This article was downloaded by: [Concordia University Libraries]
On: 26 September 2012, At: 08:22
Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK

The Communication Review
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/gcrv20

Welcome to the Bubble Chamber: Online in the Humanities Today

Lisa Gitelman [a]

[a] Department of Media, Culture and Communication, Steinhardt School of Culture, Education, and Human Development, New York University, New York, New York, USA

Version of record first published: 12 Mar 2010.

To cite this article: Lisa Gitelman (2010): Welcome to the Bubble Chamber: Online in the Humanities Today, The Communication Review, 13:1, 27-36

To link to this article: http://dx.doi.org/10.1080/10714420903558647

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: http://www.tandfonline.com/page/terms-and-conditions

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

The Communication Review, 13:27–36, 2010
Copyright © Taylor & Francis Group, LLC
ISSN: 1071-4421 print/1547-7487 online
DOI: 10.1080/10714420903558647

Routledge
Taylor & Francis Group

Welcome to the Bubble Chamber: Online in the Humanities Today

LISA GITELMAN
Department of Media, Culture and Communication, Steinhardt School of Culture, Education, and Human Development, New York University, New York, New York, USA

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

New scholarly resources are undoubtedly helping to change the methods of inquiry in media history and the humanities more broadly. However, this essay raises the question of the ways in which they are also helping to change the substance of that inquiry. Any satisfying approach to this issue must entail multiple strands. The author uses an analogy to the field of particle physics to illustrate the multiple issues this question raises and to suggest some possible answers.

What does it mean to do media history in a digital age? Does it matter that primary and secondary sources are increasingly encountered online? Thank goodness they are online, yes, but does it matter? How? How will histories of analog media be restructured by digital contexts of inquiry? And how are digital media already structuring the ways their own histories can be told? Tough questions but important ones, as more and more archives are digitized and born digital, and as the World Wide Web increasingly becomes the instrument of first resort for searching and displaying research resources. If these issues don't seem pressing, consider what it's like to work in the thriving little subfield of book history these days. Indeed, one might ask, what does it mean to do book history in a digital age? How will histories of print be structured by digital contexts of inquiry? Not only do digital archives variously offer scans of printed pages as the pages themselves, but the very terms distinguishing the printed from the digital are mutual ones. That is, the printed and the digital are understood in terms of one other, as the logic of computation continues to

Address correspondence to Lisa Gitelman, Department of Media, Culture and Communication, Steinhardt School of Culture, Education, and Human Development, New York University, 239 Greene Street, 7th floor, New York, NY 10012, USA. E-mail: lg91@nyu.edu

spread.[1] By implication, book history is a thriving little subfield because the ever-more-massive digital regime has made some things about print easier to see and more interesting—more important—to study.

As I make these observations, I am investing in at least three assumptions. First, media are reflexive subjects of history. Knowledge of the past rests absolutely if intuitively on a shared understanding of inscriptive media that construct and delimit the historical record, on "the archive" and all of the medial conditions of "archive-ability." Second and related, as much as one might like to pretend otherwise, "media specificity" is something of a misnomer, an oxymoron, or impossibility. No text can be interpreted specifically according to its medium, since every medium—think of the printed and the digital—can only be understood in relation to its others. Varied and variable conditions of mediation make any medium knowable as such. And last, as I hope the breadth and abstraction of my terms—*media*, *book*, *history*, *digital*, *archive*—will help to suggest, the questions at stake are less about any single field or subfield than they are about the production of knowledge in general and about the humanities in particular, where "the humanities" is a shorthand for all of the disciplines and text-centered practices of understanding culture in time: disciplines such as history, English, and classics; and practices such curating, editing, and citing.

It turns out that there is little consensus about what distinguishes the humanities from other intellectual domains, even though (or to the extent that) it has long been agreed that the humanities—whatever they are—are in "crisis."[2] There is an attendant "crisis in tenure and publishing," acknowledged by many in the academy, and there is, at least coincidentally, what I'm calling the *ever-more-massive digital regime* (EMMDR). Though intuitive, the interconnections among crises and the EMMDR can be difficult to specify. Connections between digital media and the crisis in scholarly publishing alone are dynamic and complex. Some people see digital publication as a possible solution to the economic pressures that currently jeopardize the monograph. Others note the role that digital resources have played in creating those same pressures, as libraries commit dwindling budgets to digital subscriptions rather than books. Any detailed analysis of these and other multivariate conditions of crisis is well beyond the scope of this essay. Instead, I propose to step away from questions of political economy and the rhetoric of crisis as much as possible (and however artificially) in order to take a wide-angle, albeit sketchy, view of the current conditions of humanistic inquiry. In particular, I'd like to introduce an obviously imperfect analogy, one between the humanities today and the field of high-energy experimental physics during the 1950s and 1960s. My aim is to better understand the purchase of the questions I started with, questions about what difference it makes intellectually—what kinds of difference it makes—that the media and methods of humanistic inquiry are changing.

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

In a long article entitled "Bubble Chambers and the Experimental Workplace," historian of science Peter Galison (1985) wrote of the extended moment in high-energy physics when a new kind of particle detector—the bubble chamber—was developed for use in conjunction with particle accelerators such as the ones at the Lawrence Berkeley Laboratory and the European Organization for Nuclear Research (CERN, founded 1954). Before these new detectors, it was still possible for laboratory physicists to work alone or with small groups of collaborators. With the success of bubble chambers, however, and in keeping with big-science experience garnered by some during WWII, physicists soon worked collaboratively in giant teams involving thousands of specialists. Analysis of data required increasingly sophisticated computational tools, which, according to Galison, "reduced" the blizzard of pictures that the bubble chambers generated into meaningful results. Parts of the work could be delegated off site and around the globe, while the publication of results became increasingly collaborative, resulting in articles signed by hundreds of authors. By 1966, Galison related, "Changes had occurred in almost every respect" (1985, p. 309). Not only had the social organization of experimentation changed in tandem with instrumentation, but "the kind of physics question being asked" and even "the criteria of experimental demonstration" (Ibid.) had also changed.[3]

This relatively swift, wholesale transformation of experimental high-energy physics was neither the first nor the last such change to occur in the modern physical sciences, but it makes a compelling story, in this telling, because Galison is able to weave together three explicit and one implicit narrative strands. Explicitly, his is (a) a "history of physics questions and results"; (b) a "history of instrumentation" in particle physics; and (c) a history of the social organization of that discipline: how labor, expertise, resources, and rewards are distributed as well as where collaborations occur. Implicitly, it is also (d) a history of the ways in which those three vectors—questions, instruments, and social organization—"are bound together" in an ongoing dynamic (Galison, 1985, p. 355). One can see, by extension, that any account of disciplinary change must include all four strands in order to be persuasive. Nor is this a model limited to the sciences, because all fields—once one thinks about it—have their own dynamic interrelation among the questions that get asked, the instruments that get used, and the social organization that pertains. We don't usually think of the humanities as a domain in which instruments are used, but we should: There are writing instruments from the pencil to the PC, of course, as well as all of varied instruments of circulation and reception, transmission and storage, which are typically called "media." Media aren't exclusive to the humanities, of course, but they are integral to humanistic inquiry.[4] How, we must ask, is knowledge production in the humanities changing in relation to dynamic contexts both medial and social?

Here's my point: If humanistic inquiry of today in any way resembles physics of the 1950s and 1960s, then the World Wide Web is its bubble

chamber.[5] Similar to particle detectors, only infinitely more so, the Web is big. (Unlike particle detectors and more like CERN's new Large Hadron Collider, the Web is singular.) And the Web has been party to large-scale changes in both the social organization of the humanities and the questions that humanists are finding it interesting and important to ask.

In terms of social organization, a few cursory observations must suffice. Early observers noted that the World Wide Web was bound to have a leveling effect on the humanities, just as it would beyond the academy. Because online tools offer easier and broader access to primary and secondary sources, scholars at poorer institutions and those further from archives and libraries could compete with their more economically and geographically advantaged peers. Research in most fields within the humanities now requires fewer trips across campus to the library, fewer appeals for interlibrary loan materials, and fewer flights across country to an archive.[6] Because much of the ease of online tools resides in their search capability, scholars at the beginning of their careers can, in some measure, compete with those in their field who, by dint of longer study, have achieved greater familiarity with the relevant corpus. Having read a significant amount and being able to search a significant amount are not equal, of course, but online tools typically enable a form of searching that works the same for all users, no matter their familiarity with or privilege within the field (Ruhleder, 1995).

Clearly, however, decisive advantages do exist for some scholars by dint of institutional affiliation, particularly to the extent that so many online resources remain proprietary. Rich institutions can buy more and better access to databases relevant to more fields of inquiry, and rich institutions presumably have more of the computing power and personnel necessary to integrate resources into a more seamless research platform. Nor is institutional wealth the only variable. For example, pricing structures adopted by Project MUSE and JSTOR—two "essential resources" for journal literature in the humanities (Borgman, 2007, p. 214)—reflect assumptions about the research needs of students and scholars at different types of institutions:

> For research libraries, MUSE provides a comprehensive selection of top-tier, heavily indexed, and widely held journals. For undergraduate libraries, we combine the most widely held, heavily used, core general education titles. . . In addition, MUSE collections are a very economical and effective information literacy tool for secondary schools and community colleges. (Project MUSE, 2008)

Research universities pay the most for these resources, and they get the most. Colleges are presumed to be less well funded, and to require fewer titles beyond a certain core. JSTOR uses the Carnegie classifications for institutions and then divides them by enrollment size. A giant but impoverished state university pays more than an elite, endowed, liberal arts college. Far

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

from leveling the playing field, proprietary online resources such as these help to instantiate existing hierarchies among rich and poor, research and teaching institutions in ways that nonproprietary online resources do not.

If the organization of humanities scholarship thus remains marked by familiar vertical structures of privilege, what are the relevant horizontal structures? That is, do online resources help to account for greater degrees of centralization or collaboration, as the bubble chamber analogy might suggest? If one considers the production of online resources, then the answer is emphatically yes. The high cost of scanning has meant fewer, bigger vendors and unlikely partnerships (think of Google Books), whereas in other cases open-source models are inspiring broad collaborations (think of Zotero, or the Public Knowledge Project and Open Content Alliance). Likewise, the so-called digital humanities projects, which range from the earliest Web-based scholarly editions to today's data-mining engines, have inspired collaborative research teams that sprawl beyond the humanities to include programmers and information scientists.[7] Yet when one considers the typical user of online research resources, who proceeds according to what has been called the conduit model of humanities computing,[8] questions of centralization and collaboration remain open ones. Scholars in the humanities may all be using the same instrument—the World Wide Web—but theirs has remained the domain with "the lowest rate of co-authorship and collaboration of [all] the disciplines" (Borgman, 2007, pp. 219–220). The Internet has clearly improved scholarly communications, making the distances among scholars feel shorter, but research and publication, like the consequent rewards of tenure and promotion, are so far persistently individual.[9]

The client/server architecture of the Web itself has additional implications for the social organization of research in the humanities, at least because of the way it has helped to repattern what might be called the *geobibliography of research*. Where once scholars used and cited unique, local copies of published research resources—bibliographers might call them *tokens*—and cited them as representative of a whole class—bibliographers might say an edition or *type*—today scholars everywhere can all use and cite the same remote file online. Sameness now resides in the production and storage (and often ownership) of data on a server, and not in the look or locality of its reception on a client. Whether the source in question is a journal article in JSTOR, an out-of-print book on Google, or an orphan film from the Prelinger Archives at archive.org, that source has been digitized from a unique copy, a token, that the digital file now represents. Whether or in what degree different scholars experience the digital image on their screens as the token itself or as a representation of that token (and more similar to a type?) remains obscure. It seems likely that scholars experience the image on their screen as a token and a representation, in which the interplay of those alternatives remains in flux according in part to the research questions at stake. The representational quality of digitized resources

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

remains vexed, in other words, as researchers often treat them as if they were self-identical with the sources they digitize and yet sometimes need to treat them as if they were not. There's nothing wrong with this, it's just different, and pulls against questions of horizontal organization in ways that seem important to acknowledge.

Although it's easy to feel overwhelmed by increasing mountains of data, as more and more is digitized, digitization can also be seen as a form of what Galison calls *data reduction*.[10] At the simplest level, digital sources are often consulted in "lossy" formats, compressed or otherwise shrunk for ease of transmission and storage. And even as information may be missing, digitization forecloses the tacit knowledge that accrues by dint of the medium digitized. (Think of that book historian using Google Books or that film historian using archive.org.) The most pervasive foreclosure of this sort is probably the elimination of clues that point toward missing material. As Christine Borgman noted, "Missing parts are much easier to notice in physical objects" (2007, p. 217). And if missing parts are harder to see online, missing wholes are too: that-which-has-not-been-digitized is rarely represented online. The online journal literature is marked by visible gaps and bordered by publisher-protective *moving walls*—intellectual property structures that keep current journals offline for a specified period to protect the publishers' interests—but the partialness of other literatures and the irregular erosion of that partialness is all but impossible to grasp.[11] The category of the not digitized, the not yet digitized, or the not as digitized includes most manuscripts (not to mention images), which have less value to the producers of databases because they can't be rendered searchable using optical character recognition (OCR) scans. The category of the not digitized also includes all of the decisions—editorial as well as technical—that have gone into producing the resource in question. "In direct contrast to a textual edition with explanatory notes in the introduction" wrote Karen Ruhleder, "these decisions about the construction" of online resources are hidden from view, buried in "about" pages or simply left unsaid (1995, p. 53).

Using online resources—always so ungraspably and changeably partial—thus works in the humanities as a subtle irritant, an unnoticed abrasion of the hermeneutical tradition, which has naturalized coherence and unity as tacit indices of textual authority.[12] As a salve and as compensation the EMMDR offers searching: the staggering ease of access that gratifies users of the World Wide Web with search results or hits in response to queries. Resources for the study of early American history and culture, for example, seem to scholars in that field to have recently reached a critical mass, to the extent that online primary sources are encouraging "new questions" (Gustafson, 2006, p. 207)[13], at the same time that they are "inspir[ing new] ideas" (Davidson, 2003). Anxieties persist that the humanities may benefit less from online searching than other fields (Borgman, 2007, p. 219), yet here already is an intimation of the sorts of changes Galison identified with the adoption of bubble chambers.

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

How is online searching helping to change the content and contours of the humanities, the questions that seem interesting and important to ask and thence the knowledge that is being produced? Although changes must vary by field, we might speculate that online searching is bound to diminish the prestige of finding things, to the extent that the World Wide Web makes the same archive readily available to all (Ruhdler, 1995, p. 51). (Also, because proprietary resources are not available to all, a particularly twisted economy of prestige may be emergent: scholars with less access have a harder and harder time accomplishing what is less and less prestigious.) Some users may be better at using online searches than others, but changing notions of findability are broadly shared. We might speculate that finding an out-of-the-way instance, or even a pattern of instances, does not earn a scholar as much credit as before, at the same time that finding instances and patterns of instance remains a core practice of humanistic inquiry, whether one thinks of finding primary sources to analyze or secondary sources to engage. By implication, if less academic capital accrues by dint of finding instances, relatively more academic capital must accrue by dint of using what is found, in which using involves all of the interpretive skills, habits, and values of the different fields and the different communities of practice within and among them.

We might speculate further that finding instances online—no matter its dwindling prestige—may be narrowing what counts as instance. Researchers specify search terms and search strings, whereas programmers devise what are called *keyword-in-context* and *term extraction* analyses to mine data (Cohen, 2006).[14] Instances are increasingly constructed according to diction, in other words: they are found as instances because they have certain words or groups of words in them or indexing them, and not because they contain any identifiable style, figure, or form of argument. Philology trumps rhetoric. Word trumps image. There is nothing surprising about this, but it may involve unnoticed assumptions that tend to be "actuarial" in Lauren Berlant's phrasing, because they concern the "adequacy of an object to bear the weight of an explanation" (2007, p. 666).[15] Berlant is writing specifically of the case rather than the instance here, but the difference is merely one of scale in many cases, in many instances. Constructing the instance according to diction helps shape the local architecture of explanation, where one type of event—the linguistic event—occludes all others. Searchable character strings increasingly mark by default the "detail that captures the interpretive eye" (Berlant, 2007, p. 670). This suggests nothing less than a subtle reengineering of explanation within the humanities—a subtle reengineering of the logic of "for instance" as it inhabits the logic of "making a case for" something.

That the instance can be imagined as data is itself new in many fields within the humanities, and we must wonder at the difference that makes. We have become practiced in the belief that imagining media *circulation* and

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

its conditions is constitutive of imagined communities or identities. (This is Benedict Anderson's "print capitalism," for one.) What is the imagination of media *storage*, of data, constitutive of by contrast? Every discipline and disciplinary institution has its own norms and standards for the imagination of data, just as every field has its accepted methodologies and its evolved, evolving structures of practice. *Data* and *datum* are from the Latin verb "to give": I'm suggesting that as humanists, we now need to ask what "givens" attend the data we enter, the data we manage, the data we mine, and the data we visualize. How do different World Wide Web–based vendors—such as Google, JSTOR, EBSCO—imagine data for us (imagine us as data?), and how does searching online depend upon different, vernacular, ad hoc imaginaries cobbled for the occasion by every user according in part to disciplinary frames? Foucault may have "destroyed the innocence of the archive" (Appadurai, 2003, p. 18)—but it's the putative innocence of the database that is testing us today.[16]

As imperfect as it certainly is, the World Wide Web/bubble chamber analogy has some strategic value to the extent that it helps to discern the humanities broadly as a collaborative endeavor, one that constructs its objects of study in common and according to the organization of communities of practice and the World Wide Web–based tools that they use. The same kind of thinking has lead Alan Liu by a different path to what he has serendipitously called the paradigmatic method of the humanities: the "method of *bubble universes*." This is a method of the New Historicist anecdote "as random access" (Liu, 2008, p. 259), the New Cultural History micro-case, the formalist close reading, and similar mediated, data-like structures of analysis—like the lyric and the document[17]—each instance of which can whisper with the voice of a particular field of study, "this has a microdesign that feels like it might be part of a broader pattern. What does . . . history look like if we filter it through that microdesign?" (Liu, 2008, p. 24, p. 259). Paying attention to what counts as instance, and how instances habitually get deployed in arguments stands to tell us much about the labors and disciplines of humanistic inquiry as labor and discipline continue to evolve according in part to changing conditions both medial and social.

Last, the bubble chamber analogy may have additional strategic value if it helps to promote the subject of knowledge production as corollary to the subject of equal access. Arguments for the openness of online standards, platforms, programs, and resources rightly focus on "digital divides," on the patterns of unequal access that currently mark the digital regime. These arguments are important. Inequality is bad. Yet getting beyond questions of access to questions of knowledge production—what counts as good physics, what counts as good media history—adds fuel to the fire. Users don't need access for its own sake; they need it because it matters to what we know.

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

NOTES

1. See Golumbia (2009). In what follows I will refer—wryly—to the increasing availability of digital resources and to the pervasive cultural logic Golumbia explores as an *ever-more-massive digital regime*.

2. Harpham (2005) is a great place to start thinking about the humanities and their putative crisis, and his essay is joined by many helpful comments and rejoinders in this special issue of *New Literary History*. The "crisis in tenure and publication" is Jerome McGann's phrasing from this issue and elsewhere, referring in part to a letter (which identifies a "serious problem," not a "crisis") sent by then-MLA-president Stephen Greenblatt to members, May 28, 2002; see "A Special Letter from Stephen Greenblatt" (http://www.mla.org/scholarly_pub); see McGann (2005).

3. See also Galison (1997).

4. I've tried to make this last observation clear in Gitelman (2006) especially pp. 5–12.

5. The World Wide Web has also been an important instrument in high-energy physics—it was developed first at CERN in 1990—but that's another story. Of related interest is the new Worldwide Large Haldron Collider Computing Grid, an infrastructure designed to handle the data output of the new Large Hadron Collider.

6. For the most part, the discussion that follows will consider digitized resources rather than those that were born digital. Both are worthy of consideration but would require much more space than available.

7. Elena Razlogova was very helpful in making these points.

8. For an appeal to conduit and other models of humanities computing, see Bradley (2005).

9. To the extent that every individual's publication depends upon the work of others, we need to wonder too about more tenuous, second-order collaborations. Are online resources encouraging scholars to cite more widely, connecting to the work of others, or to cite more deeply, connecting to older work than they might have before? Analyses of citation patterns have so far offered mixed conclusions on these points while at the same time demonstrating the pitfalls of citation analysis as a method adequate to an understanding of the humanities. Such studies typically confine themselves to journal literature and are thus imperfect in fields that remain structured by the monograph (Borgman, 2007, p. 215). Any casual use of the Arts & Humanities Citation Index (a Thompson Reuters product) will demonstrate its inadequacy as an encapsulation of scholarly activity in the humanities. Even with regard to the sciences, scholars dispute the presence of a "long tail" effect; see Rebecca Tuhus-Dubrow for an overview, "Group Think: The Turn to Online Research is Narrowing the Range of Modern Scholarship, a New Study Suggests" in the *Boston Globe*.

10. Not on the scale or with the sophistication that the bubble chamber required, certainly, but data reduction nonetheless; see Galison (1985, pp. 340–346).

11. As Ruhleder observesobserved, the problem with gaps "lies not so much in what the system does or does not include . . .[as] in individuals' willingness to use these systems as though these limitations did not exist, their inability to recognize these limitations in the first place" (2007, p. 59).

12. I'm thinking of Foucault's treatment of St. Jerome (1984, p. 111).

13. Gustafson suggests that one result of the "new questions" and speed of searching is that the relative cultural weight of different periods may change as—for instance—early American studies starts to cut a new figure within textual studies, one that it has previously lacked (pp. 207–211).

14. For more on data mining, see. Pasanek and Sculley (2008). I am grateful to John Unsworth for directing me to this article.

15. With this insight, Berlant introduces two special issues of *Critical Inquiry* on the concept of the case. Although she is here (on p. 666) she is distinguishing the case from "a merely gestural instance, illustration, or example," I am not persuaded that case and instance necessarily differ in kind.

16. Manovich (2001) offers an initial and important argument for the complexity and efficacy of "database logic."

17. These are Liu's examples until the lyric and the document. On the lyric particularly, see Jackson (2005). I consider the document as such in Gitelman (2006).

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

Downloaded by [Concordia University Libraries] at 08:22 26 September 2012

REFERENCES

Appadurai, A. (2003). Archive and aspiration. In J. Brouwer, A. Mulder, & S. Charlton (Eds.), *Information is alive* (pp. 14–25). Rotterdam, The Netherlands: V2_/NAi Publishers.

Berlant, L. (2007). On the case. *Critical Inquiry*, *33*, 663–672.

Borgman, C. (2007). *Scholarship in the digital age: Information, infrastructure, and the Internet*. Cambridge, MA: MIT Press.

Bradley, J. (2005). What you (fore)see is what you get: Thinking about usage paradigms for computer-assisted text analysis. *Text Technology, 14*(2), 1–20. Retrieved January 21, 2010, from http://texttechnology.mcmaster.ca/archives.html

Cohen, D. (2006). From Babel to knowledge: Data mining large digital collections. *D-Lib Magazine*, *12*(3). Retrieved January 21, 2010, from http://www.dlib.org/dlib/march06/cohen/03cohen.html

Davidson, C. (2003). Tales from the vault: From moveable type to searchable text. *Common-Place 3*(3). Retrieved January 21, 2010, from http://www.common-place.org

Foucault, M. (1984). What is an author? In P. Rabinow (Ed.), *The Foucault reader* (pp. 101–120). New York: Pantheon.

Galison, P. (1985). Bubble chambers and the experimental workplace. In P. Achinstein & O. Hannaway (Eds.), *Observation, experiment, and hypothesis in modern physical science* (pp. 309–372). Cambridge, MA: MIT Press.

Galison, P. (1997). *Image and logic: A material culture of microphysics*. Chicago: University of Chicago Press.

Gitelman, L. (2006). *Always already new: Media, history, and the data of culture*. Cambridge, MA: MIT Press.

Golumbia, D. (2009). *The cultural logic of computation*. Cambridge, MA: Harvard University Press.

Gustafson, S. (2006). The emerging media of early America. *Proceedings of the American Antiquarian Society*, *115*, 205–250.

Harpham, G. (2005). Beneath and beyond the 'crisis in the humanities.' *New Literary History*, *36*, 21–36.

Jackson, V. (2005). *Dickinson's misery: A theory of lyric reading*. Princeton, NJ: Princeton University Press.

Liu, A. (2008). *Local transcendence: Essays on postmodern historicism and the database*. Chicago: University of Chicago Press.

Manovich, L. (2001). *The language of new media*. Cambridge, MA: MIT Press.

McGann, J. (2005). Information technology and the troubled humanities. *TEXT Technology, 14*(2), 105–121. Retrieved January 21, 2010, from http://texttechnology.mcmaster.ca/pdf/vol14_2/mcgann14-2.pdf

Pasanek, B., & Sculley, D. (2008). Mining millions of metaphors. *Literary and Linguistic Computing*, *23*, 345–360.

Project MUSE. (2008). *About MUSE*. Retrieved November 1, 2008, from http://muse.jhu.edu/about/muse/index.html

Ruhleder, K. (1995). Reconstructing artifacts, reconstructing work: From textual edition to on-line databank. *Science, Technology, and Human Values*, *20*(1), 39–64.