orthography of writing (so-called exteriority), without which no memory traces could be preserved and analyzed independent of living memory. That the phonetization of writing preconditions the literate experience of history does not preclude the possibility of reflecting on the specificity of linear writing, but attention to this insight demands that we rethink what it is we are studying we when study the history of writing and other communication/memory technologies. Writing is not a secondary prosthesis, in the sense that it comes after speech, as if it were invented merely to represent a matured language (with principles of logic and rhetoric already installed) in regards to which its de facto function would be to preserve copies. Moreover, conceived as an originary supplement, writing cannot be the invention of people who already possessed the capabilities for abstract, categorical thinking; it cannot be conceived as a retroactive extension of a natural human intelligence supposed to precede it. According to Derrida, writing exceeds (literate) metaphysics on all sides, and therefore we need to understand writing more generally by ways other than classic logic and static oppositions.

While Stiegler heeds this call, he suspects that Derrida’s outright commitment to it—manifest in his “frequent blurring of phonological writing’s specificity”—actually
weakens the grammatological project in advance (30). In fact, Stiegler mobilizes the history of alphabetic writing in his philosophy of technics by privileging its “orthographic character” over its phonetic dimension. As such, this point of emphasis links alphabetic writing with subsequent recording technologies as an initiation of exact recording, and not (only) with logocentrism as a phonetic monopoly over nonlinear writing and “the pluridimensional character of symbolic thought” (Ulmer, *Applied Grammatology* 8). In this sense, by stressing the exact recording of the voice rather than the exact recording of the voice, one can construct an orthographic continuum between early picto/ideo-graphic writing, alphabetic writing, photography, and cinema—as Stiegler indeed does. In establishing this orthographic continuum, which is also a continuum of arche-writing and differance, Stiegler remains interested in characterizing the unique technical operations and experiential effects of media, for which he adopts a more concrete, comparative approach to technics than that of Derrida's grammatology. Again, no task is more urgent to Derrida than that of overcoming the logocentric limitations associated with traditional conceptions of writing. Owing to the success of Derrida’s project, and perhaps also to the rise of digital media at the beginning of his career, Stiegler is less concerned with this task, as if logocentric limitations have already been dismantled, or are at least no longer as overwhelming.

Phonetization is therefore more of an object of inquiry in Stiegler’s writing and less a target for deconstruction. He wants to understand phonetization in terms of its grammatological operations and historical impacts, which he consults as a source of analogies for understanding contemporary technics. For Derrida, “the mediation on writing and the deconstruction of the history of philosophy become inseparable” (*Of
Grammatology). While Stiegler participates in the deconstruction of the history of philosophy, particularly in regards to important thinkers’ neglect of technics, his references to writing typically serve a different agenda. For Stiegler, the mediation on the history of writing (i.e., orthographic supplements) becomes inseparable from philosophical speculation on the essential, dynamic technicity of humanity.

Only by accounting for the historical specificity of the supplement in its various stages can we generate theoretical knowledge about what possibilities a certain technics “opens up,” and what conditions or “programs” it installs into becoming. The logic of supplementarity is not sufficient for Stiegler’s ambition because its general principle—that exteriority (e.g., technics) constitutes and preconditions the possibilities of interiority (e.g., time)—does not in itself help us gain insight into the constitutive forces of contemporary technics as they unfold all around us and within us. In Stiegler’s writing, as will be demonstrated in the analysis below, the history of the supplement comes to supplement the logic of supplementarity. His focus on describing processes of grammatization engages specific media and writing technologies as if they were forms of iteration of archi-writing. This method avoids the tendency to conceive of and treat media and writing as secondary support systems or mere tools (following Derrida), and it also endeavors to generate episteme on techne (challenging Derrida).

**Grammatization and Grammatology**

Gregory Ulmer’s succinct account of grammatology’s emergence as a transdisciplinary field provides a framework for situating the unique character of Stiegler’s intellectual contributions and a basis for unpacking the scholarly value of the concept of grammatization. According to Ulmer, grammatology developed in three phases, all of which remain ongoing. First, the historical phase featured a variety of
archeological and paleontological investigations into the evolution of writing systems. Each of these historians of writing attempted to account for the actual invention of writing in ancient civilizations, as well as devise elaborate taxonomies for categorizing the world’s writing systems, almost as if taking inventory of different species of plants or animals. Derrida, the first theoretical grammatologist, finds fault with these taxonomic histories; namely, they “tend to confuse the question, What is writing?—asking after the essence of writing—with the problem of the origin of writing” (Ulmer, Applied Grammatology 6). Racing to gather new empirical facts surrounding the origins of particular writing systems, early historians of writing rarely paused to consider the theoretical significance of writing, nor did they question common assumptions about which activities and artifacts count as writing. For this reason, Derrida embarks on a “point-by-point repetition, of the history of writing into a theory of writing” (Ulmer, Applied Grammatology 17). That is, adjacent to the empirical facts, Derrida identifies a thorough correspondence between these historical studies of writing and the philosophical tendency to suppress, neglect, and outright condemn writing as a secondary support system in the service of the natural bond between speech and thought (i.e., the interior life of the mind). Having adopted this restricted concept of writing without any reservations, historical grammatologists thus limited their study of writing to phonetic systems, or at the very least, included non-phonetic writing only to the degree that it was seen as a moment of progress toward phoneticization. Thus, over the course of his deconstruction of the metaphysical opposition of speech and writing, Derrida assembles something of a counter-history, wherein non-phonetic systems like hieroglyphics
function as figures or emblems with which he theorizes writing in general, beyond the
limits of phonocentric discourse.

Stiegler’s project, as I have suggested above, might be described as a complex
variation of grammatology that, while centered on contemporary technics, routinely
enacts a point-by-point techno-historicization of the theory of archi-writing and the logic
of supplementarity. In this sense, Stiegler negotiates historical and theoretical
grammatology, which is also to say that his work, like Ulmer’s, indicates a wealth of
connections between Anglo-American and French grammatologists whose texts rarely
reference one another. The third phase of grammatology Ulmer outlines is applied
grammatology, which his book of that name and his subsequent work has initiated.
Inspired by the rhetorical and aesthetic strategies he finds in Derrida’s writing, Ulmer’s
applied phase aims to invent new picto-ideo-phonographic writing practices and rethink
humanities pedagogy in the emerging contexts of electronic and digital media. An over-
arching ambition driving his development of electracy has been to “bring the language
and literature [and arts and humanities] disciplines into a more responsive relationship
with the era of communications technology in which we are living” (Ulmer, Applied
Grammatology 4). Stiegler’s mode of engaging the history and theory of writing shares
this ambition. He extends Ulmer’s propensity to construct generative analogies between
distinct eras of the technocultural apparatus.

The two thinkers, however, do employ different frameworks for mapping
apparatus shifts. Building off pioneering research in orality-literacy studies, Ulmer adds
electracy to the schema and often uses historical insights concerning the transition from
orality to literacy as a methodological basis for formulating theoretical questions critical
to the current transition from literacy to electracy. His latest book, *Avatar Emergency*, begins with the premise that, just as “the entry into writing produced the experience of 'selfhood,'” the digital revolution is giving rise to a new form of identity experience, which he calls “avatar” (xi). Ulmer charts this emergence in terms of the tripartite apparatus schema: “Avatar is to electracy what ‘self’ is to literacy, or ‘spirit’ to orality” (*Avatar Emergency* x). Furthermore, another premise that structures Ulmer’s grammatological inquiry is that major changes in communication or information technologies produce or condition new social institutions and cultural practices, in addition to new forms of identity experience. Hence, if avatar is supplementing the experience of selfhood—which literate metaphysics and schooling cultivated—then we need to develop new venues and practices for education designed to accommodate and further cultivate the emergent experience. The heuristic (or *heuretic*) principle of Ulmer’s theoretical-applied grammatology is to move between the three apparatuses in search of literate practices (e.g., genres of composition, deliberative rhetoric, inference paths—which many theorists fail to regard as technologically situated) that now demand to be rethought or developed anew relative to the electrate apparatus.

While Stiegler occasionally refers to literacy as a technocultural period, his primary vehicle for identifying and explicating apparatus shifts amidst the history of the supplement is his notion of grammatization processes. Grammatization happens with all kinds of writing and communication technologies (which Stiegler typically calls “mnemotechnics” or “mnemotechnologies”), and in many ways Stiegler privileges this class of technics. Crucially, though, grammatization is not limited to mnemotechnics. Noting these other cases of grammatization processes is paramount to understanding
the status of this central term in Stiegler’s work, as they can be integral to some of the grammatological analogies driving his insights.

**Grammatization and Industrial Technics**

Some of Stiegler’s favorite examples of grammatization are the machines of the industrial revolution that “discretize” the movement of the human arm, making the gesture and its force autonomous and iterable across the range of manufacturing tasks that characterize modern factories. As a result, the human laborer acts an operator of industrial machines more often then s/he acts as a craftsperson who uses tools according to his or her own locomotion. (The significance of this historical moment in technical evolution is also discussed by Karl Marx, Hannah Arendt, and Vilem Flusser.)

The movement from stylus to printing press indeed mirrors the dynamics of this transition. And one could also understand how this historical trajectory—the technical autonomy of industrial machines—inform the subsequent manifestation of the “computer layer” and the “cultural layer,” terms that Lev Manovich employs to describe the fundamental dialogic operative within contemporary digital culture. The link Manovich draws between mechanization and software (both “take command”) also finds a parallel in Stiegler’s account of technical evolution. In “grammatizing” the laborer’s gesture, industrialization precipitates proletarianization, or “the loss of know-how” on the part of the working class, if not all but a technocratic elite and a dwindling number of independent artisans (Stiegler, “Memory” 71). Stiegler postulates that this reduction of the craftsperson to machine operator foreshadows another proliterianization managed by the global programming industries today: the reduction of the citizen to a consumer. This hyper-industrialization entails a general short-circuiting or liquidation of the collective individuation processes, which are disrupted and superseded by corporately
managed and marketed processes of adoption that regulate existence to matters of subsistence (Stiegler, *Decadence* 34).

For Stiegler, industrialization thus constitutes a pivotal stage of grammatization, which has become intensified by the onset of digitalization, wherein, as we shall see, industrial resources and investments become centered around the programming of behavioral models engendered through the production and commoditization of audiovisual temporal objects. Whereas prior grammatization processes dealt primarily in the “sphere of language, of *logo*” throughout much of writing’s history, industrialization “came to invest [in] the sphere of bodies,” and the age of mass media turned mechanization toward “apparatus-dependent reproducibilities of the visible and the audible” (Stiegler, “Memory” 70). Stiegler adds that the cultural capitalism of today’s hyper-industrial experience economies involves “the grammatization of affects…[and] all forms of knowledge”—a claim that I take up in Chapter 4 on ubicomp (“Memory” 71).

Industrialization and hyper-industrialization does not, therefore, indicate a closure of or break from the grammatization processes that characterized writing and communication prior to the industrial revolution. As a process of grammatization, industrialization is especially significant with regards to media of technical recording because the rise of industrial technics—the grammatization of bodily gestures—transforms (one’s relation to) alphabetic script, which after all was produced exclusively via hand gestures. In fact, the printing press was the first industrial machine, though movable type was invented in a non-industrial context centuries earlier in Asia. As such, the printing press grammatizes an-other grammatization process: print breaks down the flux of alphabetic script into the discrete elements of moveable type.
Stiegler’s analysis of industrial machines suggests an altogether different account of technical evolution and techno-human relations than the familiar notion of augmentation, which models all technologies as prosthetic extension of innate human capabilities, in keeping with the repression of writing and technology evident in Derrida and Stiegler’s respective critiques of the philosophical tradition. Conceived as processes of grammatization, the organization of inorganic matter that technologies are results not from an extension but an appropriation, a *writing*, defined by its disjunction from the continuity of a flux or movement, human or otherwise. Once disjointed and inscribed autonomously as inorganic matter, the movement becomes a *gramme* and therefore unfolds by the logic of the supplement and the nuclear traits of (arche-)writing. Augmentation cannot account for the autonomous, iterability of technics and its originary, constitutive force within the development of social organization, ontology, and even the human body itself.

With grammatization, then, Stiegler directs inquiry on techno-human relations toward processes of dynamic composition and away from the static opposition of humans and technology, upon which augmentation-oriented theories and even technogenesis more or less rely. He willfully blurs this traditional dichotomy in his frequent discussions of the “programs” that regulate social organization and the inheritance of genetic and cultural codes, as well as the formative ways in which “technics thinks”:

Isn’t it necessary to think what we think as technics, as it thinks? It thinks *before* us, being always already before us, insofar as there is a being before us; the *what* precedes the premature *who*, has always already preceded it. The future—which is ‘the task of thinking’—is in the thinking of (by) technics. (*Technics and Time* 2, 32)
In thinking of or about technics, we must remain aware of the fact that every act of thinking is itself conditioned and supported by certain assemblages of the technical apparatus. Theoretical knowledge of technics builds not as one thinks about technics but only as the thought of technics attends to the facets of its own constitution by technics, which precondition thought but nonetheless manifest in the technical act of thinking. The ‘thinking of (by) technics’ therefore seeks to think the technical underpinnings of thought in general by comparing and distinguishing the grammatization processes characteristic to specified archival modalities throughout the history of the supplement. Another important theme throughout Stiegler’s texts, which resonates sharply with this imperative—thinking of (by) technics—is his discussion of the technical evolution of temporality from alphabetic grammatization to the audiovisual objects of contemporary programming industries.

**The Grammatization of Real-Time**

In *Technics and Time Volume 2*, Stiegler sets out to show precisely how “modern modalities of archivization” (by which he means audiovisual mnemotechnologies like photography and cinema, but especially live news broadcasting) reconfigure our experience of temporality and the techn(ont)ological structure of the event. As usual, Stiegler builds a theoretical framework for pursuing this claim by laying out an analogy selected from the history of early writing, namely “the transition from the cuneiform to the alphabetic” (*Technics and Time 2*, 43). The significance of this transition for Stiegler, as for Vilem Flusser, is that it marks the emergence of historical consciousness. Flusser locates historicality in the formal, geometric conventions that became altered in the move from oral to literate cultural practices. The difference between history and pre-history is a matter of *lines and circles*: “Only one who writes lines can thinking logically,
calculate, criticizes, pursue knowledge, philosophize...Before that, one turned in circles” (Flusser 7). In referring to these “dizzying circles of preliterate consciousness,” Flusser is no doubt indicating the seasonal patterns of Nature that structured ancient agrarian life, and also, perhaps more profoundly, the habit of immersive recitation that was a cornerstone of everyday life in oral societies. Since the recitation of rhythmic verse (i.e., “poetry” in ancient Greece) was the only cultural technology by which intergenerational myths and traditions were virtually inscribed into living memory, education was essentially a collection of mnemonic exercises, and a ruler’s policies persisted to the degree that they were poetic. Rhythmic, imagistic discourse governed the politics of oral memory. Contradiction, fallacy, and reflection were antithetical to the necessary circularity of tribal recitation that sustained the oral modalities of archivization.

That acts of critical reasoning would have threatened the very archivization modality—the definitive grammatization process—of pre-literate societies leads Stiegler to argue against historians of writing, such as Jean Bottero, who attribute the invention of “true [i.e., alphabetic] writing” to human genius. For Stiegler, the emergence of reason could have only occurred when a new process of grammatization suspended and in some ways obsolesced recitation, making possible an alternative modality of archivization capable of supporting institutions of cultural inheritance and social adoption. Moreover, the course of this transition is accidental in that the emerging technologies and techniques belong to no premedi(t)ated rationale. The new “programs” (e.g., school, law, etc.) that come to displace the traditional programs (e.g., immersive recitation, poetic decrees, etc.) are fundamentally unthinkable without alphabetic grammatization, for rational habits of mind short-circuit the circular inscription living
memory. In effect, an oral person could not practice let alone invent critical reasoning without simultaneously losing their ability to access and retain traces of their cultural record. Oral rationality would thus be completely empty of content, such that it could not be said to properly exist. Reasoning only becomes possible when, by virtue of orthographic writing, one can access the cultural record without having to incessantly maintain it via total immersion in imagistic, rhythmic recitation.

Eric Havelock attributes this ability, manifest as critical reflection, to the alphabetic separation of knowledge from the knower, such that the cultural record maintains a material existence apart from living memory. The orthographic line permits re-reading, reflection, and revision; whereas the self-referential circles of recited, living memory cannot be stepped out of without dissolving. The former modality of archivization conditions a structure of event-ization necessary for the linear movements of historical consciousness and the abstractions endemic to logical thinking. One can access a past they have neither lived nor memorized; singular moments can be marked down on an individual basis and deferred for later reading, rather than having to be collectively ritualized following the instant of their occurrence. Orthographic lists of written signs make apparent any relations potential to a set of items, making it possible to recognize and label perceived semblances by making still more written marks—termed “categories” as literate metaphysics matures—that come to signify this semblance.

On the basis of this analogy, Stiegler argues that, because audiovisual temporal objects are currently displacing the archival modalities of literate writing, the literate experience of historical consciousness is becoming supplanted by the “real-time” of
contemporary technics. Since the rise of the culture industry in the twentieth century, grammatization processes operative from photography to television have each intensified a “reality-effect” that now dominates the temporality of digital media, in place of the deferred time quintessential to alphabetic writing. This begs the question of what it is exactly that real-time processes of grammatization effectively suspend or obsolesce with regards to the deferred, historical time-consciousness of literate writing. And, further, what does real-time grammatization enable and support in the way of event-ization? How does it alter the production of the cultural record and the all-important conventions for preservation and access?

Stiegler’s discussion of the emergence of “real-time” begins with what he calls (following Roland Barthes) the “reality-effect” of photography. That the photograph, at least in theory, manifests a “conjunction of the past and of reality” makes for a temporal situation very different from that of linear writing: “The instant of the capture coincides with the instance of that which is captured” (Stiegler, Technics and Time 2, 16). As an indexical medium, the photograph is always and absolutely a measure of singularity. This is why Stiegler qualifies Barthes’s “punctum” as “photography’s essential phenomenon” (Technics and Time 2, 19). The real-time of photography allows it to capture what remains unnamable in the image, owing to its irreducibility to cultural codes—codes that have themselves accumulated from the deferred economy of linear writing and which can, therefore, no more capture the singularity of an instant than the rhythmic economy of living memory could retain abstract, prosaic statements.

Stiegler’s analysis of “real-time” culminates in an in-depth look at the live feeds of televisual news broadcasting. Live streaming conjoins primary retention and tertiary
retention, such that any distinction between lived perception and technical recording becomes, in these cases, “absolutely formal and empty” (Technics and Time 2, 242). The literate tradition for selecting historical events operates according to the deferred time of alphabetic writing wherein “an event precedes its input into a system, and…this input precedes its dissemination—its reception” (Technics and Time 2, 121). In such cases, historians preside over the accumulation of cultural heritage as they manage the task of tertiary retention on behalf of a collective, carefully evaluating—in retrospect—the significance of various moments of a preserved past they typically did not live. In the context of literacy, people can distinguish between their perception of live events and their engagement with forms of tertiary retention; granted, one’s engagement with tertiary artifacts impacts, even constitutes, the criteria (i.e., secondary retention) that direct his or her lived perceptions (i.e., primary retention). Nevertheless, this impact occurs over time—it is deferred—on account of the technics of alphabetic writing.

With live streaming, on the other hand, the technics of real-time footage and the essential technicity of perception become synchronized:

Because there is a conjugation between the news story’s reality-effect and its real-time transmission as event, the story of the event, and that story’s transmission, take place in one and the same instant, in one and the same temporal reality, as an omnipresent temporal object inaugurating an entirely other ‘work of time.’ (Technics and Time 2, 121)

The “real-time” event reaches viewers having already been worked over by and presented according to the primary and secondary retentions of the media producers, many of whom still represent the culture or programming industries. This process exemplifies what Stiegler is getting at whenever he speaks of “the industrialization of memory.” In turn, he calls for a politics of memory attune to the ways in which, despite its apparent immediacy, live streaming constitutes an already-there, a
mnemotechnologys, in that real-time broadcasts stage “events I have not lived, ‘presented’ by ‘presenters’ who have not lived them either” (Technics and Time 2, 242). Thus, tuning in to live streams on television or the Web supports or engenders an altogether different kind of perception and memory than its literate equivalent. The mediated presentation of “being-there live” has already been selected and crafted as a historical event before anyone has lived it. The “now” of “real-time” is always an already-there. Obviously, this affects the course of events and structures their unfolding. Stiegler also contends that the production of real-time affects knowledge-building; all information, communication, and memory practices that generate and preserve knowledge are of technics and therefore not outside of time and its technical evolution.

**Grammatization as Method**

What I have just presented is an overview of a few successive stages in Stiegler’s history of the supplement, cobbled together from related passages across his Technics and Time series that emphasize the formative relationship between grammatization processes and temporal experience. In more recent essays, Stiegler turns this grammatological framework into a method for theorizing particular elements of emerging media in relation to specific points in the history of the supplement. His recent essay on YouTube, for instance, exemplifies his basic strategy for pursuing the theoretical knowledge of technics in spite of Derrida’s doubts. That his emphasis on grammatization processes makes a theoretical method out of writing/media histories distinguishes Stiegler’s work from the historical grammatology that Derrida criticized. In this essay, “The Carnival of the New Screen,” Stiegler generates his theoretical positions on contemporary technics by making grammatological analogies between digital video sharing platforms and the rise of home video in the 1980s, on the one
hand, and some of the earliest forms of writing on the other hand: the advent of cuneiform in Mesopotamia, Egyptian hieroglyphics, and alphabetic writing in Greece. With these comparisons, Stiegler shows that the major technical inventions throughout the history of writing did not engender philosophical thinking or a culture of critical reflection immediately upon their adoption in ancient societies. Stiegler claims that “in its first stages of development, writing doesn’t produce any reflexivity,” as he points out that cuneiform was performed exclusively by an elite class of scribes whose primary tasks focused on accounting and administrative record keeping (“Carnival” 44).

And yet, eventually these systems of notation and inscription—as they evolve toward abstraction, efficiency, and phonetization—become the basis of “the regime of psychic and collective individuation that makes the appearance of the law as such possible”—which Stiegler then claims is also the precondition for democratic citizenship and literate forms of knowledge such as tragedy, geometry, history, philosophy, rhetoric, and logic (“Carnival” 44-5). What this grammatological commentary suggests, when considered in the context of digital video platforms at the dawn of the Web, is that certain habits of mind and forms of knowledge will likely arise (through experimentation) as digital video continues to develop. For Stiegler, the urgent question that media theory must face up to now—which he derives from the analogy to early writing—is this: what circuits of psychic and collective individuation make the appearance of literacy’s equivalent possible today? In terms of its bottom line, Stiegler’s message to all scholars concerned with new media, which is remarkably consistent with that of Ulmer’s project of electracy, is to stop lamenting over the society of the spectacle as if it were an essential property of audiovisual media, and to start contributing to the development of
theories and practices capable of facilitating something like a literate revolution 
commensurate to our own stage in the history of the supplement.

Why does Stiegler attach so much historical and theoretical significance to Web 2.0 platforms like YouTube? Again, he is motivated by his analogy to early writing systems. He proposes that the twentieth century monopolization of analog media by the cultural industries mirrors the scribal culture of early writing in that both situations hold to a pervasive opposition between producers and consumers. The creative class of the cultural industries is thus described as “the scribes of the audiovisual” (“Carnival” 50).

Digital technologies, akin to the introduction of the phonetic alphabets, generalize access to the means of production and to recording practices themselves, thereby extending the economy of contribution to encompass the activity of people other than just the audiovisual scribes. To an extent, this transition already began with the marketing of affordable “home video” cameras. With this in mind, Stiegler locates the unique value of platforms like YouTube in their “bottom-up” approach to metadata, which, he thinks, “constitutes a radical novelty in the history of humanity”:

Up to this moment, the production of metadata, whose digital concept was formulated in 1994, but whose practice goes back to Mesopotamia, had always been executed in a top-down way, by the official institutions of various forms of symbolic power. Produced automatically for the semantic Web, or produced by Internet users’ analytic and synthetic capacities of judgment for the social Web, this new type of metadata opens up the possibility of delinearizing audiovisual works to include editorial markers, to inscribe pathways and personal annotations, to make signed readings, signed listening and signed vision accessible by all users. (“Carnival” 52)

Stiegler uses this insight to counter popular concerns, expressed by critics from Jurgen Habermas to Al Gore, that the public spheres in which democratic debates occur are threatened by the ascent of image culture, which they oppose to a more rational model of exchanging ideas via reading and writing (i.e., the circulation of printed words).
Justified by the analysis above, Stiegler concludes that the separation of producer and consumer is not an inherent consequence of audiovisual media, just as the public sphere is not an automatic feature of alphabetic writing and print. There was no public sphere in early scribal cultures.

YouTube—and, more importantly, the process of grammatization we can ascertain from its emergence—shows that electronic and digital media have not hopelessly handed over our culture to the cultural industries. In short-circuiting processes of collective individuation, the consumerist model of the cultural industries is the threat to democracy—not audiovisual production in and of itself, which is ultimately a pharmakon. Indeed, these new technologies appear to be evolving in ways similar to those of alphabetic writing, such that recent advances in digitalization seems to “deeply modify relations to the audiovisual temporal flux, allowing one to imagine the appearance of a more reflective and less consumerist gaze” (“Carnival” 41). From 1980s home video to today’s digital video networks, more and more people can break down, manipulate, annotate, and revise the analogue audiovisual flux. Moreover, the bottom-up production of metadata introduced in Web 2.0 platforms displaces that cultural industries’ “calendar organization for program access,” which to a large extent shaped the calendarity of mass media cultures (Stiegler, “Carnival” 52). Instead, platforms like YouTube offer on-demand access to “stocks of traces called data and metadata, and no longer to the flow of programs that constitute radio and television channels” (Stiegler, “Carnival” 52).

The first literate philosophers responded to alphabetic grammatization by developing a series of logical techniques, designed to be practiced by individual thinking
subjects who sought to exploit the new relations to speech that alphabetic writing made possible. A key task of media theory in the age of digital networks, then, is to formalize “a collective intelligence of transindividuation through images,” the stakes of which Stiegler aligns with a potential “renaissance of political as well as economic life” on par with the literate revolution in ancient Greece or the rise of print in early modern Europe (“Carnival” 56). Stiegler’s formulation of this project and his attempts to carry parts of it out in his books are all inconceivable without his analogical method for mobilizing concrete studies of historically specific technologies in an effort to theorize the new forms of individuation, knowledge, and social organization that digital media will have preconditioned. In other words, his mission is not to predict the future of technical evolution by inventing it, but to conceptualize possible futures for digital culture by scrutinizing the prevailing processes and potentialities of contemporary technics in the context the broad history of that technocultural evolution, which got set into motion during the Neolithic Age. As we have seen, Stiegler’s name for these all-important processes is grammatization.

**Grammatization and Digital Rhetoric**

Now I want to briefly indicate how Stiegler’s notion of grammatization, critical as it is to his project, could also act as a critical-creative framework for humanities research concerned with theories and practices of writing and culture pertaining to digital milieus. Focusing on grammatization processes adds a point of emphasis, if not a methodological orientation, that is complementary to current approaches such as orality-literacy-electracy, comparative media studies, and digital rhetoric. To the orality-literacy-electracy framework, grammatization supplies a greater degree of specification when characterizing a given apparatus, and the concept also extends to logic of
supplementarity to forms of technics, such as industrial machines, that are not traditionally associated with communication or memory technologies. Stiegler shows how industrialization profoundly influenced the organization of social flows, breaking down the flux of labor into discrete and iterable vocabulary of gestures; furthermore, his assessment of hyperindustrialization draws attention to current grammatization of affects and all forms of knowledge managed by the programming industries, beckoning a redoubling of proletarianization in the domain of aesthetic and political capacities. Attending to the grammatization processes unique to contemporary technics can give us a more distinct and differentiated sense of the manifold fluxes that constitute electracy and digital culture.

With regards to comparative media studies, Stiegler's work instills a sense of purpose into the convention of making historical comparisons. Too often in recent scholarship, terms like remediation, convergence, and technogenesis are put into the service of mere academic exercises. One delves into the historical circumstances of an older medium in order to show that, in fact, something was developed in that medium that is vaguely fundamental to the basic operations of contemporary digital technologies. We learn that the jacquard loom and the difference engine were among the first machines to employ binary code based on simple presence and absence; that telegraphy anticipates the shift from natural language to increasingly complex and artificial code groups, which have since become endemic to the modern computer (Hayles 142). But these history lessons do not reveal much about new media. Indeed, critique could be leveled against this mode of comparative media studies similar to the one Derrida leveled against historical grammatology: the researcher enters the history of
technical evolution with the intent to trace older media operation to an apparent or conventional understanding of new media, which in turn yields little insight into what is new with new media. Lev Manovich says as much when he explains the role of comparative media studies in his methodology:

This perspective is important and I am using it frequently in this book, but it is not sufficient. It cannot address the most fundamental quality of new media that has no historical precedent—programmability. Comparing new media to print, photography, or television will never tell us the whole story. *(Language 47)*

Of course, no single approach to writing, media, and culture can tell us the whole story; clearly, though, certain approaches exhibit an inclination to tell certain kinds of stories. Hayles' brand of comparative media studies tends to rely on *causal narratives of progress and continuity*. While Manovich acknowledges the value of these kinds of stories, he is clearly more interested in moments of discontinuity when something radical and unprecedented emerges. Stiegler's emphasis on grammatisation processes suggests a framework for generating these rapturous turns in otherwise harmonious histories of writing and media, which underpin the most conservative theories of new media. As Manovich implies, historical inquiry is most beneficial to media theory when it assembles disjunctive comparisons and generative juxtapositions that help us identify what is most transformative and unique about new media, and to theorize the implications of those radical elements in the context of comparable effects and consequences of prior media that are now evident in retrospective analysis. In syncing relevant stands of inquiries from media theory with theories and histories of writing, writing theorists can connect their research to urgent questions facing contemporary digital culture. In addition, media theorists can look to the history and theory of writing to broaden their historical reserves for a grander sense of what is contemporary.
“Contemporariness,” as Giorio Agamben points out, “is *that relationship with time that adheres to it through a disjunction and an anachronism*” (41). Contemporary technics only appears as such in the juxtaposition of technics from different stages in the history of the supplement.

Finally, grammatization stands to compliment current work in digital rhetoric, especially the ongoing efforts the remix the fundamental terms of classical and modern rhetorical theory. As a scholar leading this effort, Collin Brooke has critiqued work in rhetoric and composition that seeks to apply Jay Bolter and Richard Grusin's concept of remediation as an explanatory framework. I anticipate that some readers might be inclined to equate the concept of grammatization with this more familiar idea of remediation, since both are process terms that employ comparisons among different media to comment on technical evolution. My own position, however, is that grammatization differs completely from remediation. Like the historical narratives that characterize comparative media studies, scholarship guided by the assumption of remediation seeks out an earlier medium to function as a point of origin from which to understand a newer medium. In this sense, Brooke argues, “[remediation] defers [the question of a new media rhetoric] to older media” (19). By contrast, grammatological analogies, which juxtapose the history of writing and technics with the present state of digital media, refer to older media with the aim of pinpointing the transformative or unprecedented aspects of emerging technologies. The analogy becomes a generative ground for theory, not a means of legitimating a myth of origin.

Moreover, complimentary to efforts to demonstrate the technological dimension of traditional rhetorical principles and writing genres, a comprehensive grasp of
grammatization process puts rhetoricians in a better position to root out retrofit appeals that insists upon approaching and evaluating digital practices with assumptions and values presumed to persist in spite of technological change. As a theory and method, grammatization counters the scholarly operations Brooke associates with rhetorical applications of remediation. Brooke concludes that remediation works best as an explanatory framework when dealing with “combinations [of media] that have already occurred and acquired some degree of cultural stability” (21). By contrast, as Stiegler’s recent texts prove, grammatization thrives as a generative heuristic for studying emerging media that are ripe with indetermination and radically open to cultural definition. Grammatization reflects on the already-there, the thinking of (by) technics, in order to gain insight into what is new about new media, which a rhetoric of new media must account for before it can claim to invent practices of (by) new media.

If writing is prototypical of technics in general and if, as Stiegler asserts, technics command a constitutive ontological status (in spite of the philosophical tendency to opposed techne and episteme), then scholars who claim to study writing and technology need to be attentive to the social and ontological transformations wrought by the forms and processes of digital writing/media, and not only ask after or attempt to demonstrate their use value as communicative instruments. As I claim in Chapter 2, studies of writing technologies within rhetoric and composition have largely neglected their ontological status, conceiving of contemporary technics as “digital tools” standing in reserve at the rhetor’s disposal.

This failure to address contemporary techn(ont)ologies is one of the reasons why the field, as Brooke shows, has been quick to see the affordances of digital writing
environments in the image of traditional academic genres—a maneuver reinforces the value of rhetorical frameworks rooted in the discursive economy of print. If we aspire to rethink the concepts that help orient new media practices, then we need to engage with theories of techno-human relations and technical evolution that emphasize the constitutive force of technics and foreground the most contemporary aspects of new media. A decade into the twenty-first century, one can already identify a multitude of technocultural innovations that each, in one respect or another, occasion scholars to challenge conventional paradigms. Brooke’s occasion for remixing the canons of classical rhetoric is the ascent of Web 2.0. While much work in the field is still engrossed in this mission—and with good cause since much of what emerged from these platforms has since become paradigmatic to networked media in general—technologists and media professionals have already become to herald a third wave in computing and the Web. Grammatization, as a historical-theoretical framework, stands ready to orient early inquiries into what is new about this third wave, often called ubiquitous computing or ubicomp.

Ubicomp, more than any other historical stage of grammatization, provides us with an inescapable (“always on”) illustration of the essential technicity of humans that Stiegler theorizes. For Stiegler, there is no human prior to or apart from technics; technologies do not augment or extend human intelligence—they constitute or underwrite “human” qualities and processes in the manner of a figure/ground relationship. Indeed, Stiegler insists that the “I” is a “historical figure of comprehension” linked to a “programmatic state of the what” (i.e., alphabetic grammatization). Alluded to urgently but sparsely in Stiegler’s work, ubicomp marks a new ‘programmatic state of
the what.’ Everyday experience increasingly entails medial interfaces that shape a multitude of human-computer interactions. The ontological import of technologies such as Google Glasses is right before your eyes; software is *everyware*. So-called prostheses of this sort (e.g., wearable devices) are normative, not corrective, and they often go unnoticed for being so pervasive. Following Stiegler’s revival of grammatology, we might ask: what (emerging) figures (stand to) pervade the programmatic state that is ubicomp? Which of these figures enable us to comprehend this historical moment in the evolution of technics and writing? What are some key figures of the ubiquitous interface?

I address these questions in Chapter 4, and Chapter 5 proposes a set of figures for media theorists and digital rhetoric scholars to consider. In Chapter 4, my primary objective is to describe ubicomp as an emerging stage of grammatization. What, in other words, are the key fluxes and processes by which the continuity of those fluxes are broken down into *gramme*? As I have argued above, identifying the definitive grammatization processes at play in an emerging medium—or an entirely new paradigm, in the case of ubicomp—is an effective way to ascertain its most unique, unprecedented qualities. It is only on the basis of an *episteme* of (by) contemporary technics that we can invent new practices, strategies, and concepts for a contemporary *techne*.
CHAPTER 4
UBICOMP: WRITING SPACES FOR THE TWENTY-FIRST CENTURY

Ubicomp signifies a broad perspective on current technocultural shifts occurring throughout much of the world; the term, as I evoke it here, denotes scenarios in which the personal computing paradigm bifurcates amidst an array of emerging digital technologies that are mobile, locative, wearable, projected, embedded, and implanted. My aim here is to describe ubicomp platforms as if they marked a crucial stage in the history of the digital supplement. The questions formulated and taken up here will propel my analysis of contemporary mediascapes in Chapter 5. What new processes of grammatization appear to define the ubicomp paradigm? As computer programs and digital writing continue to migrate toward post-desktop interfaces, how do acts of computing and writing transform? How might the unique affordances evident in cutting-edge developments provoke parallel innovations in digital rhetoric and design thinking?

As I argued in Chapter 3, Stiegler’s grammatological framework offers robust historical and theoretical support for inquiries into contemporary technics. Positioning new media parallel to the broad history of writing, communication, and memory technologies—as well as that of industrial machines and the culture industry—enables theorists and designers to pinpoint the most unprecedented and consequential developments accruing in societies of permanent innovation. A crucial factor separates Stiegler’s analogical approach from more common exercises in media history. Rather than consult histories of technical evolution in order to ground an already noted capacity of new media in the lineage of previous technologies that exhibited similar capacities—in the manner of a myth of origin—Stiegler works by disjunction and juxtaposition. The historical grammatization processes he assembles in his work become a basis for
generating an unthought insight about digital media culture. While the apparent continuity between the phonetic alphabet and Web 2.0, for example, motivates the comparative gesture, his methodological premise is to pursue the novelty evident in differance. Moreover, Stiegler’s thinking of (by) technics is consistent with grammatological understandings of writing and the logic of supplementarity, and thus departs from more common instrumentalist views of techno-human relations rooted in the image of hand tools and the logic of augmentation.

My approach to ubicomp incorporates the core concepts and techniques of Stiegler’s framework; however, as I build from his engagement with technics at large, I also depart from the more grandly philosophical ambitions at the heart of his *Technics and Time* series. Whereas Stiegler’s project could be regarded as a revaluation of philosophy on the basis of technics, the scope of my project hones in on the grammatological implications, as well as the rhetorical and aesthetic prospects, associated with ubicomp platforms, which Stiegler addresses only in passing, in the mists of more general remarks on digitization. My objective is to develop an interpretation of the grammatization processes unfolding today, and to formulate some rhetorical and aesthetic principles to help orient multimedia production amidst the transition to ubicomp. In conversation with recent scholarship across media studies and computers and writing, I aim to contribute a productive theory of the present. This phrase combines a term employed by Jay Bolter—productive theory—with the descriptor Lev Manovich’s uses to label his own project: theory of the present. Productive theory, as N. Katherine Hayles abstracts of her interview with Bolter, builds off “the insights won by poststructuralist theories to create a hybrid set of approaches
combining political, rhetorical, and cultural critique with the indigenous practices of digital media" (How We Think 32). Meanwhile, Manovich’s theory of the present seeks to “describe and understand the logic driving the development of the language of new media,” (Language of New Media 7). Here, I take up this collective project, with a special emphasis on the gramma-logics driving the development of computing, writing, and multimedia production in ubicomp scenarios.

Ultimately, the rise of ubicomp in computer science beckons parallel developments in the ways humanities scholars understand and create new media projects. If we aim to write and design for ubicomp platforms, then we must attend to their most characteristic processes of grammatization. Since 2006, many scholars writing about mobile and locative media have agreed that the most transformative aspect of the ubicomp paradigm is the unprecedented degree of interlocking occurring between networked digital media and physical spaces. Taking smartphones as a general emblem for ubicomp, scholars tend to emphasize the on-the-go, anytime-anywhere connectivity of the mobile Web (the sudden detachment of computing from “computers”), as well as location-based gaming and social networking (the ramped attachment of digital data to specified places, delivered for mobile access).

Pioneering ubicomp in the late 1980s, Mark Weiser and his colleagues at Xerox PARC prototyped entirely new categories of mobile, wearable, and embedded devices designed to “draw computers out of their electronic shells,” in order to bring the virtuality of computation “into the physical world” (“The Computer for the 21st Century” 98). This was not Weiser’s only mission statement, however. Increasingly, developers are working to realize a relatively underdeveloped goal of Weiser’s vision for ubicomp: to
create “context-aware” computers that interface with the multitude of autonomous, non-computational fluxes that Weiser broadly referred to as “the infinite richness of the universe” (94). Thus far, humanistic studies of mobile devices and locative media have done relatively little to account for this latter dimension of ubicomp, which is now increasingly orienting experiments within and beyond the mobile Web. By revisiting Weiser’s influential vision in light of present ubicomp development, we can begin to theorize this emerging paradigm in a way that acknowledges the full spectrum of its revolutionary potential, beyond the basic capacities of mobility and location-based data. In addition, we might move beyond theoretical accounts that characterize the spatiality of ubicomp in terms of a homogeneous “digital-physical convergence,” which, as I will show in the second half of Chapter 4, have dominated humanities scholarship on ubicomp over the past decade.

The Invention of Ubicomp

Nearly every book and article dealing with ubicomp begins with a basic outline of Weiser’s vision for a post-desktop future, which he sketched in a series of brief articles during the 1990s. “The Computer for the 21st Century,” the most vivid and celebrated of Weiser’s texts, even reads like a manifesto (which is quite rare for computer science publications). Twenty years later, leading researcher in computer science and interaction design single out this text for its guiding role in establishing vital research agendas in both fields; widespread innovations in mobile devices, as well as many cutting-edge experiments in wearable computing and smart environments, can all be traced rather directly a concept or prototype Weiser introduced (Want 32-33). The undeniable influence of Weiser’s vision makes his writing a transdisciplinary link that connects lab research in human-computer interaction, user experience design, and
software engineering with scholarship in new media studies, mobile communications, and interface theory. As such, I believe Weiser’s manifestos merit a closer reading than has been offered thus far. His essays belong in the tradition of canonical texts written by twentieth century technologists, such as those featured in Noah Wardrip-Fruin and Nick Montfort’s *The New Media Reader*, which have received considerable attention from humanities scholars. Just as Vannevar Bush’s “As We May Think” and Ted Nelson’s *Computer Lib/Dream Machine* proved vital to the technocultural development of the World Wide Web and hypertext, Weiser’s texts constitute a suggestive basis for theorizing ubicomp at a paradigmatic level (i.e., transversal to feature-level innovations in a given product area). Conceptual work that strives to think at the level of the paradigm carries a key benefit: one does not willfully subject the rhetorical life of his/her insights to the planned obsolescence intrinsic to capitalist economies of permanent innovation. Moreover, as Adam Greenfield argues, the academic habit of carving out niches of hyper-specialization very much contradicts the fluid, ambient, and “invisible” ways in which people actually experience ubicomp platforms (15).

Because Weiser’s texts are manifestos—they invent ubicomp in both a technical and a discursive sense—I engage with them from the standpoint of *heuretics*. That is, I structure my reading in terms of Gregory Ulmer’s “CATTt,” a framework designed to—among other things—identify and articulate the logic of invention operative in avant-garde discourses on method (*Heuretics* 8). As we account for Weiser’s CATTt—the generative resources that function as *contrasts* and *analogies* for his formation of ubicomp, the *theories* he draws upon, the domain of application that his work *targets*, and the “*tale*” through which ubicomp disseminates—we can gain a more nuanced of
the grammatization processes orienting current ubicomp development, particularly those that have been overlooked by recent scholarship across the humanities.

The most obvious element of Weiser’s CATTt, personal computing, stands out as a constant source of scorn in his texts on ubicomp. The magnitude of Weiser’s frustration with PCs provides historians of computing with a decisive schema for charting the broad contours of the modern computer’s evolution. This standard timeline indicates a three-wave progression: mainframe computers, personal computers, and ubiquitous computing. As the terminology implies, there is a shift from computers to computing, from rooms full of clunky machinery to desktops to laptops to an expanding array of smart mobile/wearable devices, smart objects, and smart environments. What motivated Weiser (and his colleagues at PARC) to push computing relentlessly in the direction of these latter manifestations? Why was he so contemptuous of PCs, which after all, had only been on the market a few years before his publications started to appear?

Weiser’s critique of PCs revolves around four major points: (1) PCs demand too much specialized, technical knowledge to operate; (2) PCs monopolize the users’ attention and arrest their movement; (3) PCs are too isolated from one another; and (4) as a general result, PCs tend to alienate or at least temporally bar people from one another, their surroundings, and non-computational activities. In raising this first point, Weiser maintains that the modalities of human-computer interaction (HCI) typical to PCs reinforce a fundamental split, instituted by mainframe computers, between the actions required to engage computation and the more conventional actions that people engage in while doing tasks at work, home, and other everyday environments. In spite of PCs’
early market success during the late 1980s, Weiser claims, “the computer nonetheless remains largely in a world of its own...It is approachable only through complex jargon that has nothing to do with the tasks for which people use computers” (“The Computer for the 21st Century” 94). Aside from a technical elite, who had learned programming languages and/or adapted their skills to the demands of the PC’s input mechanism (i.e., artists who learned to draw with the mouse and keyboard), people had to devote the bulk of their awareness to translating their actions into commands or at least gestures that the PC recognized. Of course, the Graphical User Interface (GUI) of early PCs like the Apple Macintosh transformed the HCI modalities of command-line interfaces, such that computers could be operated by clicking on windows, folders, and icons displayed visually on a virtual desktop. And yet, in making basic computational operations easier to master, the GUI still did not solve what Weiser took to be a larger problem: the underlying fact that PCs regulate human attention and movement to the virtual space of an isolated box/screen and its limited set of arbitrary interaction modalities.

Noting the spaces in which computation could take place via PCs, Weiser casts several general descriptions that more or less evoke his central image of “people holed up in windowless offices before glowing computer screens” for whom “the outside world and all its inhabitants effectively cease to exist” (104). Moreover, Weiser clearly states that the development of mobile PCs (“laptops machines, dynabooks, [and] netbook computers”) does little to help people integrate computing into the rhythm of their workflow and daily activities. Making the computer mobile multiplies the spaces in which PC interaction modalities can take place; mobility alone does nothing to alter character of the interaction modalities themselves. People equipped with mobile computers may
be able to engage computation amidst otherwise non-computational, pedestrian settings (e.g., parks, subways, sidewalks, etc.), but mobile devices that retain the basic interaction modalities of the PC era do not sense or engage with the real-time actions taking place in the surrounding environment—and so operating them requires users to disengage, if only momentarily, from their surrounding as well. According to Weiser, “‘Ubiquitous computing’ in this context does not mean just computers that can be carried to the beach, jungle or airport. Even the most powerful network computer, with access to a worldwide information network, still focuses attention on a single box” (94). Today, amidst the proliferation of smart mobile devices, reminding ourselves of this crucial aspect of Weiser’s vision is especially illuminating; indeed, I will recall this point below in my critique of recent mobile media scholarship, much of which has all too readily proclaimed smartphones as the emblems of ubicomp.

In contrast to the PC paradigm, Weiser and his colleagues sought to circumnavigate virtual reality. Weiser believed that virtual reality—of which the desktop GUI is a basic model—created maps that excluded territories (94). The icons and figures of the desktop interface, as Steven Johnson explains, create a visual metaphor that uses the familiarity of a typical office environment as a vehicle to help people navigate a seemingly infinite and incoherent array of binary code and electrical currents (48). Rather than incorporate people’s more familiar surroundings as a strictly imaginary vehicle, Weiser envisioned the opposite scenario: he wanted to install computing power into everyday objects and environments, so that people could engage computation without disengaging from the things that surround them—the things they already operate and/or live among. In doing so, the ubicomp paradigm would not turn these
things into computers—apparatuses for “simulating the world”—but would instead aim to dissolve into things and animate them with the task-specific functionality, always with the intent to “invisibly enhance the world that already exists” (Weiser, “The Computer for the 21st Century” 94). Rather than continue building “single boxes,” Weiser challenged engineers and designers to a network of “hundreds of computers per room,” wherein each smart object communicates with other smart objects to perform operations in response to a certain set of movements and behaviors. Emphasizing this relational and contextual mode of operating, Weiser draws a further distinction between PCs and ubicomp, as he suggest that, in the latter paradigm, computing power comes “not from any one of these devices—it emerges from the interaction of all of them” (100). In other words, one designs and evaluates the computing power of a smart object in proportion to the relations it sustains with/in smart environments. Smart environments sustain a real-time feedback loop based on the sensing and actuating capacities afforded by smart objects relating to each other; for example, when a sensor embedded into a door identifies authorized personnel by tracking a microchip embedded in their wearable ID badge, the data processed by the sensor actuates or prompts a programmed action: in this case, unlocking and opening the door when authorized personnel approach. In such cases, computational media syncs with the action of humans and other actants, and they perform actions in response to real-time activity—not (only) in response to explicit “user commands.”

Weiser’s critique of personal computing challenged the familiar assumptions and conventions that had, during that time, successfully oriented industrial production and consumer expectation. Because his vision for ubicomp was such a radical departure,
Weiser needed to relate his fantastic image of “hundreds of computers per room” to a
more established tradition of cultural practice. If people’s PCs demanded too much of
them and alienated them from the surrounding environment, then why burden people
with more computers? Ubicomp no doubt calls for a tenfold increase in computing;
however, understood as a new paradigm, ubicomp is not just about living with more
computers, but rather about inventing whole new kinds of computers to live with.
Searching for solutions, in contrast to the problems of PCs, Weiser repeatedly consults
the history of writing.

For Weiser, computing needs to become more like writing, which he classifies as
“perhaps the first information technology;” we need computers of all shapes and sizes
that we can carry with us and easily embed into our everyday environments (94). In fact,
each of the three categories Weiser formulates to guide the production of ubicomp
hardware—tabs, pads, and boards—are inspired by and defined by analogy to forms of
writing commonly found in modern offices: post-it notes, pocket-size notebooks, sheets
of paper, chalk or dry-erase boards (98-9). Many of the paradigmatic differences
between ubicomp and personal computing stem from this basic maneuver: to envision
computing in the image of writing, and no longer in the image of furniture. In this sense,
Weiser redirects the tradition of constructing interface metaphors drawn from the
modern office; he looks beyond the scene of the desktop, toward the writing that
circulates at its margins.

Writing is already ubiquitous, at least in the context of literate societies
throughout the twentieth century. Weiser explains, “Not only do books, magazines and
newspapers convey written information, but so do street signs, billboards, shop signs
and even graffiti. Candy wrappers are covered in writing” (94). What Weiser calls “the real power of literacy” is not reducible to any single book or to books in general; to fully appreciate the inescapable influence of writing within contemporary life, one must note the more subtle written texts spread across the build environment. For instance, imagine navigating your way through a large international airport without any writing—no gate numbers, no arrival/departure boards, no written flight information, etc. Entertaining this thought experiment, applied to any complex site of social interaction (and even relatively simple venues), brings into focus what Weiser took to be writing’s most important feature. In literate societies, engaging with writing “does not require active attention, but the information to be transmitted is ready for use at a glance...you absorb [written] information without consciously performing the act of reading” (94). As one readily gathers from this passage, Weiser’s conception of writing is thoroughly anchored in sender-receiver, signal-transmission models of communication. Later in Chapter 4, I will explore the prospects of theorizing ubicomp from different perspectives on writing, namely those of Derrida and Stiegler introduced in Chapter 3.

Throughout his influential papers, Weiser—like Stiegler—draws analogies between the current state of computing and relevant periods in scribal, manuscript, and print cultures. After he depicts writing as the ideal medium of seamless human-technology interaction, Weiser projects the future of human-computer interaction parallel to writing’s historical progression. He notes that orthographic writing has evolved in immense and evidently unforeseen ways from the clay tablets of ancient Sumer to the experimental novels of James Joyce (102). Weiser situates PCs toward the early end of this spectrum: “The state of the art [of PCs] is perhaps analogous to the
period when scribes had to know as much about making ink or baking clay as they did about writing” (94). Such analogies become a rhetorical apparatus for persuading his readers to see the history (and future) of computing in three progressive stages, culminating in ubicomp—which, by virtue of its position in the analogy, shines as the most democratic, sophisticated, convenient, and productive stage. In short, the ubicomp research agenda intends to develop computing in the same manner that the great Western civilizations developed orthographic writing: from specialized usages among elite groups toward mass adoption and fluid integration into everyday life.

“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it” (Weiser, “The Computer for the 21st Century” 94). As we have seen, writing sets Weiser’s standard for ‘profound technologies.’ Of course, writing, in many forms of iteration, demands active attention. Regardless of their literacy levels, readers of Being and Time or Of Grammatology, for example, will not get very far if they do not inhabit the texts’ virtual reality and disregard their surrounding environment while reading. Clearly, then, Weiser’s appeal to writing emphasizes one its circumstantial capacities, not its essence. From this circumstantial capacity—exhibited most widely in public writing embedded at particular scenes of decision (street signs, ads, product packaging, etc.)—Weiser pontificates on the nature of technology, and, more to his point, on the question of what makes a tool a “good tool” (“The World is Not a Desktop” 7).

For Weiser, good tools and profound technologies effectively recede into the background of human activities all the while enhancing them. He believes,

A good tool is an invisible tool. By invisible, I mean that the tool does not intrude on your consciousness; you focus on the tasks, not the tool.
Eyeglasses are a good tool—you look at the world, not the eyeglasses. The blind man tapping the cane feels the street, not the cane. Of course, the tools are not invisible in themselves, but as part of a context of use (7).

This argument prefaces Weiser’s call for new interface metaphors for ubicomp that should be, above all, premised upon invisibility. He objects to the common metaphors associated with desktop GUIs (virtual windows, intelligent agents, television and multimedia) because each of them makes the computer the center of attention (7-8).

Indeed, the rise of ubicomp may warrant critical perspectives that question the inherent privilege with which radio-film-television scholarship has claimed to study new media, as if those three media held an undisputed parentage over computers. Many cinema and media scholars, including N. D. Rodwich and Lev Manovich, have professed to see in digital computing the virtual life of film, to such an extent that Manovich proclaims, “What was cinema is now the human-computer interface” (Language of New Media 86). Manovich insists further that, on the heels of film’s popularity during the 20th century, cinema has become the dominant cultural logic and interface metaphor of our time—“a toolbox for all cultural communication, overtaking the printed word” (86). When read against Weiser’s ubicomp manifestos, however, these cinematic understandings of interfaces appear well suited to the virtual reality of PCs, but not necessarily appropriate for grasping alternative paradigms of computing. Manovich’s recurrent suggestion that writing is being obsolesced by cinematic computing thus seems less of a historical certainty and more a technoculturally situated observation specific to recent conditions.

The future of computing, as Weiser leads us to imagine, is resolutely boundless. Throughout Weiser’s texts, one comes upon what must be some of the most poetic moments in the history of computer science discourse. In addition to being like writing, computing should be like “taking a walk in the woods” (Weiser, “The Computer for the
21st Century” 104). And, less cited, but even more mystical: “Our computers should be like our childhood: an invisible foundation that is quickly forgotten but always with us, and effortlessly used throughout our lives” (Weiser, “The World is not a Desktop” 8).

Five years prior to the appearance of Weiser’s first ubicomp manifesto, Terry Winograd and Fernando Flores published Understanding Computers and Cognition, a widely read book that, among other things, introduced computer scientists and HCI researchers to the philosophy of Martin Heidegger. Weiser only cites Heidegger once in passing, but the influence of the latter’s “readiness-to-hand” distinction is clear throughout Weiser’s stated preferences about tools, technologies, and interface metaphors. Briefly put, in Heideggerian terms, readiness-to-hand signifies a mode of encountering entities as equipment; that is, Dasein takes up the entity (a pencil, a screwdriver, a gun, etc.) in order to achieve certain tasks. Ontologically prior to scientific reflection, readiness-to-hand names an instrumental orientation to entities in the world. Heidegger elaborates on this notion through the everyday example of using a hammer:

The less we just stare at the hammer-thing, and the more we seize hold of it and use it, the more primordial does our relationship to it become, and the more unveiledly is it encountered as that which it is—as equipment. The hammering itself uncovers the specific ‘manipulability’ of the hammer. The kind of Being which equipment possesses—in which it manifests itself in its own right—we call ‘readiness-to-hand’. (Being and Time 98)

By contrast, “un-readiness-to-hand” occurs whenever any sort of malfunction disrupts this ‘primordial’ relationship (i.e., Dasein using tools to achieve a task). Weiser’s critique of the PC paradigm essentially depicts desktops and the HCI conventions associated with them as a set of un-readiness-to-hand circumstances to which people have been forced to succumb (if they want to engage with computers). In other words, the normative functionality of PCs amounts to, at best, a socially-accepted dysfunctional
system: they are pieces of (un)equipment that require us to consciously reflect upon and ‘stare at’ them in order to achieve tasks—we cannot simply ‘seize hold of it and use it.’ Of course, Weiser does not just want ubicomp platforms to be easier to use than PCs; the ubicomp paradigm, in its most radical iterations, creates modes of HCI in which people no longer “use” computers. Instead, because computational power has been installed in everyday objects and settings, computing becomes more in sync with the established rhythms of daily life, apparently dissolving into so-called natural behaviors and environments.

Paul Dourish, one of Weiser’s former colleague at PARC, has written extensively on the philosophical underpinnings of ubicomp, and commented specifically on the resonance of Heidegger’s existential phenomenology. Though the connection is largely implicit in Dourish’s work, we can view Heidegger and Weiser as parallel figures, each of whom advanced their field in similar directions in response to roughly equivalent problems. Breaking from the Cartesian dualism of his mentor, Edmund Husserl, Heidegger rejected the mind/body split conventional to Western metaphysics; rather then reflecting on the mental phenomena within the brackets of the cogito—at the expense of being-in-the-world—Heidegger believed that “thinking is derived from being” (Dourish Where the Action Is 107). In order to think, first I must be, and being is always being-in-the-world. More generally, phenomenology sought to (re)assert the primacy of our everyday “actions in the world,” with the insistence that these embodied actions are prior to and inseparable from scientific reflection and its “abstract and idealized realm of dimensionless points and frictionless surfaces” (Dourish “Seeking a Foundation” 6). Akin to Heidegger’s philosophy, Weiser’s work in computing rejected the virtual/physical
split (i.e., digital dualism) that still structures popular and scholarly conceptions of digital media and its relation to “the real world.” Weiser’s goal was to bring computers “out of their electronic shells” and “into the physical world,” so as to make computing function in accordance with a variety of situated, everyday activities (“The Computer for the 21st Century” 98). If the phenomenological push to consider being-in-the-world effectively promoted a reconciliation of embodied action and abstract meaning, as Dourish suggests, then we might understand the ubicomp research agenda—propelled by this theory—in terms of an ongoing drive to reconcile or sync computational operations with established rhythms of human actions. If existential phenomenology theorizes the meaning of being on the basis of action, ubicomp develops computing from the standpoint of action, and so—as I will argue in Chapter 5—digital media that circulate amongst ubicomp platforms stand to encounter, affect, and be affected by the actions of actants in new ways.

How do technologists begin to make computers function more in tune with human action? Where is the site of intervention that initiates this paradigm shift? Producing more computers that are smaller and capable to networking with one another is necessary, but not sufficient. As Weiser and his PARC colleague John Seely Brown insisted, “when computers are all around, so that we want to compute while doing something else…we must radically rethink the goals, context and technology of the computer” (“The Coming Age of Calm Technology” 3). More than a matter of hardware, ubicomp targets the general flow of information across the workplace, the home, and other everyday environments. A goal of ubicomp is to make these flows of information calm, a word Weiser privileges increasingly in his later writings. “Calmness,” claim
Weiser and Brown, “is the fundamental challenge for all technological design of the next fifty years” (3). As evident in his critique of PCs, Weiser believes that desktops and other ‘electronic boxes’ organize and store data such that accessing and manipulating information requires our utmost attention, and further that, due to the un-readiness of this mode of encounter, attending to the computer’s virtual GUI via windows, icons, menus, and pointers (WIMP) means disengaging from one’s physical surroundings, in the manner of a zero-sum game.

In pursuit of ‘calmness,’ the ubicomp paradigm aims to break down the flux of information circulating among personal computers. Here, we can begin to describe ubicomp as a process of grammatization. Recall from Stiegler’s work that processes of grammatization involve the “breaking into discrete elements of [a] flux;” alphabetic writing, for example, breaks down the flux of speech into a finite system of recognizable characters that are, on the one hand, iterable and modular, and on the other hand, capable of orthographic stability (“Memory” 70). Prior to the invention of ubicomp, the development of the GUI and its WIMPs in the 1970s broke the command line interface into a set of visual cues and symbols. In contrast to the command line, the GUI “relies on recognition but not recall” (Quigley “From GUI to UUI” 250). One can discern an appropriate option to click on from a drop-down menu, and no longer needs to remember (or cumbersomely retrieve) precise bits of arbitrary command language in order to perform even the most basic operations. To a degree, the impact of this process mirrors that of the alphabetization of speech. Both cases establish a new relation between hypomnesis (i.e., the technical exteriorization of memory) and anamnesis (i.e., the embodied act of remembering). Whereas speech and the command
line require people to perform anamnesis, qua deferring to content stored in another medium (either one’s living memory or, in the latter case, a supplemental, non-computational text), alphabetic writing and the GUI have language and commands structurally embedded into them. To engage with alphabetic characters and WIMPs is to mobilize those signifying functions of phonetic language and computer code, respectively, which have been rendered discreet, iterable, and modular. One can signify via these entities—these *gramme*—without having to recall, let alone consciously engage with, the fluxes of pronunciation or programming.

Now, from the standpoint of ubicomp, the recognizable entities that have structured the flow of data/information since the PC era—GUIs and WIMPs—have become the new flux, the new continuity that will have been broken down further through the subsequent invention of yet another discrete set of *gramme*. Every process of grammatization accrues by articulating (itself as) a figurative breakdown of a prior process of grammatization. First and foremost, ubicomp cuts into the flux of inputs orienting the continuity of HCI conventional to PCs. Beyond the mouse and keyboard, ubicomp researchers continue to advance Weiser’s mission to invent whole new classes of so-called input mechanisms. Creating a new technics of input creates a new economy of contribution, which conditions the possibility of interaction modalities whereby flows of data/information become generated, organized, presented, and manipulated in unprecedented manners.

For instance, two related stands of current development efforts strive to build interfaces that render digital data *tangible* and *ambient*. In the case of tangible interfaces (sometimes referred to as physical computing or NUIs), one no longer clicks
on keyboard and mouse buttons to manipulate virtual elements on the screen; instead, the presentation of information and the capacity to manipulate it are both integrated into actual artifacts qua smart objects. Computer scientist Aaron Quigley describes the novelty of tangible HCI modalities as follows:

"a user manipulates a physical artifact with physical gestures, this is sensed by the system, acted upon, and feedback is given. TUIs [i.e., tangible user interface] attempt to bridge the digital-physical divide by placing digital information in situ coupled to clearly related physical artifacts. The artifacts provide sites for both input, using well-understood affordances, and can act as output from the system. Unlike the GUI, a classical TUI device makes no distinction between the input devices and the output devices." (253).

Tangible interfaces assign a more indexical role to bodies in motion, and to a much wider vocabulary of gestures than those registered by PC input mechanisms. We have moved from typing remembered codes into a command line, to double-clicking recognizable visual cues, and now—exhibited most notably in Nintendo Wii and Microsoft Kinect game play—to manipulating (and received real-time haptic feedback from) computational objects via a range of spontaneous, intuitive, or, at the very least, non-proscribed bodily gestures. Furthermore, recent developments in the area of ambient interfaces suggest emerging modalities of interaction that circumnavigate the PCs reliance on intentional human input; ambient interfaces are alternatively designed to register and respond to a diverse mix of dynamic variable in a targeted area. On the infrastructural basis of low-cost sensors, which can be embedded in environments or worn on and implanted inside of bodies, ambient interface design radically opens the domain of computational operation, such that the flow of information amidst ubicomp platforms ebbs and shores according to the gramma-logics emergent from a general economy of actants, many of whose actions and properties are structurally excluded.
from the feedback loops at the core the PC paradigm (i.e., transition from pre-
determined programs to pro-grams).

Ultimately, in syncing computing with everyday actions and environments,
Weiser hopes ubicomp will attune us (and computers) to a wealth of relevant
computational information and functionality, but do so in ways that do not require us to attend—constantly and explicitly—to those information streams. Computing should “increas[e] our knowledge and…our ability to act without increasing information overload” (Weiser and Brown 4). As a process of grammatization, ubicomp decentralizes the flux of computation, making it more pervasive and localized, but also more marginal. Ubicomp exists everywhere (theoretically), but always defaulting to the periphery. As a paradigm of calm technologies, ubicomp “engages both the center and the periphery of our attention, and in fact moves back and forth between the two” (Weiser and Brown 3).

In contrast to PCs, ubicomp interaction occurs at the periphery of otherwise non-discursive action. We already see all sorts of scenarios, absolutely impractical if not impossible with PCs, in which people engage with computing while they remain engaged in another activity. A runner wearing a Nike+ sensor, for example, generates a digital data visualization as she runs; each stride produces an indexical trace recorded and stored on an online database. She runs, and her running is computing. Situated actions like these, occurring in traditionally non-computational environments, become interpreted by ubicomp systems as implicit “commands,” which affect the course of computing and the flow of digital information. Moreover, the flow of information and
functionality bifurcates into the most elemental configurations, becoming more and more discreet, until it resides calmly in the periphery of a given HCI situation.

The final slot of Ulmer’s CATTt framework, the “tale” concerns the concrete form(s) through which a heuretic discourse represents and primes itself for “circulation and dissemination [as] a cultural invention” (Heuretics 4). In the case of ubicomp, Weiser’s manifestos clearly point beyond the scene of his writing, as he reports on technologies in development at PARC, which were being designed to manifest some of the scenarios his texts envision. Mentioned above, the “tabs, pads, and boards” that Weiser outlines merit further attention here for the vital role they play in ubicomp’s tale. We must also note, however, the distinction Weiser makes between his near-term expectations and his far-future ambitions. In order to apprehend the scope of the latter, we must also attend to Weiser’s “Sal” narrative and its resonance with contemporary ubicomp development. Accounting for the full spectrum of his tale will help us see that Weiser’s vision is about more than hardware, more than a set of mobile devices.

Four years after publishing “The Computer for the 21st Century”—the article that introduced tabs, pads, and boards—Weiser referred to these three classes of devices collectively as “Ubiquitous Computing, phase 1” (“The Technologist’s Responsibilities and Social Change”). Weiser explains the thought process that oriented his project, starting with the ultimate question guiding his research on ubicomp:

Could I design a radically new kind of computer that could more deeply participate in the world of people? ... As I began to glimpse what such an information appliance might look like, I saw that it would be so different from today’s computer that I could not begin to understand or build it. So I set out, instead, to build some things that my colleagues and I could put in use, things as different as we could imagine from today’s computers, yet using technology that could be made solid today. Using these things would then change us. From that new perspective, I would then again try to glimpse our
new kind of computer and try again. (“The Technologist’s Responsibilities and Social Change”)

Tabs, pads, and boards are the computers one needs to build and engage with, in order to then rethink computing for the twenty-first century. In other words, distributed or mobile computing is a bridge to more radical iterations of ubicomp. As such, “Phase 1” creates new ports that effectively scatter established PC information flows across a multitude of inch-scale (tabs), foot-scale (pads), and yard-scale (boards), with the intended consequence of making computing more amenable to real-time tracking, rapid-prototyping, and multiple forms of collaboration. Tabs, pads, and boards—as Weiser pitches them—create the conditions for ubicomp experimentation; he does not present them in the manner of a product demonstration, as is most often the tale of through which lab-based technical inventions are put on display for general audiences. Of course, a variety of commercial products—from first-generation PDAs to iPhones and iPads—have since proven the value and appeal of these three hardware genres as standalone mobile devices. And yet, as I will begin to argue in the following sections, one can clearly distinguish between contemporary mobile media (and scholarship about them) that currently act as a site for ubicomp development and, more commonly, cases in which mobile hardware is appropriated merely as smaller extensions of the PC paradigm.

Weiser’s “Sal” narrative depicts a day in the life of a representative working professional (named Sal), who lives at some unspecified period in the future, when mobile and embedded devices have become thoroughly integrated into the social fabric of everyday life. Hence, the narrative imagines some ways in which mobile and embedded devices might function relative to the ubicomp paradigm, not as tiny PCs.
From the moment Sal wakes up, she encounters a series of computers, each build discreetly into her home and work environment, that operate on the basis of her movements, speech, and gestures; and in accordance with a range of custom settings specific to her preferences. Her coffee maker syncs with her alarm clock; some of the house’s windows act as interfaces, displaying spatially accurate “electronic trails” of any recent pedestrian and vehicular traffic that occurred near her property (“The Computer for the 21st Century” 102). When highlights passages from a print newspaper with her smart pen, the highlighted text is sent to another computer at her office. During her drive to work, we learn that the glass surfaces in Sal’s car also function as interfaces, displaying real-time navigational information, even recommending an optimal parking spot. As soon as Sal enters the office building (wearing her ID badge), all of the electronics at her workspace turn on, while she chats with a few colleagues. At work, Sal uses tabs and pads to share her screens, her location with collaborators, and edit documents projected onto the walls. With so many devices active, whole new kinds of data gets recorded without “user input” and becomes automatically stored in search-friendly formats, just in case Sal ever needs to access a fractional bit of this information in the future.

**Beyond Mobility and Location**

Weiser’s Sal narrative charts the crucial transition from smart *mobile devices* to smart *environments*, wherein the embodied interactions among the devices and specific bodies in motion have become the crux of computation and ad hoc networking. Obviously, this day-in-the-life overview provides only the slightest glimpse of potential ubicomp scenarios, and the examples it features are fairly specific to Weiser’s everyday life as an employee at Xerox PARC, where research revolved around workplace
productivity. (One might make similar claims of Vanever Bush’s memex use scenarios in “As We May Think,” which are imagined from the standpoint of a research scientist.) Recent critics have wagered that Weiser’s vision, at least its most radical aspects, may turn out to be an unrealistic technological utopia, or at least a highly exclusive luxury reserved for a privileged elite, adding another level to the digital divide.

For instance, mobile media scholar Jason Farman predicts that smart objects, let alone smart environments, “would remain accessible to only a fraction of the world’s population” (9). On the basis of this claim, as well as statistics indicating the global spread of smartphones, Farman aims to justify his methodological decision to limit the ubicomp paradigm to current mobile devices. He suggests that theorists who associate ubicomp with broader developments beyond mobile are living on a prayer, so to speak, and that, in any case, the “massive potential for ubicomp…is already integrated into digital cultures: our mobile devices” (8). Indeed, Weiser predicted that “ubiquitous computing, phase 1” (i.e., tabs, pads, and boards) would reach a critical mass by 2011. Consumer reports from 2012 show that worldwide PC sells are decreasing dramatically, especially among young people, who opt increasingly for mobile devices (“PC Sales Slump” Wohlsen). Industry projections suggest that, by 2015, “the number of users accessing the Net from mobile devices will surpass the number who access it from PCs” (Anderson and Wolff). And yet, we must remember, the popular success of mobile computing marks the onset of the ubicomp paradigm. For Weiser, these mobile devices, which he helped invent, from the outset marked the enabling conditions within which to invent more radically; tabs, pads, and boards are not the pinnacle or culmination of ubicomp. While I agree that certain iterations of mobile media do act as an intriguing
cipher for the ubicomp paradigm, I find Farman’s reasoning—his willful reduction of ubicomp to smartphones—to be consistent with the PC paradigm, at least to the extent that he considers personal ownership of a codified device a criteria for the arrival (or lack of arrival) of a given technology.

Granted, smart houses, or what Adam Greenfield calls “digital homes,” will be no more widespread than multimillion-dollar mansions are now; most small businesses cannot afford to upgrade every single employee’s office to the level of Xerox PARC. But ubicomp is not about personal computing. Cities all over the world (and not just the “developed world”) are starting to fund and manage smart environments designed for public access, in the service a variety of civic and cultural initiatives. For example, in 2007, the Spanish city of Zaragoza commissioned architect Carlo Ratti and his lab at MIT to build the public smart environment eventually titled the Digital Water Pavilion. Ratti’s design treats water as a pixel; that is, water becomes a surface of/for digital writing, which senses dynamic variables in the surrounding environment and actuates structural and rhetorical changes in response to real-time activity. Accounting for current growth of public ubicomp projects like this allows us to engage the full spectrum of the paradigm’s revolutionary potential, and, moreover, to eschew efforts to reduce ubicomp to the medium-specificity of the latest product line of electronic boxes. Noting the generative interplay evident in Weiser’s work among smart objects and smart environments—rather than postulating a division between them—is paramount to cultivating a paradigmatic understanding of ubicomp and the shifts it is giving rise to in various domains of technocultural practice.
The critical question, as Stiegler insists, concerns the kind of interpretation we give to ubicomp, as an unfolding process of grammatization. What technical capacities do our theoretical characterizations foreground? How do we understand emerging social practices in relation to this paradigm shift in popular computing? The idea of “mobile media” is an interpretation of the post-desktop age. Scholarship on ubicomp qua mobile media stresses, above all, the capabilities and phenomena associated with anytime-anywhere Internet connectivity. Smart mobile devices have certainly extended computing to an unprecedented array of everyday activities: surfing the Web while waiting in line at the grocery store, transferring funds between bank accounts while the waiter prints the check, replying to email while walking the dog, etc. In this sense, Internet-enable mobile devices initiate a stronger link between human action and computational media than the more stationary use parameters inherent to desktops and laptops. That said, the majority of mobile media practices today—at least those measured by American statistical studies—constitute nothing less than the coopting of ubicomp technologies by the PC paradigm, perhaps Weiser’s worst nightmare. In other words, while smart mobile devices clearly bring the virtuality of computation out of clunky computers, the models of computing that they bring are those of PCs. Most alarmingly, the bulk of smartphone usages perpetuate modes of human-computer interaction that divide the virtual reality of the screen from the activities occurring in the surrounding environment, the ‘infinite richness of the universe.’ This division is not a total one, of course; I may read an email on my smartphone that adds to my environmental awareness in that moment, and at any rate, a dialogical co-influence always exists between my geographical situated experience and whatever media I am
accessing on-the-go, regardless of its relevance. What we cannot ignore, however, is the statistical evidence—the pragmatic reality—that the PC-oriented design of most mobile platforms requires people to disengage from their surroundings in order to engage with computation media, if only for a fatal moment. Had he lived to see the rise of smartphones, such would have been the source of Weiser’s horror: current mobile media practices spread the very elements of PCs that Weiser so vehemently critiqued; the ways in which one must engage with a desktop have now become regular ways of behaving anytime-anywhere. What were once simply points of irritation among innovative technologists has now become a major cause of death and “accidents” in America.

The theoretical task to think ubicomp beyond PC-oriented, mobility-centered interpretations is at once an ethical imperative. In this context, the wisdom of Weiser and Brown’s foresight is worth restating: “when computers are all around, so that we want to compute while doing something else…we must radically rethink the goals, context and technology of the computer” (“The Coming Age of Calm Technology” 3). In valorizing anytime-anywhere connectivity as the quintessential capacity of post-desktop computing, many designers and scholars of mobile media neglect to address the discord that is programmatically installed: smartphones allow people to ‘compute while doing something else,’ but the vast majority of current iterations still require people to disengage from this ‘something else’ that they are doing in order to engage with computational media. Nowhere is this more evident than with the issue of distracted driving.
As with guns, one can always claim that PC-oriented mobile devices in-themselves do not kill people, and that the real problem is irresponsibly on the part of certain people. Such claims, valid as they may be, do not solve the problem. Public service announcements and awareness-raising commercials cannot inspire overnight changes to deeply engrained social practices, let alone cases of media addiction. Any addictions to guns and to shooting people are (fortunately) not as widespread as the addiction to videogames and shooting digital characters, and perhaps the psychological pull of the latter pails in comparison to the drives of text messaging and social networking. At the time of writing, smartphone-related distracted driving kills more people than do bullets in America. Reports indicate that distracted driving is statistically more dangerous than drinking and driving. According to the National Safety Council, one-fourth of all automotive car crashes (about 1.2 million) in 2010 “[were] the result of distracted driving” (“Annual Estimate”). Meanwhile, studies released in the fall of 2012 show that the percentage of American adults rose thirty-five percent since the Spring of 2011 (“Future of Mobile News”). Early legislative attempts to ban or regulate smartphone use while driving have failed to slow the steady increase of crashes, especially among teenage drivers—nearly half of whom admitted, in a 2012 NHTSA survey, they send texts and emails while driving (Halsey). Acknowledging the futility of legislative regulations and calls for mass self-discipline, software developer Erik Wood created an mobile app called “Otter,” which is designed to pull up customized, already-composed text messages in response to an incoming text; this feature minimizes the effort needed to send a reply—one chooses from a list of likely relevant responses, replying in one-click, rather than typing an entire message. Technological quasi-
solutions such as these represent the threshold of what is possible when conceptions of ubicomp platforms remain wedded to the PC era.

Beyond the PC-oriented models of mobile media, we need a new interpretation of ubicomp to help orient contemporary technical development, multimedia production, and cultural practices. The more recent turn to “locative media” or location-aware computing marks a productive step on the way to a more comprehensive framework. With the rise of geoinformation and the democratization of GPS over the past decade, scholars increasingly discuss mobile devices in terms of their evolving capabilities to help us locate places, attach digital data to particular locations, and trace the current position of users within location-based social networks. Several media critics, including Alice Crawford and Gerard Goggin, invoke Henri Lefebvre’s conception of space as a social production, along with Situationist practices such as detournement and derive, as theoretical resources for understanding the potential of locative media practices to reconstruct both our experience of everyday places and the arrangement of media on the Web. Whereas most early commercial iterations of location-based services were limited simply to consumer way-finding (e.g., helping tourists find the nearest Starbucks or ATM), Crawford and Goggin identify hopeful trends in “user-generated geomobile content that promises to…elaborat[e] ‘fields of care’ based on community, history, and individual stories about the places in which we live” (105). According to Adriana de Souza e Silva, location-based games and social networks, which track and share users’ geographical positions, “create a new way of moving through a city and interacting with other users” (“Hybrid Spaces” 262). De Souza e Silva claims that such networks and practices associated with mobile devices can be “regarded as interfaces of hybrid
spaces, promoting new types of social environments” (263). The nodes of the network (i.e., mobile users) wander through physical space, thereby attributing a level of importance to location, which in the early years of the Web was, by contrast, largely celebrated as an issue made irrelevant by the “cyberspace” of massive global networks (267). The difference, then, between mobile media and locative media—as interpretations of the ubicomp paradigm—is that locative media theories and practices hinge upon the intersection of digital media and physical locations, which is an affordance of mobile technologies, of course, but the anytime-anywhere connectivity driving conceptions of mobile media is, in locative frameworks, no longer the chief focal point orienting design, user experience, and critical reflection.

Acknowledging the marginal role of location during the Web’s first decade, compositionists Tim Lindgren and Derek Owens grant that “place and technology might be seen as conceptual realms occupying opposite ends of the spectrum” (196). Indeed, the history of composition scholarship exhibits a clear division between, one the one hand, place-based studies of writing pursued by scholars associated with ecocomposition, environmental rhetoric, cultural geography, and public writing; and, on the other hand, the work of scholars exploring the rhetorical and pedagogical import of various digital writing technologies. “What has yet to be fully explored,” write Lindgren and Owens, “is the fecund and, we would argue, now unavoidable relationship between place-based pedagogy and new media technologies providing mechanisms for the articulation, monitoring, and evolution of place” (196). In their 2007 essay titled “From Site to Screen, From Screen to Site,” Lindgren and Owens survey a range of “location-aware modes of composition” evident in community media projects based in several
American cities. Collectively, these projects showcase the potential for place-based writing pedagogy to integrate digital technologies into assignments designed to build local knowledge, cultivate environmental awareness, and strengthen existential ties to place. Locative media and the geospatial arrangement of the Web have transformed the relationship between place and technology, such that digital information and physical location—site and screen—co-construct one another. If the 1990s Web qua cyberspace endorsed a dualistic model in which digital worlds represented a virtual (as in fantastical) territory apart from the material realities, the geospatial Web resides on location as a virtual flow, which, in a Deleuzian sense of becoming, actualizes new potentials amidst already perceptible actualities (De Souza e Silva and Sutko 33). Now that online content can be organized and accessed on the basis of geographical coordinates, opportunities abound for local groups to initiate crowdsourcing projects in which members of a neighborhood or city contribute “geoannotations” that forge links between a place and locally curated media about that place qua news, narratives, histories, personal memories, etc. Ultimately, Lindgren and Owens’ point, similar to Crawford and Goggin, is that these community-based locative media projects model a promising trajectory for rhetoric and composition pedagogy amidst the ongoing development of ubicomp writing spaces.

Rita Raley’s “Mobile Media Poetics” extends the reflection on location into considerations of recent digital artworks. Most importantly, for our purposes, she provides a broad view of ways in which mobile media give way to locative media; below, I will suggest that the emphasis on location has begun to reveal limitations of its own, and that we need a new, more precise focal point to make better sense of contemporary
ubicomp development. Attempting to identify appearance of “the literary” amidst mobile communication, Raley moves from the anytime-anywhere quality of SMS-poetry toward participatory interfaces set in public spaces. While she seems to prioritize the latter, Raley insists that even poems and narratives delivered to mobile users on a global scale entail an environmental aesthetic, even when authors do not attach their work to any specific geographical locations. That is, the general ability to be in motion among places is a core dynamic underlying the reception of such works, such that they comprise a genre apart from the kinds of webtexts traditionally catalogued under headings like net art or electronic literature. Raley claims, “A live, albeit asynchronous, text [message] creates situations in which the chance meeting of text and reading environment would produce unexpected effects and affects” (3). Mobile media poetics emerge, singular and performative, through the ongoing interplay of the author’s written text and the reader’s lived environment.

In the case of public installations, artists create participatory interfaces, which in effect establish smart environments, as pedestrians with mobile devices contribute media to the installation’s display in real-time for all to experience and possible interact with. Generalizing from the artwork she examines, Raley observes that “digital poetics, like mobile media poetics, are tending toward multiple rather than single screens, live performances rather than private consumption, and crowds rather than the single reader” (4). This passage also appears as a citation near the end of Farman’s book, *Mobile Interface Theory*; in fact, Farman’s attention to what he calls “the convergence between public and private interfaces” (e.g., when mobile devices are used to project and/or access locative media) signals a similar progression, from PC-oriented mobile
media to ubicomp-inspired locative media, unfolding over the course of his book. His introduction strenuously qualifies smartphones as emblems of ubicomp; his conclusion acknowledges that many of the mobile media examples he covers “will be obsolete” soon, if not before the book’s publication (131). In spite of his privileging of mobile devices, much of Farman’s writing speaks to broader issues critical to ubicomp at large, especially his reflections on information landscapes, which I touch on below. That said, a critical distinction can be drawn from his study of mobile and locative media, as well as the related articles I have discussed above.

As I stated at the onset of Chapter 4, ubicomp platforms are mobile, locative, wearable, projected, embedded, and implanted. Transversal to each of these categories, the ultimate goal shaping Weiser’s vision was to develop forms of computing whereby people can engage with (or unconsciously be engaged by) computational media without having to disengage from whatever else the might be doing, without having to bracket the surrounding environment. Much of the recent scholarship on mobile and locative media appeals to the ubicomp paradigm only as a means to historicize the rise of smartphones, GPS navigators, and other recently widespread devices. One gets the impression that mobile and locative computing has succeeded ubicomp. And yet, after revisiting Weiser’s invention of ubicomp in the detail it deserves, we readily gather that the most popular iterations of mobile and locative media today have much more in common with the PC paradigm. The most common activities supported by anytime-anywhere connectivity (i.e., checking email, playing videogames, consuming news), as well as location-based services that merely announce users’ location to the Web (e.g., Foursquare), tend to reinforce the HCI models of PCs, even
as they vastly extend the reach of computing. On the other hand, the outliers of mobile and locative media—the technologies and practices that constitute smart environments (be they elaborate architectural installations or cloud-based ad hoc networks)—do resonate with the ubicomp paradigm. In such cases, mobile devices facilitate location-aware capabilities; for instance, one finds a video about the Jefferson Memorial by pointing one’s phone at the actual monument (or simply looking at it via AR glasses), rather than searching Google or YouTube in order to find the video.

Nevertheless, when we really push at this emphasis on location, we will find that it cannot bear much critical or creative weight. How does the fact that an image, a video, a song, or a website has been geotagged for random access at a given location become significant? If I make a geoannotation in a forest that no one inhabits, does it mean anything? Does it have any effect on the world? How many iterations of locative media today do people find compelling enough to engage with on a regular basis? I venture that any locative media projects which people do find compelling, such as those artworks and community practices acknowledged by multiple scholars, are compelling not because of their relation to physical location, but rather due to their relation to actions that may be occurring at a physical location. In other words, I am compelled to watch a video on the Jefferson Memorial because I am taking a tour or doing research—not because I am passing by the monument on my way to catch the bus. The technical phenomenon that the video is geotagged at the memorial site enables it to correspond with my actions there, but the significance accrues from relations between the multimedia and my actions—the sheer fact of the media’s location is necessary but not yet significant. Just as locative media has proven a more salient term than mobile
media for discussing post-desktop scenarios involving the conjunction of digital data and physical location (the significance of which, in any notable cases, implies a relation to embodied actions of some sort), a new term is needed to support invention and inquiry into an emerging wave of ubicomp development whereby media syncs with the real-time actions of a variety of actants, human and nonhuman. I propose a new term and framework for this class of media in Chapter 5. First, we still need to address another central theme that has defined scholarship on ubicomp across the arts and humanities disciplines.

The Space of Ubicomp

Tragically, Weiser died in 1999, at the age of forty-six. His work on ubicomp, however, has since become one of the most vital sources of inspiration guiding today’s leading researchers and inventors in computer science and interaction design. The global proliferation of smart mobile devices, recent advancements in smart infrastructure, and other ubicomp projects currently in development all stand as strong indicators that “many aspects of their vision [i.e., Weiser’s research team at PARC] have been realized, at least from a technological perspective” (Dourish and Bell 3). As indicated above, the recent commercialization of ubicomp qua smartphones has put it on the humanities’ cognitive map. But more work remains to be done, particularly in fields beyond computer science where scholars and non-academic professionals have just started to think seriously about the cultural implications of ubicomp.

Observing trends in computing and scholarship, Paul Dourish and Genevieve Bell reflect insightfully on the rhetorical life of ubicomp discourse and its ongoing circulation—from undercurrent to new wave—across a number of intellectual milieus:
[Ubicomp] has come to be broadly recognized in academic, commercial, and government settings worldwide as one of the key agendas for information technology research. And it has held sway, in a range of sites and guises, for more than twenty years. Influencing more than two generations of scholars, it has become a foundational story, a technomyth, in computer science and allied fields and as a result has shaped the kinds of technologies that have been made and also made possible. (3)

Of these ‘allied fields,’ architects and theorists concerned with the transformation of urban public spaces were the first to seize upon the transdisciplinary significance of ubicomp research. Their spatial meditations over the past decade constitute the most sustained line of inquiry connecting lab-based research and development with the conceptual resources of the arts and humanities disciplines. Indeed, one may claim, without hesitation, that the vast majority of humanities scholarship about ubicomp has been about ubicomp and space. Taking inventory of key texts in this area will prepare us for the task of theorizing scenarios in which media circulates across the writing spaces of ubicomp. Additionally, recent efforts to rethink spatiality and architectural practice in light of ubicomp will also serve as critical departure points for taking up pragmatic questions concerning writing, rhetoric, and multimedia production in similar contexts.

Malcolm McCullough’s 2004 book, *Digital Ground*, was the first major work to explain ubicomp (or pervasive computing) to a general humanities readership. More specifically, McCullough attempted to persuade architects, designers, and scholars that this emerging technocultural paradigm carries new challenges and new opportunities for built environments in the twenty-first century. In shaping the build environment, architects have always been privy to the ways in which materials frame and cue social action, or more generally, how physical structures “organize flows of people, resources, and ideas” (47). PC-based virtual worlds also organize informational flux, doing so via
an autonomous, computational logic that marginalizes the otherwise decisive impact of physical arrangements. Prior to ubicomp, architects engaged with digital media as a design and modeling tool, which, in spite of its utility, seemed to represent a new spatial order (i.e., bits) in opposition to both architectural and natural entities (i.e., atoms). While “previous paradigms of cyberspace threatened to dematerialize architecture,” the significance of ubicomp is that it promises to write this opposition under erasure (McCullough xiv).

In asserting the relevance of ubicomp to architecture, McCullough constantly recalls Weiser’s objective to bring the virtually of computation out into the physical world. Ubicomp adds a “digital layer” to the build environment, thus installing into architectural structures the operations and functions associated with computational interfaces (McCullough 47). Henceforth, architects must incorporate this pervasive digital layer as a spatial, structural variable in their design thinking. McCullough lists several technical components (e.g., microprocessor, sensors, actuators, tags) that support ubicomp’s model of situated computing. Each of these components establish different kinds of “connections occur[ring] between digital and physical infrastructures” (49). Sensors, for example, are embedded into physical environments in order to recognize any changes in the state of some dynamic variable. When enough sensors communicate with each other, the system becomes capable of “adaptable programmability,” which in the case of architecture, can lead to buildings that identify patterns (in traffic, weather, etc.) and reconfigure themselves—via actuators—in response to those patterns. Sensors detect action, which becomes written into the system as input to be interpreted by actuators, which then perform a programmed
action. One might say that sensing and actuating are the machinic equivalents of reading and writing. Furthermore, like sensors, tags link networked digital media to precise locations and to bodies in motion. QR codes and geotags render all manner of surfaces and places capable of “function[ing] as physical tokens in hybrid physical-digital systems” (81). Wearable tags in the form of ID badges, or RFID tags implanted in living pets or commercial products, can be tracked in order to determine the identity and location (current and past) of a variety of actants in real-time. The ‘physical-digital systems’ that each of these technical components constitute opens new relations between computers and architecture. By embedding computation into the build environment, architects can create structures that not only affect action and behavior, but also become affected by the variety of social, geographical, material, and discursive flows that traverse territories within the reach of a given sensor network. The real-time actions of actants, whose behavior may be more or less cued by a building’s arrangement, sends cues back to the building in turn, effectively altering some aspects of the building’s composition. Ultimately, the ubicomp technologies that support context-aware structures provide architects with more resources to gauge and design for “activities in context” and to cultivate “environmental knowing” among people who inhabit those structures (72). Determined to make the most of these ubicomp affordances, McCullough reframes architectural design around the following question: “Who is here and what are they doing?” (91). McCullough’s “topology of situated interactions” (places for thinking, places for negotiating, places for monitoring, etc.) outlines thirty ways of designing physical-digital systems optimized for commonplace modes of human activity, and can thus be read productively alongside the work of fellow
architect-critic Anna Klingmann. Departing from the modernist imperative to make form follow function, Klingmann calls for a paradigm shift in her field as she urges her colleagues “to expand the notion of architecture from the perfection of the object to the transformation of the subject” (9). At the intersection of ubicomp and architecture, the action of embodied subjects (or actants) and the composition of the architectural object (re)shape one another in real-time.

Whereas Digital Ground emphasizes the structural fluctuations potential to physical-digital systems and context-aware structures, Lev Manovich’s article 2002 “The Poetics of Augmented Space” explores a variety of cases in which digital data overlays physical space. Though the article is explicitly addressed to architects, Manovich gives much more attention than McCullough to the media (texts, images, sounds, etc.) that circulate amidst ubicomp-enhanced architecture. That is, Manovich’s interest in the convergence of digital data and physical space lies less in how computing can sense and actuate real-time structural changes to a building’s form, and more in how post-desktop platforms can foster new interactive modalities between digital images, text, audio, etc. and the physical entities that comprise architectural spaces.

First, Manovich explores the “phenomenological experience of being in a new augmented space,” in order to then formulate some initial principles to help orient artistic and architectural practices in the context of such spaces (“The Poetics of Augmented Space” 225). Most of Manovich’s examples call attention to television screens, embedded in public and commercial venues, that display multimedia to mobile viewers who navigate freely amidst physical entities. Such scenarios were, at the time of his writing, the most widespread manner of what is now commonly called “digital-
physical convergence.” Manovich was, however, keenly aware of the ubicomp research and development agendas driving technical invention in university and corporate labs. Indeed, confident in the vitality of these agendas (e.g., augmented reality, smart objects, wearable computing, sensor networks, etc.), Manovich predicted that, if the 1990s were anchored in PC cyberspace, then the coming decade(s) will be defined by the augmented space associated with mobile, post-desktop multimedia experiences. He extends the analogy further:

The previous icon of the computer era—the VR user traveling in virtual space—has been replaced by a new image: a person checking his or her email or making a phone call using a PDA/cell phone combo while at the airport, on the street, in a car, or any other actual existing space. (221)

Hence, ambient video displays and mobile computing both stand, for Manovich, as early indicators of a new paradigm in media and space, with which he aligns the more radical ubicomp experiments expected to emerge from research labs in the future. Following Manovich, theorists of media and culture have increasingly begun to consider the ways in which recent advancements across the ubicomp paradigm “make physical space into a data-space: extracting data from it (surveillance) or augmenting it with data (cellspace, computer displays)” (222). Before moving to consider a few of the spatial concepts that other scholars have since proposed—each of them similar to Manovich’s notion of augmented space—it is worth noting two examples Manovich discusses as aesthetic exemplars.

Of all the artistic precedents Manovich mentions, none do more to “demonstrate the aesthetic potential of layering new information [i.e., multimedia] over a physical space” than the audio walks of artist Janet Cardiff (226). Unlike, say, a basic audio tour designed to provide museum visitors with relevant art historical information as they view
paintings, Cardiff’s narratives guide people through uncontrolled spaces without any sort of fixed frame to stabilize the phenomena in question. Her objective is not merely to contextualize art objects, but rather to trigger aesthetic, contemplative experiences amidst more or less everyday settings. Commenting on Cardiff’s work, Manovich claims, “the virtual becomes a powerful force that reshapes the physical,” noting that the physical, in these cases, is dynamic and never totally shaped (227). That is, Cardiff exploits the (disjunctive) interplay between multimedia sensations and environmental sensations; one hears the audio she has programmed (in the past) while seeing whatever visual phenomena occupies or traverses the environment at that moment (in the present). A founding principle for a poetics of augmented space, then, is to design multimedia at the level of live, spatial experience amidst specific physical places. Manovich’s other privileged example, architect Rem Koolhaus’ Prada store in New York, incorporates multimedia displays into the very fabric of the designed retail space. In contrast to Cardiff’s walks, the store exhibits a different virtual-physical dynamic whereby the audiovisual advertisements and the materiality of the clothes coalesce into a sort of general equivalence:

By positioning screens showing moving images right next to clothes, the designers ironically refer to what everybody today already knows: we buy objects not for themselves but in order to emulate the specific images and narratives that are presented by the advertisements of these objects. (235)

Premised on the ability to design both the physical space and the digital data, Koolhaus’ building suggests similar opportunities available to cultural institutions that manage curated spaces for visitors to inhabit.

Between Cardiff’s audio walks and Koolhaus’ store, Manovich implies a spectrum in his poetics between solo-authored projects and large-scale collective ones, which
typically involve more resources. Opportunities for rhetorical and aesthetic in(ter)vention abound at both ends of this spectrum. In either case, multimedia production has vital roles to play in the convergence of architecture and computing. Moreover, Manovich encourages critics to theorize points of interplay between the spatial dimensions of public cultural venues such as museums and the physical-digital interaction modalities at play in “some of the most amazing art of our time” (236). In other words, we might strive to understand artistic experiments with ubicomp platforms as incubators of avant-garde interaction modalities ripe for development or appropriation by cultural, civic, and educational institutions looking to engage ubicomp in their rhetorical or communicative endeavors.

Since the emergence of mobile computing, communication researcher Adriana de Souza e Silva has played a leading role in scholarly efforts to describe the meeting of digital, networked media and physical places. In de Souza e Silva’s work, this meeting is depicted in terms of convergence. She employs the notion of a hybrid space, which, transversal to the opposition of a physical real and digital imaginary, “conceptually merges the physical and the digital” (“Hybrid” 181, my emphasis). In bringing the Web out of doors and into public social space, mobile interfaces “create a more dynamic relationship with the Internet” (262). Always connected, even on the go, mobile users inhabit a third dimension of spatial experience—hybrid space—wherein remote (digital) contexts become accessible inside the present (physical) context (262). De Souza e Silva defines hybrid space and hybrid reality in contrast to augmented space and augmented reality, which she claims do not deal adequately with communication and social interaction. In other words, what she calls hybrid space does
not begin to emerge as a critical category until we account for its social production whenever people use mobile interfaces in public to access spatially remote contexts. De Souza e Silva maintains that the quasi-telepresence supported by mobile devices differs from comparable affordances of twentieth century electronic media: “the difference with mobile technologies is precisely the possibility of moving through space while interacting with others who are both remote and in the same contiguous space via one’s relative location to other users” (269). The experience of hybrid space—the impression of digital-physical convergence—is rooted in embodied acts of communication; borders between the digital and the physical dissolve only when people connected to distant contexts via mobile interfaces amidst public social space—“hybrid space is not constructed by technology” in and of itself (de Souza e Silva 265).

Interaction designer Jan Rod echoes de Souza e Silva’s claim that meaningful distinctions between the digital and the physical, or the virtual and the real, no longer hold critical value in the face of recent ubicomp developments. Writing in 2009, Rod focuses on the proliferation of smart objects as a key site of hybridity. In addition to digital-physical convergence, he explains that smart objects—things installed with computing power—suggest a broad erasure of the subject/object dualism, on which user-centered perspectives on design and HCI have been based since at least the 1980s. User-centered frameworks align with a basic anthropocentric habit of Western metaphysics: to prioritize humans as thinking subjects in opposition to things as passive objects. (Eric Havelock argues that this crucial distinction owes its conceptual existence to the grammatological basis of alphabetic writing, as well as to the Plutonic development of literacy.) Rod believes that familiar user-centered approaches do not
account for the fact that “subjectivity is being subsumed into objects and creates hybrid entities that break out of these dualistic categories” (3). Equipped with networked sensors and actuators, smart objects “relate to us through...mediated symbolic interactions, something we think of as being exclusive to humans” (Rod 3). With the introduction of smart objects, ubicomp’s technological disruption of the subject/object opposition coincides with new materialist ontologies, which profess the vibrancy and agency of all inorganic matter, as well as the ways in which human minds and bodies are material assemblages.

In light of this new techn(ont)ology, Rod proposes a fundamental shift in design thinking, which he addresses to the HCI community. Rod offers the term “animate environments” as a challenge and an alternative to user-centered design, which too often treats things and places as mere props and inert backgrounds for human activity. This animate environments framework takes the complexity of dynamic ecological relations as the departure point for design; in doing so, Rod hopes technologists will “concentrate on thinking about the flow, that is happening between both human and non-human elements, as well as between the environments and their elements and finally between environments themselves” (4). In ubicomp-saturated animate environments, practically any actant (e.g., bodies in motion, inorganic matter, atmospheric effects) can impact the computational operations regulate a system’s multimedia production and circulation, and also programmed reactions to perform structural modifications any networked materials. Rod refers to experimental interactive design projects in technologists equip animals with wearable sensors, which gather data and produce digital visualizations. Hence, animals’ movements perform or at least
become translated into semiotic values, and the media they “produce” carries a potential to influence social action. For instance, in one of the projects called Fish Communication, underwater sensors created an interface that visualized the movements of otherwise imperceptible fish; upon realizing this, some people tossed food in the water, toward the real-time traces of the fish’s movement.

Focusing primarily on mobile devices, Jason Farman contends that the site-specific affordances of the locative media create new conditions in which landscapes can now act as information landscapes. Whereas Rod comments about smart objects focus largely on things installed with computing power during the manufacturing process, Farman discusses various techniques by which people may create ad hoc links among physical surfaces, geographically locations, and digital media. For example, the placement of QR codes onto the surface of a material entity effectively creates a mobile-accessible link between that thing and a selected website or multimedia file. Physical environments can thus be approach as sensory assets and navigation schemes for mobile Web design or any other endeavor of information architecture. Location-based social networks incorporate people’s real-time locations into their online status, transforming geography from an optional, contingent variable into a central piece of data that the app constantly tracks in order to orient the presentation of information to the user and to transcribe information about that user to other users on the network, whose identities are also geo-spatially discerned. Furthermore, augmented reality apps—particularly those that work in conjunction with geotagged data—establish a context-aware mode of computing, whereby digital/networked media becomes triggered by and experienced in the same semiotic
frame as the particular landscapes which a developer has programmed that media to inhabit. As such, augmented reality—sometimes invoked as a paradigm unto itself—supports medial interfaces that operate much differently than virtual reality platforms conventional to the PC era.

Farman, after surveying these and other mobile interfaces on the horizon, predicts that “emerging generations [will] no longer prioritize between material space and digital space since these spaces will simultaneously inform our experience of implacement” (42). He points to mature examples of digital-physical convergence already underway with the construction of the N Building in Tokyo and MIT’s SixthSense technology. With every window designed as a functional QR code, the N Building’s facade doubles as a 24-story information interface that connects mobile users to URLs, AR content, social media feeds—all of which stream (real-time) information about the shops in the building and status updates from people (employees and shoppers alike) currently inside the shops. SixthSense, a much celebrated prototype at the time of writing, “is a gesture-based mobile technology that is worn around the neck...pictures [and other media files] can then be projected onto any surface and interactive with [via gesture commands]” (56). With SixthSense, as with an augmented building, almost any landscape or physical entity (including human bodies in motion) can be made to serve as a computational screen and a surface of inscription—an interface for digital reading and writing. QR codes link multimedia to physical entities, Sixthsense projects multimedia onto physical entities, and augmented reality apps are capable of both projection and linking.

All of these linking and projection capabilities lead Farman to emphasize the
potential roles that digital-physical interfaces might play in the contextualization of places. He reminds us that landscapes, especially in urban areas, have always been blanketed with texts and images in the form of street signs, graffiti, statues, billboards, and so on (44). In addition to launching “an altogether different embodied experience,” digital information landscapes and the user-driven, bottom-up models of indexation and data management that often characterize them collectively re-sensitize us to Derridean observation that context is never stable, certain, or even determinable—a realization that perhaps evades print cultures and the text/context distinction fundamental to most rhetorical traditions. And so, even though digital culture is just starting to explore the unique scenarios afforded by ubiquitous computing and “our interactions with the landscape as an information interface is still in its infancy,” Farman shows that all of the rhetorical and aesthetic activity contributing to the digital-physical convergence carries with it a potentially significant sphere of influence impacting the everyday social-ontological processes by which spaces become places and locations become locales (53).

Researching urban living and digital aesthetics, Christian Ulrik Andersen and Søren Pold describe ubicomp as process of transcoding, whereby digital writing and computer programs migrate from desktops to everyday urban settings. Highlighting the “written, coded quality of ubicomp,” they align the paradigm with several public-discursive traditions quintessential to the rise of modern cities such as street signs, advertising, and graffiti (110). In recalling such practices, Andersen and Pold locate the uniqueness of ubicomp elsewhere than Farman’s emphasis on implanation. For Andersen and Pold, what distinguishes ubicomp from these other practices is the
former’s introduction of algorithmic scripts to urban spaces; hence their term for ubicomp’s spatial quality: scripted space. In other words, modern cities have long been laced with texts, images, and audiovisual electronics; that this media and other parts of the street-level infrastructure can be managed through computation is a recent phenomenon.

Electric traffic lights provide an important albeit mundane example of the evolution of infrastructural media over the twentieth century. Invented in 1914, the first electric traffic lights were wired to switches that city employees operated manually from a control booth (“First Electric Traffic Signal”). Major cities began to computerize their traffic lights during the 1960s, and we have since witnessed a gradual transition from automated programs of “fixed-time signals” (e.g., timers that switch lights at regular intervals, sometimes in sync with nearby lights) to adaptive programmability of “semi-actuated signals” (e.g., sensor networks that switch lights via detecting the presence of vehicles and pedestrians) (“Toronto Traffic FAQ”). As we traverse scripted spaces, such as high-traffic intersections, we are experiencing the execution of computer scripts. Traffic light systems are visual media, situated at and responsive to crucial scenes of decision; at present, they constitute one of the most successful ways in which ubicomp has been integrated into the rhythms of everyday life, for the sake of enhancement. The system is very simple, of course. A column of three colors arbitrates the flow of traffic, effecting patterns of social organization that almost never emerge spontaneously when drivers are left to their own devices. Traffic lights, emblematic of other mediums of scripted space, have been and remain a top-down, state-controlled production. The spread and democratization of ubicomp, however, enables the bottom-up production of
scripted spaces. One can create media for ubicomp platforms—well beyond simple traffic lights—that resides at important scenes of decision and action, with the aim to effect new patterns of social becoming.

As Andersen and Pold suggest, rhetorical and aesthetic enterprises of this sort are precisely what need to be undertaken in urban spaces. Despite ubicomp’s capacity to support scripted spaces, Andersen and Pold observe that much of the computing people actually do in public—while moving among one another—remains personal or “predominantly exclusive” (121). That is, engaging with mobile devices qua PCs, people move through scripted spaces as if they were “a setting for individual performative activities,” and tend to neglect their potential as “a space for debate and knowledge dissemination” (121). Digital participation in the former sense typically (though not always) competes with our ability to engage with the activities of the actants that surround us. Whereas embedded traffic lights prevent accidents, mobile text messaging contributes to them at an alarming rate. Rather than linking primarily to information pertaining to various remote contexts, a collectively engaged scripted space would harbor digital links that reaffirm and revitalize the urban space as a “basis of social encounter, communication, and debate” (121). While people often read and add to the blogosphere and other virtual agoras as they inhabit an urban setting, Andersen and Pold claim “there has been little effort to actively promote the urban setting as a context for active participation” (121). To do so requires us to invent “new forms of digital civic participation” while also creating “new ways of developing cultural interfaces in scripted spaces” (Andersen and Pold 121). In sum, the technical fact of bringing the virtuality of computation out into the physical world is not in-itself sufficient for creating a culture in
which digital media become integrated with—for the sake of enriching—the extra-computational fluxes of everyday life, or what Weiser called ‘the infinite richness of the universe.’

**Beyond Digital-Physical Convergence**

Several insights can be drawn from these spatial inquiries, and thus serve as cardinal points orienting the formation of a new conception of media in the age of ubicomp, beyond the limitations associated with terms like mobile media and locative media. Perhaps most importantly, theorists from Manovich to Farman clearly show how vital the architectural circulation of digital writing and multimedia will be to the increasingly sophisticated information landscapes that organize social flows, particularly in urban settings. As popular computing continues to shift toward the ubicomp paradigm, digital creatives must face up to new opportunities and new challenges. By all recent accounts, the discursive space of ubicomp differs from the model of cyberspace through which we have traditionally understood the Web. Environments can no longer be regarded as stable contexts or backdrops for personal computing; landscapes and cityscapes become navigational schema and sensory assets that play crucial rhetorical or aesthetic roles within the new writing spaces ubicomp founds. The domain of public writing that has always organized social flows is now open to ad hoc, bottom-up production and indexation.

Early architectural engagements with ubicomp prove instructive for thinking about post-desktop futures of multimedia. Like ubicomp infused buildings, media texts become increasingly “context-aware” in that they can be affected and even produced by a variety of otherwise non-discursive flows within the reach of a given sensor network. A key objective in designing and writing for ubicomp platforms is to cultivate
environmental knowing or aesthetic events by targeting experience economies specific to certain situated actions. Nevertheless, ubicomp breaks from restricted economies (instrumentalist and anthropocentric) of human experience implicit in the PC paradigm’s construction of users.

The image of the user—a person staring intently at an isolated electronic box, either desktop or mobile, consciously imputing data via mouse, keyboard, or touch screen—is no longer the exclusive (let alone central) focal point in ubicomp design processes. Beyond user-centered models ofHCI, contemporary ubicomp development broadens the scope of computing to emphasize the relations and alliances accruing in real-time among ‘loosely bound actants.’ The human user becomes rethought as an actant among other actants, each of which supply movement or behavior to be sensed, actuated, and, in effect, translated into digital writing (i.e., networked *gramme*) that initiates media effects, structural/architectural changes, or programmable reactions.

Furthermore, we cannot address the social experience of augmented-, hybrid-, and scripted space without accounting for their grammatological constitution of (by) mnemotechnics (techniques and technologies of tertiary retention). While the spatial theories outlined above touch upon computational operations and multimedia production, they do so only to the extent that these technologies and techniques reconfigure social space. In other words, while scholars congeal around the idea that ubicomp produces a new kind of space, very little work attends to the grammatological constitution of ubicomp interfaces, and even less addresses the question of how to produce multimedia for the writing spaces of ubicomp. Instead, transformative instances of writing and technology are gathered as a kind of obligatory scaffolding that is useful
for making claims about space, as if spatiality was the more fundamental issue. From the standpoint of grammatization, ubicomp is not primarily a spatial phenomenon that carries secondary impacts for “the type of interaction” or communicative relationships potential to a space. The space of ubicomp is founded by the post-desktop migration of writing and programming. Andersen and Pold’s attention to the role of scripts raises a key premise that writing theorists have invoked for decades: space (and time) are grammatological productions. Instead of leaping toward general propositions about space—professing convergence, augmentation, and hybridity—media theorists might, in keeping with Stiegler’s notion of originary technicity, focus first on the process of grammatization that underwrites this range of spatial impressions.

Understanding the space of ubicomp requires us to think of (by) contemporary technics; critics’ urgent calls for new conceptual models and cultural categories should be responded to on a grammatological basis. Before taking up such calls, however, one must take note of a basic conceptual flaw they share with (or inherit from) all of the above spatial theories; namely, I wish to problematize their tendency to frame ubicomp platforms in terms of a general merger, coalescence, or convergence between the digital and the physical. For example, the highly innovative MIT architect Carlo Ratti issues a call in this fashion: “today we need to find new ways to make sense of the increasing wealth of digital data layered over top of physical space—of bits layered on the top of atoms” (“Architecture that Senses”). Recall McCullough’s discussion of ‘physical-digital systems,’ Manovich’s statements about digital data being extracted from and delivered to mobile users in physical spaces, and de Souza e Silva, Rod, and Farman’s respective theses concerning the blurring of borders between digital and
physical spaces. Of course, each of these digital-physical assertions could be traced to Mark Weiser’s often quoted ambition to bring the virtuality of computation ‘out into the physical world.’ The critical tendency to characterize ubicomp in terms of a homogenous convergence of digital and physical space rests on a blatant contradiction—and these theorists are themselves no doubt aware of it.

Each of their insights catalogued at the start of this section can be strained away from logic of digital-physical convergence, and be reframed to constitute the basis of a new position relative to ubicomp. In order to formulate that new approach; however, we can no longer resort to appeals professing a reconciliation of the digital and the physical. Ultimately, the problem with these reconciled binary approaches to ubicomp is that critics and scholars who invoke them seem to equate the mere acknowledgement of conceptual limitations with their transcendence. Nowhere is this tendency more evident than in Nathan Jurgenson’s 2012 article “When Atoms Meet Bits” (which features a section titled “Digital Dualism versus Augmented Reality”). With the term “digital dualism,” Jurgenson pinpoints a critical fallacy that highlights the weakness of much media theory, especially with regards to the question of the interface in ubicomp contexts.

Basically, Jurgenson accuses critics of engaging in digital dualism whenever their work hinges upon an explicit or implicit opposition between digital or virtual spaces and the physical or real spaces. So-called digital worlds and virtual realities have always owed their every pixel to the inorganic matter that technologists have organized into the hardware, satellites, and other infrastructure supportive of networked computing. The digital is not immaterial, even though the form of the hardware often reveals little about
the function of the software. Electronics bears serious material consequences, which, while this may be painfully obvious with phenomenon like e-waste, often elided the early adopters of cyberspace who quickly acclaimed the Web as new frontier cut off from earthly realities. Prior to Jurgenson’s formulation of digital dualism, Bernard Stiegler, in *Technics and Time Vol 3*, proved to be an early rejecter of the notion of cyberspace that many commentators still use to distinguish online activity and digital venues as a world apart from Earthly, material existence. Moreover, as Stiegler suggests, the phantasmal separation of digitality and materiality has become even more flagrant with the recent spread of geoinformatics and systems driven by geo-referential databases. In such cases, materiality is not only a technological support; geotagged locations and GPS-tracked entities actually orient the production and presentation of digital data.

Jurgenson’s article also attacks the idea that what happens in so-called cyberspace stays in cyberspace, or that digital activity occurs in a vacuum. Even the most apparently benign videogames can influence the way we apprehend and act in “real world” situations. Email brought on a dramatic decline in postal mail, and cell phones have done the same for home telephones. Jurgenson ultimately argues that social networks, search engines, blogs, and other venues are no less real for being online. He cites numerous crowdsourcing protests and other digitally planned “offline” events as clear examples of how Internet activity regularly informs and organizes our social existence, to such a degree that it is becoming more and more absurd to speak of cyberspace or of the real world as if those spaces were neatly sealed off from one another.
Instead of digital dualism, Jurgenson contends that the nature of reality in digital cultures should be rethought as augmented reality. For Jurgenson, the term “augmented reality” signifies a conceptual framework that “view[s] on and offline as enmeshed” (88). Referencing augmented reality (AR) mobile apps that “layer the digital and physical together,” he notes that his usage of the term means to indicate a general transcoding of the synthesis that AR technologies perform. In other words, the suggestion is that we experience digital-physical convergence not only when using AR apps, but also whenever and wherever social media and the mobile Web shape, impact, or alter events. AR technologies, in fact, play no evident role in his assessment, and this glaring absence suggests a limitation of his work. For hasn’t “reality” always already been “augmented” in this sense? Jurgenson’s discussion of the ways in which the digital and the physical intersect and influence social interaction could just as easily be referencing print or even manuscript culture. That Twitter helped spur on political revolutions would hardly surprise the Colonial readers of Thomas Pain’s Common Sense, many of whom were themselves inspired to fight in a war that was fought and won in no small part thanks to the revolutionaries’ revolutionary use of communication technologies. Furthermore, while Jurgenson’s arguments against digital dualism are timely and helpful in identifying several popular critics’ questionable assumptions, the theoretical solution he pursues with his notion of augmented reality seems redundant in the context of contemporary technogenesis and originary technicity. Rather than theorizing the specific interactive modalities that constitute meetings between atoms and bits, he merely cites cases of “augmented revolutions” (i.e., protested organized via social/mobile media) as a collective example in favor of a theory that pre-dates this
technological unfolding. The more original task for media theory with regards to ubicomp is to ask after the specific interactive modalities now orienting the technocultural paradigm shift toward ubicomp. Such questions involve thinking more in terms of grammatization, and not merely in terms of convergence. If we take digital dualism seriously, then we must abandon the “reconciled binary” constructions through which so many media theorists’ describe ubicomp: digital-physical, physical-digital, physical-virtual, etc.

While I agree with the high degree of importance that Jurgenson and other theorists each place on the relations between digital media and physical places in their analyses of mobile interfaces, I object to their notion that these relations can be categorized simply as a merger that founds a new “third” spatial continuity. In conceiving of digital-physical milieus as hybrid spaces, media theorists and practitioners often conclude that ubicomp platforms “blur [the] borders between physical and digital spaces” (de Souza e Silva 274). By contrast, conceptualizing ubicomp platforms with regard to their constitutive processes of grammatization leads us to construct a very different model. One asks what flux(es) become broken down into systems or networks of grammme, rather than assuming homogenous convergence. Alphabetic grammatization was not a matter of speech converging with writing; the written alphabet broke down the flux of spoken language into a system of grammme that never existed in oral socities. In creating this new system of grammme, alphabetic grammatization transformed the flux of speech, by disorienting one’s relationship to language.

As a process of grammatization, ubicomp is reorienting our relationships to computing and multimedia. Imagined in this way, the digital and the physical each
comprise their own respective fluxes, which never converge to form a unified flow. Instead of founding a homogenous third space, the digital and the physical continually break down each other, conceptually if not syntactically, such that the digital flux of the Web, for instance, becomes modular and iterable across the physical flux of, say, a street corner. All of the material, dynamic variables that make up the physical flux of the street corner at a given moment thus act as a surface of inscription for discreet bits of digital data; however, each constituent of the physical flux retains its capacity to act as a continuity autonomous from whatever digital media might be layered over that particular location. Further still, the flux of the physical can be broken down into discreet and traceable points of information, which in turn may function to geo-organize the Web or to trigger the presentation of digital data on a geographical basis. The breakdown of the digital flux, in such cases, is conditioned by the breakdown of physical flux and the real-time movement of various human and non-human actants.

I sketch these convoluted, abstract scenarios not as proof in support of conclusions, but as swift indications that a rigorous account of so-called digital-physical relations is needed. In particular, we need approaches that challenge the tendency of recent scholarship to congeal around discussions of spatiality that often neglect the grammatological operations that underwrite the production of ubicomp space. In order to think critically—but also productively—about the impact of digital, networked media amidst everyday, physical spaces; we need to reflect further on the emerging interactive modalities that constitute “digital-physical convergence.” For that matter, the more we examine these interactive modalities in light of other historical grammatization processes, the more prepared we may be to comment on their contemporary social and
ontological impacts, and to formulate rhetorical and aesthetic principles for multimedia production designed to circulate across ubicomp platforms.

Finally, the field needs to establish critical distance from leading scholars’ habitual dependence on digital-physical assertions. If we agree that categorical distinctions between the digital and the physical are fundamentally misguided, then why do we continue to perpetuate this opposition (albeit in hyphenated forms) in terminology intended to signal alternative positions? Hybridity, convergence, and augmentation always refer back to the oppositions from which these terms are supposed to get beyond. Hybridity and convergence denote the fusion of two (sometimes more) previously distinct species, flows, or substances. While some apparent truth-value may accrue in critical descriptions that account for mobile and ubiquitous computing in terms of the mergers such systems instantiate between digital spaces and physical spaces, this framework still plays off of the assumption that the digital and the physical are two distinct domains. Of course, the brightest critics who work with/in these terms acknowledge that the digital is thoroughly material, and that digital media can only be experienced and engaged with in some physical space. In other words, desktops have always occupied certain locations; computer labs and Wi-Fi venues have always existed as physical spaces permeated by digital media. Places where mainframe and PC computing occur are no less augmented spaces. Indeed, if we take the idea of originary technicity seriously, we might claim that all the spaces of human civilization have always been augmented spaces, and that any realities associated with human existence have always already been augmented qua the history of supplements. Humans only emerged through merging or converging with technics. Humanity is inescapably hybrid.
If we acknowledge digital dualism as a critical fallacy, and if we understand techno-human relations according to originary technicity, then the descriptors of ubicomp’s spatiality—augmented space, hybrid space, scripted space, digital-physical convergence, and augmented reality—become empty, floating signifiers. While no term is ever perfect, these terms are hardly adequate. As I have indicated, nearly all of the scholarly explications of these terms rely on constructions that pair the digital and the physical, in order to indicate a continuum or merger between the two realms, effectively signifying by means of the very opposition supposed to be supplanted or obsolesced by the phenomenon in question. In other words, whenever critics appeal to concepts like hybridity or augmentation to name the kind of space that emerges in the wake of so-called digital-physical convergence, they inevitable reinforce the categories of an ontology that divides nature from culture, technology from society, media from materiality, and supplements from subjectivity. One could argue that it is precisely this quality that makes such terms useful, at least during the technocultural transitional from PCs to ubicomp. Articulating the new phenomenon through a paradoxical reconciliation of an established binary opposition at least calls attention to the phenomenon’s disruptive force. In showcasing disruption, however, the reconciled binary puts its own conceptual limits on display as it retains a long list of inherent contradictions. Digital-physical assertions derive their signification by referring to the very opposition/ontology they mean to critique; thus, the reconciled binary overcomes nothing—it is a transitional vocabulary—not a framework for conceptualizing or composing media specific to the technocultural conditions of ubicomp. At best, the reconciled binary is a discursive placeholder, beckoning the invention of a new term.
Not only is the heralded meeting (e.g., merger, convergence) of the digital and physical premised upon the problematic assumption that they were once separate, even opposed spheres; more to the point, the sheer correspondence digitality and physicality—to entertain this reconciled binary for just a moment—is in itself an utterly uninteresting phenomenon. Similar to conceptions of mobile media and locative media, what lends significance to indications of digital-physical fusion in scholarship and popular discourse is that such statements often pertain to media practices in urban environments and public settings. Why is the alleged merging of digital spaces and physical spaces most significant in these contexts? It is in these cases where computing syncs most profoundly with action, and where the ubicomp paradigm founds interaction modalities through which actants may productively engage with (e.g. consume and/or produce) multimedia without disengaging from whatever else they might be doing.
CHAPTER 5
ACTIONABLE MEDIA: FROM WIMP TO ATLAS

There is an undeniable relationship between technical invention in computer science and rhetorical invention in media theory. Concepts such as mobile media and locative media are interpretations of post-desktop innovations; artists and humanities scholars discussing derive from computing discourse, often with the hope that their aesthetic and critical insight will influence our cultural understanding of new technologies, help shape new digital practices across society, and, in turn, perhaps inspire new directions for future technical invention. Points of intersection between media and computing are, according to Lev Manovich, precisely what constitutes “new media.” For Manovich, new media emerges as a bonafide technoculture field when the “two separate historical trajectories [i.e., media and computing] finally meet…graphics, moving images, sounds, shapes, spaces, and texts become computable, that is, simply sets of computer data” (*Language of New Media* 25). Manovich’s foundational work in new media studies is exemplary for its capacity to negotiate between histories of media and computing.

When writing about new media, Manovich often includes specific examples depicting the platforms and gadgets of the day, but he always offers conceptual and historical insights beyond these media-specific analyses. His ultimate focus is on the database as a symbolic form, or the poetics of augmented space—not an isolated operation in Final Cut Pro or a bit of videogame code, though these serve as examples or grounds for his theoretical work. He appropriates and abstracts from technical-industrial buzz words—the terminology of computer science and tech promotions—to develop aspects of this language that aptly signify broad cultural impacts that circulate
beyond the websites, videogames, or devices that nevertheless support (our recognition of) the emergence of major cultural shifts. On one hand, it makes little sense to couch critical framework in industrial-technical vocabularies, for such terms usually to bear a relatively short shelf life no matter how much buzz they create at the peak of their hype. On the other hand, new media theory should still be recognizable as being part of current conversations about emerging technologies. It is not as if theorists are referencing some other world apart from the technologies that fill many our lives. The strategy for negotiating this dilemma is to choose words from popular technology discourse that evoke concrete associations with an array of specific media—words that create conductive, contingent links between actual devices without succumbing to a hyper-media-specificity that effectively reduces one’s commentary about a medium to the planned obsolescence of a specific instance, iteration, or content of that medium.

Since the industrial revolution, societies of permanent innovation have altered the historical course of technical and scientific invention. Invention in the technical system has come to outpace innovation in other social systems, such as law, government, and education; the current speed of technological change overdetermines the conditions under which all the other social systems must adopt the advancements of the technical system. The computer revolution continues to intensify this rift, as industrial production gets rerouted toward the production of tertiary retentions—technical systems that archive individual and collective memory. The rapid innovation of digital networks increasingly disorients and scrambles the traditions, conventions, and practices that have defined national institutions during previous centuries. Bernard Stiegler associates this disorientation most fundamentally with the current upheaval of temporal and spatial
conventions, which he calls systems of calendarity (time) and cardinality (space). As computing becomes more ubiquitous, global networks introduce a new world order that require[s] the digital electronic industries to produce new techniques to assist with orientation. These techniques are needed to help us navigate, no longer through past experience handed down by history, but through the real time of information events that occur on this planet, by the hundreds of millions, with every second that passes. (Stiegler “Our Ailing Educational Institutions”)

Relatively stable until the 19th century, the communication technologies or “mnemotechnologies”—which have traditionally been heart of the religious or educational apparatus—are now under the sway of industrialization. In fact, Stiegler insists that the industrial production of tertiary retentions and mnemotechnologies are the “decisive element” of globalization (Technics and Time 3, 134). Industrial programming manufactures digital devices and networks, ultimately creating a situation where “the flux of consciousness [is] inscribed into the process of adoption,” and mnemotechnologies “integrat[e] calendarity and cardinality, which constitute the primordial interlinking elements of societies” (“Our Ailing Educational Institutions”). That is, the industrialization of mnemotechnologies installs mnemotechniques—'new techniques to assist with orientation’—into the devices and software that hit the market.

Whereas schools used to be the institution tasked with teaching citizens about the technics of calendarity and cardinality, the spatiotemporal conditions of the new retentional systems displace these educational programs. And since the programming industries control the process of adoption, educational institutions—like other social systems—appear ill-equipped to adjust their programs to permanent technical innovation. Not without lament, Stiegler proclaims the “global commodification of education”:
The international programming industries are gradually replacing national educational systems and their national institutional programmes which, as a result, no longer seem compatible with the transmission imperatives defined by the planetary industrial and mnemotechnical system. ("Our Ailing Educational Institutions")

At issue here is not simply the (in)ability of educators to "teach with technology." Rather, Stiegler is drawing critical attention to the fact that technical inventions managed by the programming industries largely determine the ‘transmission imperatives’ and the paradigm of use relegating the dominant cultural functioning of new technologies.

Educational, cultural, and civic institutions must, therefore, find ways address to this maladjustment (or misalignment), which as Stiegler indicates, has been a recurring challenge for social systems in times of apparatus shift (i.e., revolutionary periods initiated by intense technological change).

**Introducing Actionable Media**

While it could pass as a merely academic pastime among theorists, the quest to formulate new paradigms of media, relative to recent shifts in computing, issues from the urgent social and political dilemmas that Stiegler outlines. Likewise, Johanna Drucker calls for digital humanities scholars to raid their own disciplinary traditions for terminology to describe contemporary interfaces and media effects. Whereas Stiegler recoils from the consumerism and general proletarianization he associates with "designed usages" prescribed by the programming industries, Drucker despises the limitations she finds in the engineering-centric discourse on interface design and studies of human and computer interaction, which obsess over maximizing efficiency and eliminating ambiguity:

This language does not come from a theory of interface, but from a platform of principles in the software industry. Deliberately mechanistic, it eliminates the very element crucial to humanities work—substituting the idea of a
‘user’ for that of a ‘subject’ whose engagement with interface in a digital world could be modeled on the insights gained in the critical study of the subject in literary, media, and visual studies. (1)

Humanities approaches to interface theory would, in addition to closing “the distance between the interface design community and that concerned with critical theory,” also intervene in systems of calendarity and cardinality, and formulate alternative techniques for orienting amidst the industrial production of tertiary retentions and transmission imperatives (Drucker 12). The problem with many of the humanistic conceptions of ubicomp interfaces, as we saw in Chapter 4, is that they deal with media-specific features of ubicomp (e.g., mobility, geoinformation, digital-physical convergence) rather than the full scope of its revolutionary potential as a new technocultural paradigm. Moreover, existing humanities scholarship on ubicomp has all but neglected the question of what this moment means from the standpoint of multimedia production. As a result, critical media studies and digital rhetoric remain maladjusted to current ubicomp developments. Theorists tend to discuss post-desktop mediascapes in terms of models and metaphors inherited from the PC era; digital artists and designers have only began to search for new aesthetic principles suited to their experiments with context-aware technologies. In sum, current and near-future technical invention in computing has found its definitive agenda in ubicomp, and conceptual development across humanities disciplines concerned with new media is lagging behind, maladjusted.

Hence, I propose a new concept—a new critical/creative framework—on the heels of Mark Weiser’s groundbreaking work. From Weiser to present-day leading technologists, computing has become increasingly synchronized with real-time actions; as such, ubicomp beckons media designed to sync with action, as well as new media theories that reflect and speculate about this crucial capacity. Drawing on the military
phrase “actionable intelligence,” actionable media describes the compelling ways multimedia can be created to hinge upon what we are doing while we are doing it. In this emerging paradigm, multimedia accrues at and becomes delivered to the periphery of situated actions, rather than—or at least in addition to—the virtual reality of the Web. There is no longer a fundamental split between the actions required to engage computation and the more conventional actions that people engage in while doing other tasks at work, home, and other everyday environments. One interacts with computation while doing something else, and so media must become a part of what is happening around us, becoming informed by and informing, affected by and affecting, dynamic environmental variables in real-time. Actionable media assumes that computing operates to reinforce, record, or otherwise aid one’s relations with extra-computational matter and events. Among such conditions, which critics sometimes call “natural user interaction,” we hardly distinguishes input mechanics from the broader vocabulary of everyday gestures; designing and navigating ubicomp mediascapes suggests an affinity with the ways we inhabit and interact with landscapes or cityscapes.

Actionable media, in this sense, pertains to the situations of ubicomp emerging at the margins of social media and mobile media, and the critical discussions that center around those terms. Social media calls to mind the vast array of Web 2.0 platforms, epitomized by Facebook and Twitter, which establish digital networks in which every “receiver” can also act as a “sender.” Of course, the World Wide Web always afforded this potential, but with social media networks, a critical mass of people who lack technical expertise and/or the time required to write computer code on a regular basis can now build robust online communities and participate in relatively powerful ways,
quickly and cheaply. Social media can be organized around or otherwise related to location, but location-awareness is certainly not its definitive characteristic. The term locative media describes scenarios and systems that connect digital information to geographical places (some designers and critics also say “geo-information”). Locative media is generally accessed through internet-enabled mobile devices, most recently smartphones and tablets. In addition to tags situating media via GPS, however, embedded or spatial techniques for linking information to place are becoming more varied and robust. Mobile media indicates digital devices that can be carried with relative ease, allowing people to access the Web and other Internet applications and media files on-the-go, as they inhabit and move amidst any location covered by their service provider. Of course, mobile media indefinitely expand our potential to engage with the Web and digital media at large. These devices mark the emergence of a new stage in computing—and in culture—where one can almost always be connected to and surrounded by online activity. Just having the ability to check, write, and send email messages can profoundly alter the course of one’s day, the rhythm of our daily routines, and the modes of social interaction that constitute our personal and professional lives. Still, actionable media foregrounds situations that—while having emerged in social, mobile, and locative media—gesture beyond these terms’ definitive characteristics: the flattening of networks, accessing the Web on-the-go, and the linkage of digital data to place.

Adding a new term—actionable media—to this chain of descriptors does not in any way diminish the importance or relevance of the kinds of media associated with the more established terms. Desktops and PC-oriented mobile interfaces still occupy vital
roles in post-desktop media ecologies. In fact, a critical area of actionable media
development targets commonplace computational experiences (e.g., reading ebooks,
searching the Web, video chatting), many of which do not rely upon any of the technical
affordances unique to ubicomp. Nevertheless, such software pays homage to Weiser’s
notion of calm computing in every aspect of its design. The website Social Book, for
example, grafts the logic and functionality of popular social networks onto the otherwise
isolated experience of reading books online. This juxtaposition founds an original kind of
social network and a different reading experience. Whereas conventional social
networks such as Facebook or Linked In serve as user-generate content systems
without any necessary referents, the design of Social Book insists on the primacy of
EPUB documents—every user comment necessarily posts at the periphery of a given
EPUB document. By situating comments in the margins, Social Book encourages
communities to form around shared/public readings of specific books. Hence, the flux
social networking is broken down and reassembled according to the experience
economy of online reading. The iPhone app Summly stands as another telling example
of actionable media on the (mobile) Web. Summly aims to combat information
overload—particularly in the case accessing news on a smartphone—by using machine
learning techniques to generate on-the-fly, four-hundred character summaries of online
articles. The app effectively breaks down the textual flux of articles into a discreet set of
bullet points, generating paratexts in the periphery, which demand less of one’s
attention than would sifting through entire articles on the Web. Furthermore, in beta at
the time of writing, the iPad app MindMeld runs in the periphery while people video chat.
The verbal content of one’s conversations double as search commands; that is, the app
recognizes peoples’ speech and automatically pulls up new search results relevant to the conversation as it unfolds. Of course, Social Book, Summly, and MindMeld mark only the bleeding edge of a broader tend in development. Having become social and mobile, media is now becoming actionable, on the Web and especially beyond it.

Amidst ubicomp platforms, actionable media syncs with the flux of activity in a given network in order to circulate data (text, image, audio, video) specific to extra-computational experience economies and/or generate data in response to real-time movements and gestures. While the PC-oriented examples above clearly indicate the relevance of actionable media principles to today’s electronic boxes, the vision of actionable media I lay out here is more explicitly cast around instances of interface design and multimedia content that exploit context-awareness, calm inputs, and other affordances unique to the ubicomp paradigm. Increasingly, developers are working to realize the relatively underdeveloped goal of Weiser’s vision for ubicomp: to create computers that interface with the multitude of autonomous, non-computational flux he called ‘the infinite richness of the universe.’ This sounds like quite a lofty ambition, and it is. But such technology has been commonplace since the early 2000s. We just have not yet articulated a robust theory of the possibilities it raises for the future of multimedia production writ large.

Consider GPS navigation devices—the twenty-first century’s system of cardinality par excellence. The GPS generates multimedia in direct response to drivers’ otherwise non-computational gestures and movements. As opposed to a map, a printout of directions, or a list of directions pulled up from the Web; GPS navigators delivery bits of actionable media to drivers such that they need not disengage from the
act of driving in order to engage with computation. The GPS speaks the directions to the driver during moments of decision; the audio refers to street names and landmarks that are likely to appear in the driver’s field of vision at that moment. In effect, the GPS showcases the two processes of grammatization at the inventive core of actionable media: it breaks down the digital flux of the Web, rendering multimedia as a discreet and dynamic periphery relevant to situated action in real-time; it generates multimedia (and often reorganizes existing Web content) on the basis of calm inputs that record the action of certain entities or variable in real-time.

At this moment in digital culture, turn-by-turn GPS navigators are arguably the most pervasive and influential manifestation of actionable media. More than the latest means of vehicular navigation, GPS devices manifest new modalities of interaction among media, humans, and environments. Starting with GPS navigation as a commonplace example of actionable media, we can ask, thereafter, how we might extrapolate from more recent ubicomp inventions to imagine further rhetorical and aesthetic possibilities.

In her analysis of the GPS as a rhetorical artifact, Amy Propen foregrounds questions of text and agency: what kinds of multimodal utterances are generated during GPS navigation, and who/what (co)produces them? Propen outlines visual cues through which the GPS digitizes territories (e.g., highlighted routes, place indicator icons, real-time mileage approximations), as well as the audio cues by which it communicates instructions to drivers (e.g., recalculation announcements). Having conducted interviews with a pool of GPS users, she presents insightful reflections about the various techno-human relations apparent in embodied experiences of GPS navigation. Throughout the
chapter, Propen returns to her thesis that “the GPS and its user co-construct an interactive agency that is malleable and involves a process of ongoing exchange, negotiation, and sometimes resistance” (141). Some of her interviewees, for example, described their techniques for commanding the GPS-issued driving instructions; the drivers would purposefully disobey certain instructions, knowing that the device would in turn adapt to their movement (123). One might say, counterintuitively, that the driver’s agency in these cases derives form the device’s capacity to maintain precise surveillance over them, and that the device’s program runs (i.e., generates multimodal texts) in response to the driver’s non-discursive actions. The radical distribution of agency in GPS rhetorical production suggests a mode of environmental knowing that can at once be “understood as contributing to posthuman, embodied ways of knowing” (123).

In such iterations (i.e., navigation aids for automotive transportation), the GPS has redefined the navigational experience for many people throughout the world; and yet, the GPS—the global positioning system—is a vast, all-purpose technology. The familiar navigational aids many drivers have in their vehicles provide access to the GPS, but they are not actually themselves the GPS; this reduction has been thoroughly naturalized in everyday speech patterns and in product advertisements. Strictly speaking, the GPS is a system of twenty-four satellites launched by the U.S. Department of Defense, which became fully operative and available to civilians in the mid 1990s. The “GPS” that we have in our cars is only one application that makes use of the GPS proper. With the rise of smart mobile devices and other ubicomp platforms, we are witnessing the start of a generalization of GPS technology, which has recently
inspired an expanding array of new applications concerned principally with action-oriented production and circulation of writing, media, and digital data of all kinds. Propen rightly claims that GPS navigation “engages users in a unique way that elicits interaction and bodily engagement in everyday settings and mundane activities” (123). In light of current computing trends, however, I believe that actionable media promises become integral to an increasingly diverse mix of everyday activities. That is, the actionable media operations of the digital age are no longer unique to the rhetorical situations of vehicular transportation. From rhetorical considerations of GPS navigators, we can move to extrapolate insights relevant for conceptualizing and composing all manner of actionable media emerging with the spread of smartphones, tablets, and other mobile and locative media—and even more so with pending developments in wearable computing, augmented reality, ambient informatics, and nanotechnology.

**Techno-Geographic Actant-Networks**

Before exploring more examples, I want to elaborate further on the philosophical underpinnings of actionable media, initially in close proximity to Stiegler’s work on the interplay of *gramme*, gestures, and machines. In addition to Weiser’s efforts to redesign computing on the basis of human action, Stiegler’s commentary on the evolving relations linking humans, machines, and geography serves as a second pillar for theories of actionable media. Attending to this avant-garde array of technologies and techniques is to at once ask larger questions about the orientation of contemporary technocultures. What new modes of interaction among people, technologies, and environments become significant amidst profound shifts in today’s mediascapes? How might these changes inspire conceptual and pragmatic innovations in digital rhetoric, design, aesthetics, community media, and other technocultural practices? Profoundly
relevant to these questions—and to actionable media especially—is Stiegler’s notion of a “techno-geographic milieu,” which he appropriates from Gilbert Simondon’s writing on various machines integral to the technical systems driving industrial production throughout the twentieth century: steam turbines, automobile engines, boilers, electron tubes, and power plants. Techno-geographic milieus occupy a privileged place in Stiegler’s understanding of (hyper)industrial machines, for they suggest a new epoch of production. Starting with Stiegler’s general stance on the interplay of *gramme* and gesture, we can begin to assemble some theoretical and historical building blocks necessary for articulating a robust framework for conceptualizing and composing actionable media.

Here is Stiegler’s first principle: “To separate the question of language, alphabet, photograph, cinematograph, audio recording, and so on from all the questions of gestures is a very big error” (“On Kittler”). Words, images, sounds: these are not the only *gramme*. For Stiegler, some of the most important processes of grammatization—historically and especially today—involve the becoming-*gramme* of territories, bodies, and even cells. In addition to writing by virtue of bodily gestures, today—by virtue of machines—we write *with* our bodily gestures, which have been broken down from the flow of muscular continuity, detached from our bodies and iterable in their absence. For instance, the gesture or action of hammering a nail can be performed by a discreet and replicable machinic configuration, just as the letters of the alphabet can be arranged to record a speaker’s every word. In addition to mnemotechnics, grammatization also includes all manner of machines, which variously enable and delimit a general writing of bodily gestures. Describing archetypal factory machines as a writing system, Stiegler
claims that these machines “discreetiz[e] the gestures of the worker, which are transformed into operations of the machine” (“On Kittler”). Today, digital machines and computer programs undertake the grammatization of thought processes and affects, initiating what Stiegler calls a general proletarianization through which consumers (no longer citizens) undergo a loss in their capacities to know, think, and feel—just as Marx writes of the industrial age laborers and their loss of craftsmanship. Moreover, in genetic engineering and experimental biotechnologies, Stiegler sees the onset of the industrial production of bodily organs and cells as a new kind of *gramme*—“grammatization at the molecular level” (“On Kittler”).

From the standpoint of originary technicity, living organic matter (e.g., the human) has always been organized by organized inorganic matter (i.e., technics). Technics, being inventive before having been the invented, is the pursuit of life by means other than life. Increasingly, as Stiegler suggests, life treats living organic matter as if it were technics, as if it were *gramme*; indeed, the autonomous actions of living organic matter are becoming-*gramme* by virtue of contemporary technics. While, on the one hand, we are witnessing the continued expansion of traditional *gramme* (e.g., words, images, sounds) through global networks that turn vast stretches of the Earth’s surface into a writing space—a surface for digital inscription. At the same time, more and more materials act as *gramme*, or at least can be manipulated to perform as such. Here, I am not simply referring to the act of writing letters in the soil, an act that is as old as letters themselves. Rather, the movements of the soil can be tracked via satellite and microchips, in the absence of a human writer, such that soil produces its own traces, in conjunction with data visualization software.
The machines that inspired Simondon’s conception of a techno-geographic milieu, which Stiegler evokes throughout his work on contemporary technics, signify a turning point in the history of grammatization. The twentieth-century technologies that Simondon examines can serve as a primer for understanding the generative interface modalities between technical machines and geographical flows that, as we shall see, characterize key operations of actionable media. A student of Maurice Merleau-Ponty during the 1950s, Simondon was one of the first French philosophers to assert the cultural and ontological import of technical objects. He treats technical objects as if they constitute an important class of beings. For Simondon, the historical transition from hand tools to industrial machines marks a new era of techno-human relations, such that “human reality resides in machines as human actions [become] fixed and crystalized in functioning structures” (13). Simondon aspires to act as a “responsible and creative consciousness” for this “society of technical beings,” with the basic objective to “achieve an understanding of technical reality and introduce it into our culture” (13).

Simondon introduces the notion of a techno-geographic milieu to describe what he sees as an especially unique kind of machine. Generally put, these machines establish an unparalleled degree of interlocking with their surrounding environments; they assign a multitude of technical functions to the geographical flows that they have been designed to accommodate if not exploit. Such machines are distinct from older windmills and watermills in that the former sync geographical flows with electrical networks. Simondon presents the Guimbal turbine (in the context of a wave-power generation factory) as his primary example of a techno-geographic milieu. The Guimbal turbine stands as a technical ensemble “constituted by [the] oil and water in motion
within and around [it]” (50). In his frequent references to Simondon’s analysis of the
Guimbal turbine, Stiegler summarizes the way in which the seawater becomes a
“polyfunctional” element in the technical system:

the [techno-geographic] milieu structurally and functionally associates the
energies and natural elements composing this milieu, such that nature
becomes a function of the technical system. This is the case of the Guimbal
turbine, which assigns to saltwater (the natural element) a triple technical
function: to furnish energy, to cool the structure of the turbine, and to
catalyze the water-proofing of the stages. (“Memory” 83)

This passage calls to mind Heidegger’s concern that, in the grip of modern technology,
Nature becomes a standing-reserve of energy, ready-to-hand, and thereby reducible to
a reservoir of resources available for (and subservient to) human use.

Both Simondon and Stiegler share Heidegger’s contempt for a world reducible to
calculation and usage; so much so, in fact, that Simondon and Stiegler constantly
refuse to discuss technics as a mere tool or utensil. In other words, if Heidegger
associates modern technics largely with a technocratic and inauthentic way of dwelling,
the two French philosophers (particularly Stiegler) theorize technics as the originary
condition of human becoming and cultural development. Contra to the more
conventional manner of discussing machines in terms of calculated automation,
Simondon locates the ultimate power of machines in their “margin for
indetermination…a margin that allows for the machine’s sensitivity to outside
information” (13). In the case of techno-geographic milieus, then, what is most
significant—at least in terms of Simondon and Stiegler’s emphasis—is the fact that this
machinic margin of indetermination syncs with and becomes sensitive to the
geographical flows, which retain some degree of autonomy and accidentality even as
they perform certain functions assigned by the technical system. As such, we might say, “The two worlds act on one another” (46).

Stiegler extrapolates from Simondon’s writing on techno-geographic milieus as he broadens the concept to account for ways in which digital networks have begun to converge with geographical flows. According to Stiegler, many current technological and industrial transformations are related to “the fact that, with digital technology, and particularly networked technology, the technical milieu is becoming…a techno-geographic milieu” (“Technics, Media, Teleology” 334). Throughout the third volume of *Technics and Time*, Stiegler focuses on what he calls “the digitization of territories” now occurring with the emergence of geo-information. By “geo-information,” Stiegler means to indicate all manners of digital simulations and reproductions of Earthly locations, as well as all mobile devices that operate in accord with geo-referenced data. Akin to the Guimbal turbine, geo-information assigns a “technical navigation function” to territory (Stiegler, *Technics and Time 3*, 138). That is, territories effectively enter into the technical system as a generative epistemological force, playing a heuristic role as “a vehicle for action and information in a three-way [transductive] relationship involving man, the machine and the world” (Simondon 68). Through digitization qua geo-information, territories become a constitutive element in the essential technicity of perception, memory, and decision-making—and not merely a standing-reserve to be seen, retained, and acted upon by an already constituted subject.

Ultimately, we might understand the phenomenon of geo-information in terms of a broader strand of technical evolution giving rise to a “geo-graphical” gaze, in which perception and cognition fuse with the writing (*graph*) of the Earth (*geo*). Attending to
both senses of the phrase, the writing of the Earth signifies the (f)act of making inscriptions upon the Earth as a (digital) writing surface, and it also signifies the modalities through which the Earth’s geographical flows become translated (i.e., sensed and actuated) into written traces—or at least affect the arrangement and/or presentation of digital data—amidst the real-time functioning of techno-geographic interfaces. No longer restricted to turbines and power plants, techno-geographic modes of operating have contributed to a definitive class of digital interfaces, the iterations of which many of us already engage with on a daily basis.

In the case of GPS navigation, the machine—or, more precisely, the software program (in conjunction with larger technical systems)—assigns a polyfunctional role to human geography; the margin of indetermination becomes sensitive to an individual’s automotive movements and, in many cases, the movements of other automobiles qua the tracking and displaying of nearby traffic patterns. That GPS navigators function in real-time relative to dynamic, geographical variables marks a crucial dimension of the paradigmatic shift away from print cultures rooted in the epistemological habits and temporal conventions of alphabetic literacy. In the context of (pre-digital) literacy, people can distinguish between their perception of live events and their engagement with forms of tertiary retention; granted, one’s engagement with tertiary artifacts impacts, even constitutes, the criteria (i.e., secondary retention) that directs his or her lived perceptions (i.e., primary retention). Nevertheless, this impact occurs over time—it is deferred—on account of the technics of alphabetic writing.

Stiegler argues that, because audiovisual media are currently displacing the archival modalities of literate writing, the literate experience of historical consciousness
is becoming supplanted by the real-time of contemporary technics. Streams of real-time information events conjoin primary retention and tertiary retention. Moreover, Stiegler also contends that the production of real-time affects knowledge-building; all information, communication, and memory practices that generate and preserve knowledge are of technics and therefore not outside of time and its technical evolution. For instance, when accustomed to GPS devices, we tend to make navigational decisions in the real-time of a geo-graphical gaze that is processually co-constructed between lived perception and technological memory, and not primarily on the basis of our own historical consciousness.

While Stiegler’s turn to techno-geography showcases the constitutive role of geographical flows in the production processes of contemporary technics, his work does not speak to the wider array of flux that are becoming-gramme through the rise of actionable media. Moreover, in spite of his thorough demonstration of humanity’s essential technicity, Stiegler has not yet formulated a term that would enable him to rhetorically sidestep the anthropocentric connotations his work so pointedly critiques. As technologists aim to develop computers that function more in sync with human action, they often assign computational functions to non-human entities or flows as a means to achieve anthropocentric ends. Whether or not ubicomp inventors bias human action in their theoretical discourse, the multimedia practices that develop in tandem with ubicomp platforms indicate a kind of ontological flattening occurring within twenty-first century writing spaces. A text no longer travels, in-tact and in-itself, apart from its surrounding environments; the array of fluxes that constitute “environments” are no longer just a context for an already constituted text—these fluxes actually compose the
text (figures) and textual field (grounds) of actionable media. As such, the production and composition of actionable media accrues through circulation.

As a corollary to Stiegler’s work on grammatization, Bruno Latour’s theory of action offers us a way to account for the ontological flattening inherent in (and extensible beyond) the techno-geographic operations of actionable media. According to Latour, actions can never be undertaken by an individual human actor; action is fundamentally a relational capacity engendered through contingent chains of associations among humans and non-humans (109). Latour’s concept of an “actant” denotes any source of action, and he employs the term indiscriminately to humans, animals, weather, technologies, raw materials, fabricated artifacts, etc. Obviously, humans are an important source of action, but no actor acts alone, and so Latour refuses to attribute a heightened degree of agency to any species of actants in his resolutely flat ontology. Any kind of actant may play a pivotal role and make a difference that affects the network or chain of actants with which it associates, at a particular time and place. Reflecting on Latour’s actant-networks in the context of political theory, Jane Bennett insists that we need to consider the vibrancy of material fluxes and non-human entities in our evaluations of political issues and our debates about public policy. Akin to Bennett, rhetoric scholar Laurie Gries draws on Bruno Latour’s notion of actants in order to think beyond the human-centricity bound up in conventional theories of discursive production. Proposing the notion of “rhetorical actancy,” Gries foregrounds the ways in which “humans and other actants work together to construct rhetoric” and concludes that “discourse is a vital, material force.” (87-8). Bennett and Gries both highlight scenarios in which human rhetors and an audience’s interpretation of their discourse is
influenced by encounters with material entities, and Bennett celebrates texts that “direct sensory, linguistic, and imaginative attention toward a material vitality” (19).

In the actionable media ecologies, rhetorical and political actions become distributed in yet another sense. Here, texts do not just draw attention to vibrant matter or the parliament of things; the text is itself produced by the real-time actions of actants. The actant-network doubles as a networked *gramme*. Hence, in addition to the grammatization of human gestures and human bodies, and in addition to the grammatization of geographical flows (qua the digitization of territories), actionable media assign rhetorical and aesthetic actancy to the vast array of non-human actants that constitute the chains of association without which no human actions would be possible. We have already indicated how actionable media can be generated calmly in the periphery of the real-time movements of human (or animal) bodies, via mobile, wearable, and implanted computers. As an ongoing MIT experiment demonstrates, such processes are also operative at the level of inorganic actants. The *TrashTrack* project, launched by MIT’s SENSEable City Lab in 2009, aims to raise public awareness about the circulation of garbage and its environmental impacts. Researchers attach traceable microchips to “different types of trash so that these items can be followed through the city’s waste management system, revealing the final journey of our everyday objects in a series of real time visualizations” (“Introduction to Trash|Track”). Items of trash are pivotal actants in the environmental issues about which we propose public policies, yet we know little about the afterlife of our things, after we have thrown them away. Where do they end up and how exactly do they get there?
Translating the movement of trash into a real-time data visualization, *TrashTrack* traces the actant-networks that actually circulate particular kinds of trash around North America. Every pixel that is composed on the screen has been generated in response to the actions of various actants as they intersect with and propel the movement of the trash. These actants include the machines and employees at waste management facilities, the vehicles that transport trash, the highways and airports that structure their journey, etc. Each one of these actants, consciously or not, becomes embellished with a rhetorical function that composes an aspect of the visualization. The visualization is the writing of the actant-network. The project’s leader, Dietmar Offenhuber, said, “The extent and complexity of the network of waste trajectories was quite unexpected” (“MIT Researchers Map the Flow of Urban Trash”). For instance, researchers traced a printer cartridge that traveled 3,823 miles in order to reach the recycling facility to which it had been sent. More than a laboratory experiment, *TrashTrack* visualizations have been set up as installations at several museums and libraries. Assaf Biderman, the associate director of SENSEable City Lab, believes ubicomp projects like *TrashTrack* “allow individuals to monitor and describe their environment, while also providing an insight into the impact of their own actions.” As an innovative case of actionable media production, *TrashTrack* orchestrates a rhetorical-aesthetic-political performance on the basis of the real-time actions of actant-networks. However, the delivery of this rhetorical performance—the real-time data visualizations displayed in cultural institutions—falls short. The display of the visualizations remains isolated and out of sync with the actant-network in which it is designed to intervene. As the project continues, I expect the research team to develop ways to display the visualizations at settings more relevant to
the scene of the behavior they are trying to influence. As such, the visualizations could also be designed to project or highlight certain traces on a case-by-case basis, rearranging its content in response to the action of actants present at the display.

**Figures**

We need a new set of figures for navigating the digitization of territories, the linkage of media to bodies-in-motion, and the becoming-gramme of actant-networks. These emerging grammatization processes, which I have just collected under the heading of actionable media, variously condition the post-desktop breakdown of the Web and inform the creation of digital content designed to circulate across ubicomp platforms. Since the rise of PCs, the desktop GUI interface metaphor has structured the majority of software development initiative and popular computing experiences around four basis figures: windows, icons, menus, and pointers (WIMP). As I explained in Chapter 4, the WIMP framework broke down the flow of information characteristic to command-line interfaces, establishing a new “user-friendly” paradigm of human-computer interaction. Taking the distracted driving epidemic as an emblematic symptom, I argued that WIMP and other PC-oriented models are fundamentally ill-equipped for today’s ubicomp paradigm, while also noting that (theories of) mobile media still revisit desktop archetypes. What figures today constitute the ubicomp equivalent of WIMP? What new acronym might we construct to serve as a conceptual framework for understanding and creating multimedia in the age of ubicomp?

Before outlining the new acronym—what I will call ATLAS—we must note the long historical tradition in which this enterprise is inherently situated. Since the invention of writing, scholars have proposed and developed figures relative to the emerging cultural technologies of their era. In the disorienting wakes of apparatus shifts, people
seek new techniques of orientation to make sense of their new relationship with language, texts, images, sound, machines, computers, etc. Historians of rhetoric have catalogued the “figures of thought” and “figures of speech” invented in ancient Greece; of course, several of these rhetorical figures (e.g., metaphor and metonymy) are still fundamental to contemporary thought, literary expression, and everyday speech. Historians of writing discuss the emergence and significance of “figures of the written word.” Coining this phrase, Jack Goody maintains that such figures (e.g., lists, tables, formulas, etc.) were formalized relatively soon after the birth of writing in the West—just before the onset of concepts, definitions, and philosophers in Athens. According to Goody, orthographic lists and tables “are not only the manifestations of thought, invention, creativity; they also shape its future forms” (9). Goody shows how the Greek development of science, history, logic, rhetoric, and metaphysics was prefigured by and intimately related to the pre-alphabetic invention of figures of the written word, which transformed one’s relation to spoken language and incited a radicalization of recording, classification, and knowledge-building. Consider the formation of rhetoric, for example. While pre-literate societies certainly practiced persuasive speech, rhetoric as a distinct art and body of knowledge came into being by virtue of the modes of critical reflection enabled by writing. Robert Hariman and John Lucaites claim, “You might say that rhetoric was speaking as it came to be seen through the lens of writing” (295).

Akin to writing and rhetoric, the history of new media and modern computing is riddled with pivotal metaphors and critical categories that we might refer to collectively as the figures of the digital interface. In fact, Colin Brooke proposes that digital rhetoricians should adopt the interface—in place of isolated textual objects—as their
basic unit of analysis and production. In the decade proceeding Brooke’s argument, new media theorists were already identifying important elements characteristic of early PC interfaces. Jay Bolter and Steven Johnson both historicized figures from the WIMP framework; Bolter discussed icons as an element of writing foundational to the graphical logic of desktops, and Johnson chronicled the role of windows and menus as “basic building-block metaphors” that facilitated the breakdown and transformation of the command-line. Buzzwords associated with the Internet and computing get picked up and appropriated by humanities scholars throughout the 1990s: Web, hypertext, link, etc. Manuel Castells expounds a theory of contemporary society structured upon the notion of networks; Manovich counts the database among the dominant cultural forms of our era. Even the future of hardware (i.e., the mobile devices we have now) was clearly predicated upon Weiser’s tabs, pads, and boards—figures he invented via analogies to the history of writing.

In order to get beyond the transitional moment of Weiser’s “ubiquitous computing phase 1,” the figurative imagination must now turn from recent advances in hardware to current software development and multimedia content. While post-desktop devices have brought computing “out into the world,” so to speak, innovation in these latter areas are needed in order connect digital media to “the infinite richness of the universe”—or, stated in terms of actionable media, to sync multimedia with the action of actants. My contribution will be two-fold: (1) I will assemble and outline a set of figures evidently orienting technocultural developments specific to the ubicomp paradigm; (2) then I will generate some rhetorical and aesthetic principles for creating multimedia relative to each of these figures. The five figures that comprise my ATLAS acronym—apps, tags,
layers, actuators, sensors—already circulate as quasi-terms in computer science, engineering, and tech journalism—just as the words “network,” “database,” and “link” were in regular use before media theorists infused them with unprecedented conceptual, social, and semiotic weight. Whenever humanities scholars include terms such as apps or layers, they typically employ them as a matter-of-fact descriptor, as if flashing a passport permitting them ventures into foreign intellectual domains. In other words, they appeal to the terms’ general connotation in popular or technical parlance without bringing their own disciplinary resources to bear on the matter. And yet, to the extent that the circulation of digital media continues its post-desktop migration; apps, layers, and the like will become the very figures many of us read, write, design, and think with. We need to develop cultural, humanistic, and rhetorical approaches to ubicomp interfaces; we need to do for today’s emerging configurations of new media what Manovich and others did for the digital forms that arose during the 1990s.

In theorizing ATLAS as a set of ubicomp-oriented figures for conceptualizing and composing actionable media, I thus draw from the history of rhetoric, writing, and interfaces. If the classical rhetorical figures of speech distinguish among formalized structures of verbal expression that variously remix conventional usage, then each ATLAS figure marks a discrete configuration syncing multimedia with the action of actants. In terms of grammatization, each ATLAS figure models a notable way of managing to break down the flux of the Web and/or a way of transcoding actant-networks into networked grammme. Moreover, important scholarly reflections on the figures of the written word also prompt us to consider what new modes of cognition and social organization might emerge amidst the technocultural conditions that ATLAS
precipitates. Classicists tell us that the major shift in writing from Sumerian cuneiform to Greek alphabet proved vital to the development of civil law, critical reasoning, and participatory democracy. What might emerge as multimedia and computing shift from WIMP to ATLAS?

**Layers: As Technocultural Category**

Technologists and scholars alike evoke the notion of layers in order to signify media convergence, knowledge transfer, and the contemporary erasure of traditional binary oppositions. As Chapter 4 on ubicomp demonstrates, one encounters the word quite often in critical discussions of digital-physical convergence, as well as in commentaries purporting a transductive relationship between computing and culture, and in the marketing discourse surrounding new apps and services in emerging software fields (e.g., augmented reality). We have yet to define layers as a bona fide digital form integral to ubicomp culture, and we have not thought rhetorically about layers as a unit/figure of multimedia production. Of course, layers have long been a commonplace element essential to desktop publishing and authoring software qua image, audio, and video editing programs. In Adobe Photoshop, for instance, image files are comprised of discrete “layers” that can be manipulated independently. We might say that layers entered the scene of new media in these GUI programs, within which layers were subordinate to the virtual reality of WIMP interface design. Recall also the layer functions in CSS and Javascript routinely used to design dynamic menus on the Web. Now, layers that perform in the capacity of actionable media across ubicomp platforms have transgressed the Web and the WIMP framework.

Whereas the desktop metaphor of the 1970s was formulated by analogy to modern offices, the figures of ATLAS interfaces were forged through metonymy; in each
iteration of the latter, a discrete part has been detached (or grammatized) from the
desktop GUI and now stands in for the whole of post-desktop computing. Note Hugh
Bredin’s distinction between these two important figures: “Metaphor creates the relation
between its objects, while metonymy presupposes that relation” (45, my emphasis). As
an excise in metonymy, ubicomp presupposes our familiarity with the virtual space of
the personal computer and its core operations. ATLAS interfaces found new
configurations of media that refer to—but at once transform—those of the PC era.
Software applications with intricate menus and multiple windows become streamlined
down to apps. Tags are lifted from their backstage function in computer code (e.g.,
HTML) and promoted from their supporting role in Web 2.0 (e.g., blogs, social media),
such that Web 3.0 tags (e.g., QR, RFID) now orient the delivery, circulation, and,
sometimes, the very composition of digital media. In each case, these figures have
become vehicles for inhabiting, interacting with, and making sense of the world at large.
If the desktop brought the office into the machine, then ubicomp transcodes the entire
networked world in the machine’s image.

The easiest way to comprehend the post-desktop life of layers is to trace the
lines of flight by which they transgress WIMPs. As we have noted, layers existed during
the PC era in two ways: (1) as dynamic menus constitutive of and subordinate to WIMP
interface logic; and (2) as discrete components of image files or “tracks” of audio and
video manipulated independently within GUI authoring software. Still today, one surfs
the Web by pointing and clicking on layers qua dynamic menus; multimedia files are
comprised of discrete layers of graphics and audio/visual footage. So what becomes of
layers in the technocultural conditions of ubicomp? First, they are no longer subordinate
to WIMPs; rather, they operate in conjunction with apps, tags, actuators, and sensors to orchestrate a new relationship between multimedia and the lifeworld. In particular, layers are media files (texts, images, audio, video) that reside, appear, and function amidst the infinite richness of the universe, the contingencies of everyday life, and the action of actants. Whereas HTML tags often stipulate the arrangement of media files within conventional websites, Web 3.0 tags sync digital content with the movement of (non)human bodies, geographical coordinates, and architectural structures in 3D built environments. Here, one no longer designs a menu-layer for navigating media on the Web; digital content exists as networked layers outside of the Web, and these layers obsolesce websites and become a chief system of cardinality in ubicomp media ecologies. As such, we no longer browse the Web—we browse the world. Image and audio editing becomes world editing. Ubicomp layers transcode the modularity of multimedia production onto the world. In addition to uploading our media files to a Web server, we can deliver those files anywhere via everyware. Vast stretches of the Earth’s surface, and many of the mobile bodies that traverse them, have suddenly become a networked surface for digital inscription.

In this sense, layers signal an immense extension of arche-writing, which, according to Sharon Crowley (commenting on Derrida), broadly conceives writing as “human in-scription on the world’s surface” (4). Of course, writing upon the world’s surface is nothing new, but prior modes of inscription such as carving or graffiti are both invasive and limited. You cannot (legally) write via graffiti on the gallery walls of the Museum of Modern Art, but you can easily do so via ubicomp layers qua mobile augmented reality. The novelty of world browsing (as opposed to Web browsing) lies in
the fact that they graft the manipulability and hyper-circulatory conditions of digital writing networks onto one’s ability to inscribe the world’s surface, as distinct from the strictly computational surface of desktops and laptops, which are “plugged in” to Web and other programs but do not interface directly with the world’s surface. Whereas Marshall McLuhan’s writing on “global theater” tends to embrace the world’s surface as a transmittable stage, the world’s surface also, if not primarily, acts as a hypertextual link in the new global theater of ubicomp. If we also factor in Eric McLuhan’s later analogy—that teleconferencing is to global theater what radio is to the global village—it becomes clear that the notion of staging is what attracts both McLuhans to the word theater. In the global theater described by both Eric and Marshall, the world serves as a stage for tele-performance, and because virtually any space on Earth can serve as a backdrop for live footage, people live with the awareness that they may become “actors” in this footage at any given moment—intentionally or not. Without dispensing with the staging aspect so central to both McLuhans’ insights, world browsing conditions the possibility for almost anything in the world to function as a hypertextual link. Through a radicalization of the link, ATLAS interfaces not only multiply the stages on which media content and online networks can perform, but also support new styles of interaction.

For instance, the layers of the ubicomp paradigm are often managed through sensor networks, which supplant pointing and clicking with an expansive general economy of gesture and presence. Examples of these layer projects have been emerging all over the world for the past decade. David’s Way Plaza in Dallas—described as an “urban musical instrument”—is a sensor network located at a high-traffic intersection along the city’s most popular running trail. David’s Way is a
representative ubicomp installation in that it plays or acts audio and visual layers in direct response to the movements of pedestrians who pass within the range of its sensors. In his proposal, the project’s artistic director, Christopher Janney, describes audio layers generated from a database as containing “a mix of melodic tones and environmental sounds, possibly also texts spoken or whispered” (“David's Way”). The visual layers, more visible at night, are simply programmed sequences of LED lights that punctuate the audio layer. In addition to its aesthetic dimension, the project serves a utilitarian interest: both the audio and visual layers alert the trail’s runners and cyclists to the busy street they are about to approach. The audio layer, which in most cases evokes a jungle vibe, delivers a gentle shock that—through cognitive dissonance—can snap you out of a “runner’s high” and provoke you, almost instinctually, to inspect the surrounding environment ahead of you. Most crucially, from the standpoint of actionable media, layer projects of this sort configure multimedia that sync with one’s actions and strive to engender a certain attunement to the activity of the actant-network in which s/he participates at that moment.

The bifurcation of layers (representative of ATLAS) in digital culture from PCs to the ubicomp paradigm resembles the grammatological transformation of the written line throughout the history of alphabetic writing, specifically the evolution undergone from lists to diagrams. In Of Grammatology, Jacques Derrida’s commentary on Rousseau’s account of ancient farming and the development of the line in writing suggests an insight about the emergence of the line as proto-figure of the written word: “It is a matter of writing by furrows. The furrow is the line, as the ploughman traces it…The furrow of agriculture, we remind ourselves, opens nature to culture…writing is born with
agriculture” (*Of Grammatology* 287). The transcoding of the line from the ancient workplace (the farm) to the page parallels the transcoding of the desktop from the modern workplace (the office) to the screen. As a commonplace interface figure, the symbolic power of the line reaches beyond the functionality of the page, becoming the basis for linear processes of thought, time, and social organization—as argued by Derrida, Heidegger, McLuhan, and Flusser. The line had been a structural element of the field/farm since the dawn of agrarian societies; hence, from a purely geometric perspective, the line is not new when it manifests on the page in the form of written lines. Lines had long shaped the way people went about farming. But more broadly transformative dimension of lines did not unfold until they became incorporated into one of the primary cultural technologies for communication, expression, memory, numeration, and economic exchange. As soon as it becomes an axiomatic constituent of figures of the written word, the line starts to shape and orient the bulk of human activities, eventually disrupting the circular habits of being-in-oral-societies.

Historians of writing and literate culture attest to the epoch-defining impacts of specific configurations of linear orthography. As I noted above, the list and the diagram are the two most relevant of these figures for our purposes here. Examining the ways in which early writing transformed speech and thought in ancient Western societies, Goody chronicles the emergence of pre-alphabetic lists, insisting that the list was not only the most common and characteristic kind of writing during “the first fifteen hundred years of man’s documented history,” but also that this largely mundane, administrative form created the technocultural conditions necessary for the intellectual achievements that fellow classicist Eric Havelock describes in his account of the literate revolution in
ancient Greece (80). Speaking of the period, Goody claims that the list “is something that rarely occurs in oral discourse at all,” to such an extent that reading and writing lists demands (and thus cultivates) entirely different forms of cognition than does speech (80). For instance,

The list relies on discontinuity rather than continuity; it depends on physical placement, on location; it can be read in different directions, both sideways and downwards, up and down, as well as left and right; it has a clear-cut beginning and a precise end, that is, a boundary…Most importantly, it encourages the ordering of the items, by number, by initial sound, by category, etc. And the existence of boundaries, external and internal, brings greater visibility to categories, at the same time as making them more abstract. (Goody 81)

As lists bring categories to the forefront of human attention, Sumerian scribes begin to posit and recognize unspeakable relationships among the items they inventory. Lists allow them to see, reflect upon, and reorder items apart from particular circumstances—and in accordance with more complex and systematic notions of order and resemblance. Categories effectively transform words into definitions, terms into concepts. Note how Goody’s language prefigures and enacts Stiegler’s understanding of alphabetic grammatization, particularly when the former writes that lists “stand opposed to the continuity, the flux, the connectedness of the usual speech forms” (81, my emphasis). Lists, like all forms of writing, break down the flux of speech, yet lists can be distinguished from other orthographic techniques, other figures of the written word. In contrast to written dialogues or treatises, for example, lists “substitute an arrangement in which concepts, verbal items, are separated not only from the wider context in which speech always, or almost always, takes place, but separated too from one another” (Goody 81). The list, perhaps more than any other form of early writing, configures
orthographic lines in a manner most conducive to systematic classification and 
abstract/analytical reasoning via the creation of conceptual categories.

Diagrams or “word-outlines” radicalize the list and its epistemological effects.
While diagrams existed in various and intricate forms throughout the Middle Ages, they
did not become a dominant figure of the written word, according to Walter Ong, until the
sixteenth century, following Johannes Gutenberg’s invention of the printing press and
Peter Ramus’s diagrammatic method, both of which spurred on immense education
reform throughout Europe. While the arrangement of items in a list does, as we have
noted, enable and support critical inquiry and conceptual development, lists still seem to
function in the service of speech and phonographic expression. This is precisely
because lists separate items from one another; the only relationship they proclaim is
that of genus and species, category and categorized. Diagrams, on the other hand,
impart a different configuration among orthographic lines and linear phonography. In a
diagram, namely of the type that Ramus popularized, each verbal item functions as a
category unto itself. The relations among categories are what the diagram maps. Rather
than taking an inventory of material things, the diagram writer presupposes conceptual
relations between categories and things, and diagrams exude a scholastic logic “in
which the terms of thought [are] conceived of as things, which could be sorted, arrayed,
and rearranged to form or analyze arguments” (Johns vii). The linear arrangement of
Ramus’s diagrams redistributes the lines of a conventional list; in effect, the diagram’s
spatial scheme multiplies amount of relations between individual line items, as well as
the significance of each items placement relative to overall structure. Where lists may
only imply an argument, diagrams can make arguments more explicit, and they do so
on the basis of a resolutely spatial-visual epistemology. For the first time, spatial-visual montage eclipses spoken dialogue as the standard method of education and knowledge building. WIMP interface design relies on this same spatial-visual epistemology; operating a program on a GUI desktop appeals to the cognitive processes involved in reading lists and diagrams. Clicking the “File” button at the top left corner of word processors, for instance, activates a layer in the form of a drop-down menu, which reveals a list of operations (e.g., Save, Print, Close) that have been collected under the File category. Further considerations of WIMP software reveal the immeasurable persistence of literacy throughout contemporary computing, which only begins to recede and rupture with the emergence of ATLAS interfaces.

In treating thoughts as things and terms as concepts, the grammatological evolution of linear orthography from the pre-alphabetic list to the Ramist diagram indicates the intensification of what Goody takes to be one of literacy’s latent tendencies: “to freeze a contextual statement into a system of permanent oppositions, an outcome that may simplify reality for the observer but often at the expense of a real understanding of the actor’s frame of reference” (71-3). Separating knowledge from the knower/speaker, writing institutes an unheard of opposition between text and context, precisely because, structurally speaking, writing preserves traces regardless of their contexts. Invoking Derrida’s notion of iterability, Stiegler argues that orthographic writing founds “a new relationship of statements to their context” (Technics and Time 2, 55). Namely, alphabetic writing remains structurally consistent apart from the circumstances of its production and in spite of the absence of a given writer or reader. In the case of pictographs and cuneiform, on the other hand, “recorded enunciation was not in itself
sufficient for the restoration of a full signification” (*Technics and Time* 2, 56). As sign systems, the pictograph requires that readers “must have lived the event it purports to record,” and cuneiform supplies only consonants, leaving the reader to deduce the implied vowels based on a given context (*Technics and Time* 2, 55). As a process of grammatization, alphabetic writing founds a system of abstract yet discreet characters that are iterable in *space*, without any necessary relation to *place*.

PCs and WIMP-designed mobile interfaces mimic the “contextual wrenching” of alphabetic literacy. WIMP interfaces, qua icons and menus, equate select images and words with binary codes prompting a set of assigned computational operations. WIMP design achieves user-friendliness through the creation of what J.C.R. Licklider called “predetermined programs,” within which every single action that can occur has necessarily been anticipated and suggested by the software’s developer(s). Moreover, to speak phenomenologically about conventional PC hardware, the keyboard and mouse are only representatives of my action—the computer recognizes me only in so far as I type, point, and click. In order to do those three things, I must remain stationary at my computer and often within range of a power outlet or a wifi connection. The recorded index of my actions (let along those of other actants)—the ratio of gestures that get recognized as *gramme*—is infinitesimal. This is as true for papyrus scrolls, manuscript pages, and print books as it is for desktop computer screens. In each case, a restricted economy of writing clearly delimits the intelligible from the sensible, enframing texts and textual production in boxes set apart from their surroundings.

Contemporary technologists who develop ubicomp platforms insist that they are creating computers that are “context-aware,” but this phrase is imprecise. In the
ubicomp paradigm, layers radically disrupt the literate opposition of text and context, which has been foundational for much rhetorical thinking since Plato and subsequently inflated by the discursive economy of print. Layers of multimedia that interface in real-time with actions of actants continue the spatial epistemology popularized by the Ramist diagram; however, at the same time, these layers—which can be visual, textual, auditory, or tactile—are emphatically multimodal. Whereas Ramus’s visualization-obsessed method sought to silence the dialogue-driven curriculum he revolted against (the scholastics who preceded him often prohibited their students from taking notes), layers found a writing space that is neither a return to secondary orality nor an intensification of the visual. In order to speak affirmatively about layers, we need to interrogate the idea of context-awareness in light of the contextual wrenching evident in the evolution of the figures of the written word.

Texts circulate from context to context, and texts cannot accrue any meaning outside of a context. But no single context ever determines (the meaning of) a text; in fact, as Derrida claims, the very structure of any context “is never absolutely determinable” (“Signature Event Context” 3). Further still, “there is nothing outside the text,” at least in the sense that no signified is not at once a signifier—a text whose meaningfulness depends on the contingent and ephemeral context of another text (Of Grammatology 158). After Derrida, what can one possibly mean in claiming that a technology is context-aware? One could say that, by virtue of ubicomp platforms, texts (i.e., any media file) react or respond to contextual activity; granted, we could easily describe TrashTrack or David’s Way in precisely these terms. Adriana de Souza e Silva (citing Katherine Hayles) describes mobile telephony/computing as a matter of
“enfolding remote contexts inside the present context” (262). In this view, “remote contexts” are the digital information or channels that people access while they move through the physical environment of “the present context.” Hence, in addition to relying upon the ontological problematic endemic to theoretical assertions of digital-physical convergence, a critical taxonomy is established here on the premise that we may indeed speak definitively about a given context, to the extent that we can even determine whether that context is remote or present.

Imagine a crowded New York City subway station: over half of the people are listening to music or engaging with their smart mobile devices. Do we count each of these cases as a remote context? If someone is in the middle of an impassioned argument on their cell phone, are the strangers surrounding that person still more present to him or her than the voice at the other end of the line? What about the people who are reading the newspaper, writing a letter, or simply daydreaming? Do these remote contexts reassemble the present context any more or less than those supported by an anytime-anywhere Internet connection? The notion of context, already unstable, cannot support critical reflection in an age when “remote contexts” proliferate beyond measure and support ever increasing degrees of telepresence. Moreover, ever since the ramped circulation of print texts (mobile, embedded, even wearable), public spaces have always hosted “pockets of different contexts” (Hayles in de Souza e Silva 269). For Hayles, mobile computing signifies a cultural turning point whereby “there is no longer a homogeneous context for a given spatial area,” but clearly this condition was already manifest in print cultures.
In her essay “Contexts as Moving Targets,” Christiane Paul raises the possibility that contemporary technics incite an erasure of context rather than a multiplication of remote contexts. She insists that all prior modes of arranging information in the world are now “subjugated to the temporality of the link,” which creates rhetorical situations where every context is yet another central text or vice versa. Digital media make relations and connections accessible and allow movement between contexts. They undermine the very notion of context, enriching it while rendering the concept of context itself superfluous.” (401)

Writing about an array of locative media art, Paul advances the claim that different types of site-specific projects facilitate different kinds of environmental knowing. Some of these projects mobilize information about a place according to geospatial relevance, variously impacting peoples’ perceptions of that place; other projects create wearable or embedded systems “for monitoring environmental factors such as air quality,” while others actuate architectural changes to a built structure (and/or formal changes to a multimedia composition) after sensing and recognizing certain patterns of activity exhibited by the inhabitants of that structure (400-1). Despite her insightful probing of the concept of context early in the essay, Paul maintains a text versus context distinction in her definitions and evaluations of the locative media genres she outlines. I return to Paul’s argument in the next section, wherein I critique her recommendations to writers and designers.

While ubicomp layers discontinue the “contextual wrenching” inherent in the shift from orality to literacy, they retain from literate forms, such as the diagram, the basic capacity to build knowledge through montage—a capacity which has become both routine and increasingly more complex through the rise of film and television during the
twentieth-century. In moving from site-specific soundscapes to the image-driven medium of mobile augmented reality (AR), one encounters another emerging set of rhetorical issues at hand in the production and circulation of visual layers. Like sound layers, visual layers (which may include audio components) bring digital images, texts, and video out of the WIMP framework and found a new (techno-geographic) relationship between multimedia and the sensible plentitude of the lifeworld, whereby actant-networks inhabit the visual frame in real-time. While visual layers mimic the spatial-visual epistemology of diagrams, layers do so without the “contextual wrenching” inherent to literate figures of the written word. This epistemological reconfiguration has important technological underpinnings. Most notably, visual layers in the ubicomp paradigm exist on a screen-camera. Whereas, in filmmaking, there is often a clear distinction between camera (production) and screen (reception), in AR—a key area where ubicomp layers are emerging today—the screen is a camera and the camera is a screen. Hence, in the latter medium, the viewer is always at once a cinematographer.

**Layers: As Actionable Media Practice; or, Computing and Writing *En Plein Air***

The cultural status of AR has shifted dramatically since Boeing researcher Tom Caudell coined the term in 1990. Witnessing the first decade of AR research, which revolved largely around prototypes of clunky headgear and demos of basic imagery projected from quick response codes, novelists and filmmakers captivated popular imagination with sci-fi scenes of how life might be if this technology ever became robust, sophisticated, and mainstream. *Minority Report*, for instance, featured built environments embedded with transparent screens and sensor networks, which interfaced with tiny microchips implanted in peoples’ eyes to deliver a barrage of personalized advertisements to them as they shopped for clothes or navigated a
Rainbow’s End, like The Terminator before it, presents a dystopic future in which the AR medium has become a vehicle for militaristic world domination, as if the capacity to overlay and attach digital media content to places and people would lead invariably to new levels of surveillance and subjugation. Most characters in these narratives are portrayed as pure consumers (if not targets) of AR content, and so they emote a sense of disorientation or inefficacy. Yet, in spite of these literary and cinematic nightmares, leaders in various fields today are optimistic about the potential for AR applications to enhance education, tourism, publishing, retail, architecture, manufacturing, and cultural heritage.

Since 2010, popular discourse on AR has turned toward the promise of everyday use scenarios, which have become more pronounced with the convergence of AR and smartphones. Of course, militaries use AR as a platform to deliver actionable intelligence to combatants in real-time, but this is just one of many applications. Of the multitude of technologies being developed worldwide, the 2011 Horizon Report identified AR as one of two technologies most likely to change the face of higher education, beginning as early as 2014 (Johnson et al. 5). Magazine publishers from Esquire to Playboy have sought to revitalize their print editions by incorporating AR icons that effectively link their pages to exclusive digital content. Retailers oscillate between excitement and fear over the emergence AR “pop-up stores,” which bring e-commerce to a target audience at a particular place and time, without any brick and mortar expenses. Archivists and museum professionals around the world now display their digital collections out in the streets; in London and Philadelphia, the historical
photographs of a city block are readily visible to smartphone users as they move through that same space.

Still, at the time of writing, these apparent trends are referred to in tech journalism as early experiments. While smartphones and tablets have made AR feasible for everyday use, industry leaders believe that AR is in its technological infancy and that the cultural impacts of current uses are but the ripples of an impending media revolution. Claire Boonstra, the co-founder of Layar Augmented Reality, exemplifies this position when she insists that AR will become “the next mass medium” once it moves from mobile devices to *wearable* devices (“Future of Augmented Reality”). Indeed, as AR co-evolves with advancements in wearable computing and nanotechnology, technologists expect to bring to market AR glasses, AR contacts, and similar iterations in the near future.

What all of these predictions and forecasts take for granted is the idea that, once the hardware becomes optimized, people will start to find AR compelling enough to engage with on a regular basis. I contend, however, that AR will not be primed to become a mass medium until early adaptors—be they technologists, scholars, or designers—become more attentive to matters of content creation. More seamless hardware may be necessary, but it is not sufficient in itself. Merely consider the bulk on content now available on AR platforms: Wikipedia entries, restaurant reviews, real estate listings, etc. Save for an avant-garde of noteworthy exceptions, several of which discuss below, current AR mediascapes simply redistribute information from the Web on a geographical basis. Rather than searching for a company’s website on Google, AR users can point their phone at a company’s building to access the website, for example.
While this phenomenon is not without significance from the standpoint of information architecture, the experience yields little aesthetic or rhetorical value aside from an initial shock and awe moment. Alexis Madrigal, a senior editor for The Atlantic, tested Google’s Field Trip app and imagined how this geo-publishing platform might be experienced through the lens of Google’s Project Glass. Noting critical differences between locative AR apps and standard Web browsers, Madrigal concludes that the projected futures of AR demand “a new kind of media” that will challenge traditional assumptions about genre, audience, and context:

No one publishes a city, they publish a magazine or a book or a website. If we’ve thought about our readers reading, we’ve imagined them at a breakfast table or curled up on the couch or sitting in their office. No one knows how to create words and pictures that are meant to be consumed out there in the world. (“The World is not Enough”)

Conventionally, literary texts, artworks, and films exist on an opaque page, canvas, or filmstrip; they are stored, circulated, and experienced in libraries, galleries, or theaters—places designed for immersive contemplation, bracketed off the distractions and disruptions of open air spontaneity.

In short, the technological conditions of mobile AR support new writing and design spaces that demand new aesthetic and rhetorical principles. As the page differs from the screen, so too do the hybrid spaces of AR differ from the virtual reality of the Web. Caught in the transition from the personal computing era to the ubicomp paradigm, multimedia producers in many fields will need to adapt to AR platforms. This article focuses principally on the cultural development of the AR medium; in particular, my aim is to establish a historical vantage point for generating aesthetic insights that may help orient digital design and content creation in AR environments.
To which traditions, then, might we turn for aesthetic models? Cultural critics writing about emerging technologies commonly employ historical practices associated with traditional media as analogies for interpreting digital practices. For instance, Lev Manovich turns to Dziga Vertov and other avant-garde filmmakers in order to conceptualize “cut and paste” and other new media operations as homages to collage and montage techniques developed in the 1920s (“Avant-garde as Software”). In addition to posing analogies (and contrasts) for the sake of analysis and criticism, Jay Bolter, Maria Engberg, and Blair MacIntyre assert that the humanistic study of media can also provide unique frameworks for “develop[ing] a kind of media aesthetics that can guide designers as they explore new forms of digital media” (37). (Readers familiar with *Heuretics* will note the pervasive influence of Ulmer’s CATTt and, more generally, his call for humanities scholars to mobilize critical theory in the *invention* of new media/texts.) Bolter et al. present the history of panoramas in parallel with their discussion of AR browsers; charting the emergence of panoramic paintings as a nineteenth century form of exhibition, Bolter et al. imagine possible use cases in twenty-first century museums for AR panoramas that are designed to graft onto a displayed artifact a visual representation of its original context (41). This analogy also exposes a fundamental difference that distinguishes AR panoramas from the panoramic tradition in prior media, from photography to VR. That is, with mobile AR, viewers encountering a composed work remain more or less aware of their surroundings because the medium is fundamentally porous.

Building off of Bolter et al.’s work, I aim to contribute to AR media aesthetics by examining contemporary artistic practices in light of latent connections with French
Impressionist painting. Impressionists painters, spurred on by mobile inventions like paint tubes and the box easel, developed the first aesthetic and methods of composition systematically tailored around painting *en plein air*. Similarly, AR beckons artists and designers to create digital media projects that break with the logic of the studio and the lab: the virtual reality (VR) paradigm that has dominated popular computing since the 1990s. Indeed, Manovich argues that AR—though not exactly the opposite of VR—is a new paradigm that “needs a structure, a politics, and a poetics” (“The Poetics of Augmented Space” 237). A steady stream of aleatoric and place-based art practices proliferated in the wake of Impressionism throughout the twentieth century; several of these traditions (e.g., kinetic sculpture, land art, improvisational street theater, French New Wave cinema, etc.) carry their own potential to jump-start efforts to theorize and generate innovative cultural expression in AR. My rationale for concentrating on Impressionism here is that, beyond the *en plein air* link, the movement’s early history models a way of seeing the world in the image of media effects, as well as an artistic precedent for developing design principles inspired by the invention of a new media technology. I will unfold the analogy with impressionism—and its generative value for AR media aesthetics—over the course of two themes: techniques of observation and principles of composition. Inquiry into these respective topics will be initiated by analyses of the place of Impressionism in art historical narratives, the critical reception of Impressionist exhibitions in Paris, and Monet’s reflections on his own artistic practices. The insights garnered from Impressionism will provide through-lines for conceptualizing contemporary AR projects and the medium’s aesthetic affordances in the context of recent scholarship in media theory.
Impressionist painting and early photography are linchpins in many historical accounts of modern art. The most familiar narratives characterize the Impressionists as a band of romantic drifters who, at the onset of photography's cultural ascent, willed imaginative ways of seeing that embraced the radical subjectivity of an individual’s visual experience, and thus defied the normative, mechanical realism captured by photography. Put differently, the advent of photography frees painters from the medium's traditional investments in mimesis. Art historian Jonathan Crary objects to such narratives, insisting that this “myth of modernist rapture” is premised upon an ill-informed “binary model of realism vs. experimentation” (4). In his rebuttal, Crary shifts the temporal focal point; he contends that Impressionism and photography in the 1870s are the symptoms of a more significant technocultural development that occurred during the 1820s: the formation of what he terms “the observer” (5). The perceptual techniques of the observer—possibilities conditioned by optical technologies like the stereoscope—rest upon the notion that visual experience is subjectively constructed and, in some cases, technically manufactured. Impressionism and photography, then, both serve as mature expressions of this techn(ont)ological reconfiguration, whereby people begin to conceive of perception as a contingent activity that is open to (if not inherently interrelated with) various intellectual, psychological, and technical processes.

Both Crary’s alternative account and the conventional narratives he critiques, however, remain oblivious to a third position argued by Aaron Scharf in his 1974 book Art and Photography, which has been largely overlooked by historians of painting. Scharf posits that the most novel stylistic elements of Impressionist painting were in fact inspired by the painters’ exposure to early photography—its accidents and glitches, in
particular. For the purposes of this article, Scharf’s thesis is immensely provocative and merits close attention. If we can understand impressionism as a way of seeing the world *in the image of media effects*, then we will have established a productive basis for further analogical insights relevant to AR media aesthetics.

When the artists we now call Impressionists (e.g., Monet, Renoir, Pissarro, etc.) came to Paris in the 1860s, they arrived as Realist landscape painters amidst the first wave of photography’s industrialization (Venturi 35). For the first time, professional photographs and stereoscopic images circulated as popular spectacles readily available to a mass viewership, though amateur cameras would not be marketed until the turn of the century. The spread of photography incited debates among painters who felt themselves torn between imitation and expression; many artists began working from photographs, though they rarely admitted to it for fear of losing credibility with dealers and patrons (Scharf 125). To date, no documentation confirms the notion that French Impressionists painted directly from photographs; in any case, it is a mystery of little aesthetic importance. As Scharf suggests, the paintings themselves attest to a greater, figurative dimension of photographic influence at the level of perception, which furnished the Impressionists with techniques of observation as they painted *en plein air*.

For instance, Scharf presents striking parallels between the Impressionists’ brushwork and 1860s photographs of Parisian settings, which had been on exhibit throughout the city. Whereas portrait and still life photographs of the period could capture images that passed as exact likenesses, photographs of modern urban life were far from “realistic.” Due to slow exposure speeds (by current standards), photographic images tended to blur whenever pictorial subjects were in motion: pedestrians walking
the sidewalks were rendered into “anonymous smears,” flags in the wind lost their angular contours, and horse-drawn vehicles left only “ghostly vestiges” (Scharf 129). These surreal distortions, which technologists regarded as a problem to be solved, contain the same stylistic tendencies that came to define Impressionist painting.

While these features were common in early urban photography, the Impressionists’ treatment of pedestrian figures, for example, “seems entirely new in art [i.e. painting]” (Scharf 129). Further stylistic commonalities—intense contrast of light and dark areas, elevated viewpoints, diffusion of details—collectively support Scharf’s claim that “[the Impressionists’] desire to record the transitory character of natural light and shade, amounted to a kind of perceptual extremism which was germane to photography itself” (126). And yet, the first art critics writing about Impressionism (and most since then), failed to note this transmedia influence, which appears undeniable from the side-by-side image comparisons collected in Scharf’s book.

On the basis of Scharf’s analysis, one might reframe Lionello Venturi’s esteemed claims about the nature and significance of the Impressionists’ artistic achievement. According to Venturi, “What the Impressionist painters actually accomplished was the finding of a form closer to the first impression of the appearance of things than other painters had” (38) Venturi credits this innovation to the artists’ “vivid sensibilities” and insists that “their mind[s] [were] sufficiently free of traditional principles of abstract form to undervalue their impressions” (38). The notion of an “innocence of the eye,” which Venturi borrows from Ruskin and Monet, is conceivable only in the wake of nineteenth century advancements in optical technology (Crary 66). The techniques of observation that propelled Impressionism were not the equivalent of pressing the reset button on
Western artistic consciousness. Rather than learning to see like a child or a blind man suddenly gifted with sight, Scharf maintains that Monet, consciously or subconsciously, painted things “not as the eye would see them but as they might be recorded by a camera” (131). From this angle, the Impressionist aesthetic is not one of transcendence but of *transcoding*. That is, instead of cultivating a natural or “naïve” subjectivity in opposition to what Venturi calls the devices of the “mechanical arts,” the Impressionists’ innovations may be attributed, at least partially, to their ability to transcode the basic operations and visual logic of photography into their perceptual experience and, subsequently, their principles of composition.

Understood in this manner, the relationship between Impressionist aesthetics and early photography exemplifies Bernard Stiegler’s philosophical thesis that contemporary recording technologies have complicated the phenomenology of perception. Stiegler’s argument, which culminates in a reworking of Edmund Husserl’s schema of retentions, is premised upon his radical conception of technics. Through his *Technics and Time* series, Stiegler routinely defines *technics* as “organized inorganic matter.” The term refers both to the history of fabricated objects (e.g., flint, hammers, pencils, computers, etc.) and to domain of *techne*—all techniques, practices, and skills involved in “in-forming matter” or making (something with) technology (Stiegler, *Technics and Time* 1, 93). For Stiegler, as I have discussed in Chapter 3, the invention of technical objects creates horizons of social becoming within which new techniques develop through experimentation, play, and adoption. Similar to Manovich, Stiegler argues, “An essential part of innovation is accomplished through *transfer*, whereby the functioning of a structure in a technical apparatus is *analogically* transposed into
another domain” (Technics and Time 1, 34, my emphasis). If Impressionism can be regarded, first of all, as an innovative technique of observation, which was inspired by photography in no small measure, then it behooves us to account for the technical evolution in (and perceptual ramifications of) visual media technologies since photography, so that we might comment more specifically on the aesthetic transfer to be gained by conceiving of AR practices in relation to Impressionism.

Stiegler’s critique of Husserl clarifies the essential technicity operative in any technique of observation, and he also supplies a techno-logical bridge that implicates a tacit link between photography and AR. Stiegler accuses Husserl of bracketing out technics in his accounts of perception and memory. In particular, Stiegler problematizes Husserl’s phenomenological description of listening to a melody. Husserl postulates two categories of retention: primary and secondary. Primary retentions are synonymous with “immediate” perception and are regarded as properties of whatever phenomena are present to consciousness right now (Stiegler, Technics and Time 3, 14). As one hears a melody, in Husserl’s example, the echo of a prior note is retained as a residue against which each succeeding note is heard. This cumulative resonance is what distinguishes melody from sheer noise. Grounded resolutely in perception, primary retentions are never imaginary; they are always presented to consciousness by an object or flux that is present (Stiegler, Technics and Time 3, 16). Secondary retentions are activated by intentional or involuntary recall; consciousness projects to itself the properties of a past-present phenomenon that has been stored in one’s living memory. Because Husserl concerns himself only with “lived experience,” he does not address any retentions that accrue outside of human perception and individual memory—retentions which Stiegler
believes play a constitutive role in the basic activities of consciousness (*Technics and Time* 3, 21).

Stiegler thus introduces a third term—“tertiary retention”—to theorize the interplay of recording technologies and so-called immediate perception and living memory. When we listen to a melody that has been recorded (and view a photograph or film), the separation between perception and imagination fundamental to Husserl’s framework proves to be false. In such cases, the melody remains exactly the same, yet one inevitably has “two different musical experiences” (Stiegler, *Technics and Time* 3, 21). The retained phenomena of a past-present experience (distinct from the “just-past”) supply consciousness with criteria that (re)orients perception qua primary retention, which is always a process of selection, due to retentional finitude. In contrast to Husserl’s schema, Stiegler ties his fluid theory of perception to a critical awareness of technics: “the intervention of the imagination at the heart of perception, is only made obvious by tertiary retentions—by a phonogram [in this case]” (*Technics and Time* 3, 18). Furthermore, twentieth century recording technologies and audiovisual media generated a new mode of temporal experience, which, in turn, informs the perceptual conditions unique to AR and augmented spaces.

For Stiegler, the historical progression from photography to film to television marks the emergence of “real-time.” The real-time of contemporary technics, beginning with photography, can be distinguished from deferred time of orthographic writing (painting included). In the contexts of alphabetic literacy, people can easily differentiate between their perception of live events and their engagement with forms of tertiary retention; granted, one’s engagement with any tertiary artifact can shape the criteria
(i.e., secondary retention) that directs his or her lived perceptions (i.e., primary retention). Nevertheless, this impact occurs over time—it is deferred—on account of the technics of alphabetic writing. Stiegler traces the dawning of real-time to what he calls (following Roland Barthes) the “reality-effect” of photography. That the photograph, at least in theory (see above for exceptions), manifests a “conjunction of the past and of reality” makes for a temporal situation very different from that of linear writing: “The instant of the capture coincides with the instance of that which is captured” (Stiegler, Technics and Time 2, 16). Film transforms the photographic image into a temporal flux, so as to render audiovisual objects that correspond to the stream of human consciousness; this is Stiegler’s explanation for the immense global appeal of cinema, television, and digital video (Technics and Time 3, 9-12).

Stiegler’s analysis of real-time culminates in an in-depth look at the live feeds of televisual news broadcasting. Live television incorporates the consciousness-like audiovisual flux of cinema and amplifies the photograph’s reality-effect, such that the instant of projection coincides (more or less) with the instant of recording. After singling out broadcasts of the first moon landing as a model for the real-time event, Stiegler writes, “If a distinction between primary and tertiary memories remains possible...here it has nonetheless become absolutely formal and empty” (Technics and Time 2, 242). Hence, the real-time of live footage scrambles Husserl’s schema of retentions even further.

Streams of real-time information events signal a general convergence of perception and recording, of indexicality and digitality. The “here and now” of real-time is always an already-there. Live footage is promoted and archived as an event before
having happened. Hence, real-time media do not constitute a departure from technological memory, but rather the arrival of a new paradigm in memory’s exteriorization. With mobile and wearable AR, the convergence of primary and tertiary retention, initiated by photography, has intensified to an unprecedented degree. For the Impressionists, the technique of observing the world in the image of media effects was a figurative process that manifested in differed time; for AR artists and designers, this process becomes literal and happens in real-time.

Digital artists and cultural institutions now experimenting with AR are currently in the position to do for computing what the Impressionists did for painting in the nineteenth century. Whereas many early Impressionist paintings depict urban scenes in a style informed by 1860s urban photographs, mobile AR projects tend to transcode the logic of digital image layers onto contemporary urban experience. Collectively, the following examples—most of which are based in New York City—forecast the potential for a more widespread transformation of public spaces and built environments, which may take hold if, as AR technology continues to evolve, a critical mass of designers and content creators incorporate such techniques of observation into their media practices.

An ethos of transgression circulates across several of the most noteworthy AR works to date. In addition to fleeing the studio in favor of plain air, so to speak, AR artists—as their projects’ titles emphasize—have *invaded* museums and galleries, *taken over* ad space, and *occupied* financial districts. In the fall of 2010, artists Mark Skwarek and Sander Veenhof organized *We AR in MoMA*, an “augmented reality art invasion” at New York’s Museum of Modern Art. The exhibition, which bypassed the museum’s curators, included a wide range of digital works appearing (for smartphone users) in the
same gallery spaces as the physical, curated exhibits. In many cases, the digital works grafted onto pieces from the MoMA’s collections (in the tradition of appropriation art), while others took a more conceptual or performance-based approach, such as Skwarek’s piece that situated author Bruce Sterling’s avatar in the MoMA lobby and included a thought bubble broadcasting a live feed from Sterling’s Twitter account.

In addition to transforming the conditions under which the museum’s exhibitions are normally displayed, the invasion-exhibit—which the MoMA staff actually came to embrace—raises several questions concerning the future of cultural institutions. How does the space of a museum change now that practically any digital work can be virtually exhibited within its walls? What becomes of our relations to exhibited artworks when user-generated, social media commentary is seen alongside the expository text panels that accompany professionally curated collections? *The Invisible Artist*, a London-based AR project created by John Goto and Matthew Leach, poses as a guide to the city’s top galleries. Approaching the entrance of each gallery, users are greeted by a well-dressed, headless 3-D figure who provides historical commentary about these institutions. The commentary, in spite of the figure’s pleasant demeanor, assembles a discerning assessment of the galleries’ curatorial practices, effectively “satirizing the bureaucracy and lack of diversity of London’s contemporary art scene” (Goetz). In turn, the figure’s missing head becomes an emblem for the artists whose work is routinely marginalized for failing to appeal to the finite tastes of appointed Academicians (in the case of the Royal Academy of Arts). Here, one cannot help but note the project’s obvious resonance with the Impressionists, whose submissions to Paris’s illustrious annual Salon were overwhelmingly rejected by the French Academy.
Indeed, AR works often echo quasi-Impressionist sentiments, such as the will to resist, expose, and subvert various institutional criteria by pursing a kind of revolution of everyday life. In two 2011 NYC AR projects—The AR/AD Takeover and AR Occupy Wall Street—what I have qualified as an Impressionist technique of observation becomes politicized with the Situationist tactical imagination. Critics writing about locative media often appeal to Situationist notions such as derive, detournment, and psychogeography in order to interpret contemporary projects. Parallels with Situationism are illuminating, but these approaches seem best suited for thinking about mapping projects that use GPS to either direct or trace users’ paths through a city, sometimes generating cartographic traces supposed to represent alternative productions of social space (e.g., Amsterdam RealTime). While The AR/AD Takeover and AR Occupy Wall Street certainly invoke Situationist politics, both projects are less about the visualization of locative data in relation to virtual maps, and more about designing “a way for the user to experience the world around her as a mixed and hybrid reality of information on the one hand and physical location and embodiment on the other” (Bolter et al., 44).

The AR/AD Takeover targets one of the most ad-ridden places in the world: Times Square. Times Square epitomizes the discursive conventions that have, in many American cities, largely restricted the production of media in urban environments to signage made by companies or government organizations with the intent to promote corporate or utilitarian interests. Realizing that AR holds the potential to disrupt this dynamic, BC Biermann and Jordan Seiler, the project’s creators, aimed to “use street level ads and billboards to trigger a citywide curated art installation in augmented reality” (1). As such, the project transforms one’s relationship with ads from passive
consumer to creative citizen; no longer an untouchable facet of a city’s infrastructure, ads and ad space can be regarded as contestable grounds to be overlaid with provocative juxtapositions and visual counter-arguments, or simply as blank canvases for playful abstractions and otherwise arbitrary digital overlays. *The AR|AD Takeover* thus presents a welcome alternative to the hyper-consumerist depiction of AR and advertising in *Minority Report*. As content creators-curators in potential, equipped with apps that enable custom filtering, “citizens will possess the choice of what messages, if any, they consume in public space and whether they are commercial, artistic, political, or social” (Biermann and Seiler 3).

Skwarek’s *AR Occupy Wall Street* suggests content variety and user choice will also extend to the ways we perceive building facades and the institutions they house. As a crowdsourced initiative, *AR Occupy Wall Street* was a wide-ranging collaboration between artists and activists; some of its most intriguing overlays were concentrated around the New York Stock Exchange. For example, one piece transforms the building’s grand columns into a slot machine, while another blankets the visual field with a streaming NYSE stock ticker, such that pedestrians moving in the background of the frame are obscured by arbitrary flows of financial data. In both cases, the metaphors occur *at the interstice* of live urban geography and programmed multimedia. The technique of observation attends to the range cinematography potential to the experience ecology of a city block. Buildings, traffic, weather, pedestrians, and street debris—these are all inevitably constitutive elements of AR works, just as they were for Impressionist paintings.
Impressionism was, of course, more than a way of seeing; the transcoding of photographic media effects bleed from perception to pictorial composition. While the technics of early photography clearly inform Impressionist aesthetics, the encounter was by no means deterministic. Indeed, had they not developed a loose set of painterly aesthetic principles, the Impressionists would have been remembered as little more than gimmick artists, whose novelty would have worn off once photography became acculturated as a mass medium.

One of the most amusing events in the story of Impressionism lies in the 1874 critical reviews of what historians now call the “First Impressionist Exhibition.” These critics were blind to the trace of photography, as noted above, and several did in fact dismiss the Impressionists’ style as gimmicky. Most importantly, the critics—whose reviews read like a contest amongst themselves to see who could best ridicule the paintings—unwittingly identified one of Impressionism’s most generative principles, which also seems to be echoed in recent aesthetic discussions of ubicomp and the AR medium.

Shown at the 1874 exhibit, Monet’s Impression, Sunrise emerged as an emblem for the movement during its early years. In addition to inspiring critic Louis Leroy’s coining of “Impressionism” (which he used scornfully), this painting was the object of Leroy’s quintessential comment: “Wallpaper in its embryonic state is more finished than that seascape” (“Exposition des Impressionnistes”). Reviews by Ernest Chesneau and Jules Castagnary also focused on the notion of finish in their back-handed compliments of the exhibition. Chesneau labeled Monet’s Boulevard des Capucines “a marvelous sketch,” before revealing his underlying position: “Clearly, this is not the ultimate
statement of art in general, nor of this art in particular. This sketch must be transformed into a finished work” (“Le Plein Air”). Despite a lavish assessment of several artists’ potential, Castagnary nonetheless dismissed impressionism as a flimsy, unfounded exaggeration of a minor tendency in more established styles of painting (what he termed “the unfinished”), and ultimately stated that the Impressionists were “soon to perish where they stand” (“L’Exposition du Boulevard des Capucines”). In each review, the mockery, the satire, and the objections hinge upon the assumption that fine art entails a high degree of finish: figures should be well defined and every aspect of the scene rendered in painstaking detail. Not until roughly a hundred years later would continental philosophers champion the unfinished in their reflections on modern literature, music, and visual art (e.g., Barthes’s “writerly text,” Eco’s “open work,” and Cixous’s “works of being”).

Stylistically, Impressionism emerged in point-by-point contrast to the then-critically-acclaimed standards of “academic art,” and in many ways this dichotomy foreshadows critical differences between AR and VR. Academic painters (who dominated the annual Salon) typically portrayed subject matter associated with “history, myth, and imagined worlds” (Schapiro 10). Even in portraits of their contemporaries (e.g., William Bouguereau’s Breton Brother and Sister), academicians contrived the scene so as to immobilize their human subjects in a classical pose, whereby all is clear and discrete, without a hint of movement or change. In accordance with these conventions, a painting is not finished until no apparent trace of the painter’s brush remains. By contrast, impressionist paintings are “discernibly constituted by the stroke,” and this, for art historian Meyer Schapiro, is their key feature—one that is all the more
evident when seen in person (51). Whereas most prior styles of Western painting work
to conceal artifice, the Impressionists emphasize materiality and movement, both in
their representation of the landscape and in their material engagement with the paint
itself. Paradoxically, Impressionist composition renders “both the illusive image-
appearance of a scene in deep space and the tangible substance of the painting as
effects produced by the artist on the framed surface of the canvas” (Schapiro 52). That
is, the twofold style indicates a representational or virtual image, but does so in a
decidedly painterly and materialistic manner.

Unlike academic art, Impressionist paintings present scenes of a world constantly
in flux. “Objects” appear rough and permeable, not for the artist’s uncertainty, but
because nothing alive is finished. The founding gesture of Impressionism is “the
dissolution of the line” (Schapiro 9). Lines stabilize the play of phenomena into defined
objects with essential properties. In metaphysical terms, to delineate objects via lines is
to finish the impression and to institute a hierarchy of the intelligible over the sensible;
or, borrowing from Deleuze and Guattari, it is to experience nature as a product rather
than as “a process of production” (Anti-Oedipus 3). Impressionism, as an aesthetics
(and even a metaphysics) is not rooted in intelligible essences of defined objects;
rather, it is uprooted by the accidents of the sensible. Photography shares this dynamic.
As an indexical document, the photograph is a measure of singularity. This is why
Stiegler qualifies Barthes’s “punctum” as “photography’s essential phenomenon”
(Technics and Time 2, 19). The real-time of photography allows it to capture what
remains unnamable in the image, owing to its irreducibility to cultural codes—codes that
have themselves accumulated from the deferred economy of linear writing, which can
no more capture the singularity of an instant than the rhythmic economy of living memory could retain abstract, prosaic statements (Havelock 137).

As indicated above, AR intensifies the real-time of photography, such that the instant of digital media consumption or production can coincide with the locative flux of geography. If Impressionism developed painterly principles of “unfinished” composition that transcoded photographic media effects at the level of artistic practice, then what design principles might theorists and practitioners propose for an AR media aesthetics premised on a transcoding of digital image layers?

On a concrete level, Impressionist practices revolve around a unit of composition that may help situate and orient AR design practices. When asked to describe his approach to painting, Monet once replied:

Merely think, here is a little square of blue, here is an oblong of pink, here is a streak of yellow; now paint, just as it looks to you, the exact color and shape until it gives you your own naïve impression of the scene before you. (cited in Schapiro 49)

The principle of composition is to abstract shapes of color from any subordination to an intelligible signified: “to no longer ‘paint water lilies’ while painting water lilies” (Cixous 589). Conversely, we can describe the AR medium in terms of metonymy; here, designers abstract layers of multimedia from their subordination to GUI/WIMP frameworks anchoring the desktop metaphor.

Since the 1990s, layers have been a commonplace form essential to authoring software such as image, audio, and video editing programs. In Photoshop, for instance, image files are comprised of discrete “layers” that can be manipulated independently. Since The Language of New Media, Manovich has returned often to the significance of layers in software; his recent discussion of digital image layers resembles Schapiro’s
comments (above) about the two planes of Impressionist composition: “An image is thus redefined as a provisional composite of both content elements and various modification operations that are conceptually separate from the elements” (Manovich “Inside Photoshop”). Drawing on Manovich’s principles of modularity and variability, design researchers Ellen Lupton and Jennifer Cole Phillips write, “Layers allow the designer to treat the image as a collection of assets, a database of possibilities” (127). Now, with the emergence of mobile AR and ubicomp, layers of multimedia are primed for post-desktop circulation amidst extra-computational entities and events in the lifeworld. As such, the modular logic of visual layering—evident in multimedia software and Monet’s method of composition—will likely become transcoded as a preeminent cultural form. Increasingly, the ways we interact with digital images in Photoshop or audio tracks in Audacity serve to model more than *human-computer* interactions. The array of media effects typical to desktop authoring software are becoming constitutive dimensions at play in our relations to all kinds of environments, provided we are within range of an Internet signal. Graphic design becomes experience design, and Web browsing becomes world browsing.

Moreover, painting *en plain air* and computing *en plain air* involve processes by which the virtuality of intelligible essences scrambles, blurs, and bifurcates in the face of the variability of sensible plentitude, or what Mark Weiser called “the infinite richness of the universe,” which, he claimed, was excluded from VR systems (“The Computer for the 21st Century” 94). Abstracted from the WIMP construct, the layers of multimedia currently hosted on AR browsers mark a crucial site of the paradigm shift from personal computing to ubicomp. AR layers incorporate the activity of autonomous physical
entities as semiotic assets integral to the “database of possibilities” that a digital image constitutes. Scholars writing about AR works today take the exact inverse stance of the art critics who condemned Impressionism for its lack of finish. For instance, Bolter et al. and Christiane Paul attribute aesthetic value to the unfinished when they each caution AR designers against creating the kinds of immersive experiences fundamental to classical storytelling, Hollywood film, and VR narratives. Bolter et al. advocate for contingent fragments of narrative or information, even if they “often seem messy…because they consist of hybrid layers of information and images that users may choose to read or disregard” (45). Writing about locative media narratives, which often involve AR, Paul cautions that “very rich media content and traditional narration…might run the risk of competing with the audience’s awareness of and focus on the site itself” (410). Writers, artists, and designers should aim, then, to produce texts that do not block out the contexts of their reception. And yet, in spite of this guideline, Paul wonders if ubicomp users’ ability to identify and concentrate on individual texts will not be inevitably compromised in the mist of “contextual noise” (415). She takes this dilemma to be an urgent cultural challenge of the ubicomp paradigm.

Contrary to Paul, I contend that—as long as we maintain text/context oppositions—we will be caught in the catch-22 to which her argument succumbs. The more fundamental challenge is to learn how to conceptualize and design multimedia without recourse to text/context oppositions. Akin to the impressionist conception of shapes of color, AR layers of multimedia beckon theorists and practitioners to consider the integral role of sensible plenitude in digital design and composition practices. Layers, in the ubicomp paradigm, are not merely a category of electronic textuality;
layers mark a new attentional form wherein any and all so-called contextual noise becomes a constitutive element in the visual, sonic, tactile, or textual field. AR layers, by default, assign an aesthetic or rhetorical function to the sensible plenitude immanently perceptible within and around the mobile screen, which is always permeable because it is simultaneously a live camera. Though I have emphasized the visual, AR layers exist in what Maria Engberg terms a “polyaesthetic” design space: “a combination of sight, hearing, touch, and proprioception” (Bolter et al. 44).

Consider the aesthetic role of sensible plenitude in site-specific sound installations, which may be regarded as AR or MR works in a broad sense. Sonic artist Abby Aresty’s installation project *Paths II: The Music of Trees* created an embedded sound layer throughout Washington Park Arboretum in Seattle. Aresty spent roughly a year recording audio at specific spots in the Arboretum, then composed seven tracks comprised of noises from the Arboretum’s soundscape. For the project’s exhibition, seven speakers were installed in the Arboretum at the respective spots from which each of the tracks drew. Visitors heard Aresty’s compositions amidst whatever noises (and other sensory elements) took place on the spot. Aresty’s aesthetic task, as she describes it, was to “bring these simultaneous yet distinct layers of sound into dialogue with one another” (“Notes”). “Contextual noise” (e.g., sounds, sights, tactile sensations) permeates the audio of a sound layer; more precisely, the sound layer is audio *plus* noise. The sound layer that each piece is *is* a singular performance that accrues at the interstice of the composed audio and the spontaneous aural-visual-tactile noises of blowing leaves, wildlife, nearby auto traffic, air traffic, fellow park visitors, etc. Aresty insists, “The pieces bring attention to the Arboretum’s dynamic soundscape, but also
depend on it to bring new life to each listening” (“Notes”). To close one’s eyes—straining to listen exclusively to the audio—would be the equivalent of bringing sheet music and earplugs to a concert.

In the spirit of Umberto Eco’s influential piece “The Poetics of the Open Work,” designers of layers (sound and otherwise) must learn to regard them as techno-geographic processes of production instead of finished products. In addition to being hermeneutically unbound, the musical compositions that Eco cites as open works actually distribute the act of arrangement to the initiative of the people who perform them. Rather than spelling out a well-defined arrangement of notes to be reproduced exactly in performance, open musical compositions are more like “a construction kit handed to the performer to assemble” (Eco 4). We might understand media files at the scene of layer-writing on this basis: as units of construction to be assembled by the autonomous movement of each listener/viewer relative to the real-time movement of geographical flows and other (non)human actants.

Accordingly, creators of site-specific soundscapes and more image-driven AR layers must make decisions about subject matter in two interrelated registers: (1) multimedia files, and (2) the locations or entities to which those files are attached or tagged. While plenty of relevant insights could be drawn from on-location filmmaking techniques, the Impressionists’ manner of selecting subject matter and conceiving of geographic milieus as aesthetic forces provides a productive heuristic for contemporary AR practices. For instance, important parallels abound between Monet’s reverence for relationality and several AR works created by artists of the Manifest.AR collective for the 2012 ZERO1 Biennial. Art historian John House characterizes Monet’s artistic evolution
around a pivotal shift in his choices of subject matter. As Monet’s career progressed, sky, water, fog, and patches of intense sunlight became “the keynotes of [his] paintings,” forming *kaleidoscopic* spaces in which the identity of any object diffuses (House 19). According to House,

[Monet] was insisting that the significance of the objects he painted lay in the relationships between them, in the multifarious elements which together went to make up the modern scene, and not in any external ordering process imposed by the artist in order to elevate one aspect above the others. (17)

For Monet, particularly in his later landscapes, sensation and mood intensify around places that generate their own abstractions and afterimages qua reflections, weather filters, and atmospheric movements. “Without the fog,” Monet wrote, “London would not be a beautiful city” (cited in House 29).

Beautification is not the principle aim of the Manifest.AR pieces on exhibit during the ZERO1 Biennial (with the exception of William Pappenheimer’s *Parking Lot Decorator*), but Monet’s relational scenes supply an artistic precedent for thinking about the selection of subject matter in the design of AR layers. The two AR works I comment on below—each of them set at computer company headquarters around Silicon Valley—forge kaleidoscopic spaces of sorts. In these cases, distinct from Monet’s technique, the identity of a place becomes diffused or compounded by the gravity of its relations to historical events, social issues, or environmental problems—relations that are insisted upon by the artists’ digital overlays, but not otherwise apparent to the casual observer.

Tamiko Thiel’s piece *Clouding Green* converts the findings of a Greenpeace report on hi-tech companies’ environmental impact into a series of locative data visualizations. Using a black-green color spectrum to indicate the degree of each
company’s impact, Thiel’s AR layers show a digital cloud in the sky above each headquarters, thus making the companies’ e-waste or clean energy practices an integral (or inescapable) element of their public image. *From Lewisburg, PA to Silicon Valley*—a collaboration between John Craig Freeman, Mark Skwarek, and Lily & Honglei—mobilizes a more complex matrix of history and geography. The juxtaposition between composed multimedia and the indexcality of the scene is visually striking but conceptually puzzling: sketched images of plainly dressed young men and women float in the air outside of Apple stores and Apple’s headquarters; their bodies upside-down and contorted, lacking any notable facial expression, they appear to be drifting whimsically through the scene like plastic bags caught in the wind. In notes on the piece, Freeman et al. describe the city of Lewisburg as a manufacturing mecca during the postwar era (“ZERO1”). Starting in the 1970, however, a critical mass of American companies began to move their facilities away from unionized towns like Lewisburg to “right-to-work” states, and later internationally to Mexico and China, in pursuit of ever-lower operating costs. Coupling this labor migration with the fact that China is now the world’s leading manufacturer of consumer electronics, one sees in these floating figures an intricate constellation of political and economic outcomes in which companies like Apple—and digital media consumers like us—are thoroughly implicated. As the user holds her iPhone up the Apple building, she beholds the displaced American workers whose factory jobs have been outsourced—and whose relatively high quality working conditions have been sacrificed—for the sake of high profits and low prices. The piece creates an exemplary kaleidoscopic scene of globalization that enmeshes now with then, here with there, and me with them.
Each of the AR projects I have discussed forecast rich democratic possibilities that might emerge with the spread of AR and ubicomp, which are not without hegemonic affordances, as critics so frequently note. Computing *en plein air* supports the production of multimedia amidst public spaces without physically altering or defacing a place’s material makeup. For this reason, the AR medium can support a much wider economy of contribution than other forms of place-based cultural expression. Paul points out that “so-called public art” typically relies on the authorization and limited funding of governments or other institutions; such terms and conditions variously constrict expression, and “[public art] has frequently been used by totalitarian regimes for propaganda” (404). Conversely, street art forms such as graffiti have long been illegal in most American cities; it would be unthinkable for graffiti artists or even mural painters to make works on the facade of the New York Stock Exchange.

The cultural significance of AR works may be akin to that which Stiegler attributes to video sharing sites, when he insists that YouTube and other Web 2.0 platforms “constitut[e] a radical novelty in the history of humanity” (“The Carnival of the New Screen” 52). After constructing an analogy between “scribal culture’ in ancient Mesopotamia and the “audiovisual scribes” of the twentieth-century culture industries, Stiegler locates the unique value of platforms like YouTube in their “bottom-up” approach to metadata, which “up to this moment…ha[s] always been executed in a top-down way” (“The Carnival of the New Screen” 52). Countering Habermasian concerns that image culture poses a fundamental threat to rational, democratic debate, Stiegler concludes that the separation of producer and consumer is not an inherent consequence of audiovisual media, just as the public sphere is not an automatic feature
of alphabetic writing and the printing press. Indeed, there was no public sphere in early scribal cultures. New media technologies appear to be evolving in ways similar to those of alphabetic writing, such that recent advancements seem to “deeply modify relations to the audiovisual temporal flux, allowing one to imagine the appearance of a more reflective and less consumerist gaze” (Stiegler, “The Carnival of the New Screen” 41).

From 1980s home video to contemporary AR browsers, an expanding range of people are becoming positioned to break down, manipulate, annotate, produce, and revise the audiovisual flux. That artists are pioneering much of the early innovative work in AR should come as no surprise, especially when we recall McLuhan’s observation that “it’s always been the artist who perceives the alterations in man [sic] caused by a new medium, who recognizes that the future is the present, and uses his work to prepare the ground for it” (“The Playboy Interview”). The AR medium supplies unique technological conditions that facilitate the rise of digital public spheres set in vibrant public places. Impressionist aesthetics, as I have suggested, provide digital artists, designers, and content producers—today’s en plein air avant-garde—with a rich art historical referent as they endeavor to see the world in the image of multimedia effects and develop principles for composing real-time mediascapes.
LIST OF REFERENCES


BIOGRAPHICAL SKETCH

John Tinnell was born in Asheville, North Carolina. He studied American literature and creative writing at Stetson University, earning his B.A. in 2007. After a year of teaching English at a Florida high school, he chose the University of Florida for graduate school and received a M.A. in English in 2010. Prior to receiving his Ph.D. in 2013, he published scholarly articles in *Environmental Communication, The Fibreculture Journal, Enculturation, Deleuze Studies, and Ecology, Writing Theory, and New Media: Writing Ecology*. His research leverages the rich legacies of poststructuralism and grammatology, in order to engage theoretically with avant-garde new media practices, as well as the rhetorical and aesthetic potential of cutting-edge cultural technologies. In the fall of 2013, he began his career as an Assistant Professor of English at the University of Colorado at Denver.