



The Materiality of Digital Collections: Theoretical and Historical Perspectives

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abstract: Digital and textual objects are coming under a new kind of scrutiny as scholars are becoming more interested in physical artifacts and their relation to their social and cultural environment. This study of material culture suggests a need to explore the nature of digital materiality, as well as the broader historical context in which electronic objects and collections are created. The following essay analyzes the implications of this work and related research into the ways in which knowledge is shaped by the technologies used to produce and distribute it. Understanding the materiality of digital and textual objects will be crucial for charting the future of libraries.

Introduction

In the last few years, theorists have developed new approaches to describing digital objects—including texts, images, and databases—by focusing on their material characteristics. In a variety of disciplines, scholars are studying material culture and exploring the concrete world of bodies, commodities, and things. Their interest lies in the myriad ways humans are shaped by their physical environment. Studies of material culture address such things as shopping malls, theme parks, fast food, Barbie dolls, G. I. Joe figures, gravestones, tattoos, quilts, and clothing. The assumption is that human-made objects both reflect and shape those who design, make, and use them. Similarly, historians of the book concern themselves with such things as cover design, typeface, and page layout to understand how books are made, distributed, and read. Scholars studying the material aspects of digital objects are developing new concepts and theories to explain how the properties of electronic objects alter our ways of creating and consuming information. Critics have also developed new historical perspectives on digital objects by analyzing them in the context of other modes of information transmission and by considering how knowledge is shaped by the technologies used to produce and distribute it.

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Early theorists of the electronic environment made much of the ostensible immateriality of digital objects. More recently critics have acknowledged that electronic objects are as dependent upon material instantiation as printed books. We access electronic texts and data with machines made of metal, plastic, and polymers. Networks composed of fiber optic cables, wires, switches, routers, and hubs enable us to acquire and make available our electronic collections. Why does this matter to libraries? As we preside over the explosive growth of digital content, we cannot simply ignore what these material changes mean for our users or ignore what the long term impact will be on the scholarly community. Our evolving collection practices promote new ways of conducting research and limit or constrain others. We must try to understand the implications of our decisions as we allocate our resources and decide what to acquire. If the role of academic and research libraries is to support and facilitate teaching and research, we must understand the nature of the objects we provide to support those activities.

Electronic Objects are Material Objects

In the past few years, writers such as N. Katherine Hayles, Matthew Kirschenbaum, and Joanna Drucker have been demonstrating the ways in which our understanding of both print and electronic objects has been constrained by an emphasis on their immateriality.¹ These writers argue that we have failed to grasp the distinction between electronic and other media and thus misunderstand the nature of both print and digital objects. Their concern with what they call electronic textuality evolved out of the textual studies community with its early emphasis on printed texts. Over time and under the influence of cultural studies and postmodernism, the definition of text has expanded to encompass many cultural objects including databases, software programs, video games, hypertext novels, film, television, radio, and e-mail. It is now widely understood that texts include verbal, visual, numeric, and oral information. Textual scholars have been developing ways to think about and analyze texts since medieval times. When those methods are adapted to examine electronic artifacts, they necessarily imply a historical perspective and provide a richer context for understanding contemporary developments.

Because textual scholarship addresses the physical aspects of texts, critics like Kirschenbaum and Drucker have declared its relevance to the electronic environment. When studying the history of the book, attention to materiality means analyzing such things as typography, binding, illustrations, and paper to understand their role in the creation of meaning. In a world of digital artifacts, textual scholars may consider a whole new range of physical objects and processes, including platforms, interfaces, standards, and coding.² A critical focus on electronic objects has also meant a rethinking of the importance of the visual and a new concern with the graphical elements of textuality. The pictorial turn we have witnessed on the Internet has been made possible by material changes like the growth in bandwidth and by data compression algorithms that have fed the explosion of visual and multimedia content.³ Critics are thus exploring how images are read, studied, and understood.

In a similar vein, critics are also concerned with the role of collage and remixing in the electronic environment. Material differences between print and electronic media can be seen in the ease with which the elements of digital objects can be manipulated, combined,

and rearranged, allowing for new modes of textual creation. Lawrence Lessig has been celebrating the artistic benefits of this new cut-and-paste culture while deploring the dangers of a copyright system that evolved with print and that may criminalize creative reuse, recombination, or transformation of others' work.⁴ William Gibson traces the roots of remix culture to sampling in the works of William Burroughs, Marcel Duchamp, and Jean Luc Goddard; but he also recognizes that the scale of these activities has risen exponentially in the electronic environment. The tools to cut, paste, and collage are, as he points out, built into the operating system of his Apple computer. As Gibson phrases it, "The remix is the very nature of the digital."⁵

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The Medium is the Message

A simple example of how the physical or material constraints of technology shape content is cell phone messaging. Because cell phone screens can display only limited amounts of text and because cell phone touch pads are more constraining than standard keyboards, a whole new genre of text-messaging has arisen, related to, but distinct from, computer text-messaging. Central to this genre is the extreme compression of text using contractions, abbreviations, acronyms, and emoticons. Any content, whether print or digital, is subject to the physical limitations of the technology used to produce and distribute it.

N. Katherine Hayles is one of the most well known theorists writing about the physical and material properties of electronic objects. She claims that the meaning of a work, whether print or electronic, cannot be separated from its physical manifestation.⁶ A reader, viewer, or listener's experience of a text is shaped by its material characteristics. As an example of this inseparability of form and content, Hayles cites the different navigational features of realistic novels and encyclopedias. The distinctive physical organization of novels and encyclopedias is crucial to how they are read and the purposes they are meant to serve. In a similar fashion, the structure and organization of hypertext documents are central to what they mean and how that meaning is conveyed. As Hayles puts it, navigational features do not merely provide pathways through a text; they are "part of a work's signifying structure."⁷

Since medium shapes content, theorists are asking what it means to translate content from one medium to another. Joanna Drucker, a book artist, experimental poet, and theorist, explores what happens when a printed text is converted to an electronic one. Drucker finds that the information of a text is much more than a progression of words or numbers. For both print and electronic objects, "the structure or configuration of a text" functions as information, and it is this information that may not translate well between media.⁸ Drucker demonstrates how graphical form or textual configuration does not only contain meaning but also creates it. She describes a number of printed works that include visual elements that can be reproduced as images but present challenges to digital encoding. Drucker asks whether this means that what is required is "a higher level of

code or programming...or whether the very process of transformation" into electronic form "is an intervention in the ontological identity of a text."⁹ If so, it would create a new object that by definition cannot be identical with the original. If print and electronic

versions are different objects, we should not treat them as if they were interchangeable.

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Literary critics have long been arguing that original texts, whether manuscript or print, cannot be fully translated into digital formats or microformats. The Modern Language Association has issued a "Statement on the Significance of Primary Records" that declares that physical artifacts provide forms of evidence that cannot

be gleaned from mere reproductions.¹⁰ A series of essays supporting this argument appears with the statement.¹¹ The authors of these essays describe specific instances in which access to original manuscripts or particular print editions provided them with evidence unavailable through reproductions or other editions.

If translating print into other formats involves a loss of meaning, objects that are born digital may suffer a similar fate when reproduced in print. Drucker not only investigates how digitization alters printed texts; she explores the difficulty of trying to replicate digital objects in other media. Drucker describes the work of three poets, Loss Pequeno Glazier, Jim Rosenberg, and Charles Bernstein, who create electronic poetry through the placement, layering, and transposition of text. In such cases, Drucker claims that the "visual configuration of the text is the text."¹² Print reproductions cannot capture these effects. Drucker's argument resembles Hayles'; something is always lost in translating a text from one medium to another because the form itself is part of the meaning. Both Drucker and Hayles insist that we must understand that works or texts are not immaterial essences that exist independently of the media in which they are instantiated. This is an argument we have been hearing in one form or another since Marshall McLuhan proclaimed roughly 40 years ago that the medium is the message.¹³

Content Management Misstates the Issue

But some librarians are not heeding this message. Recently a case has been made in the professional literature that librarians should replace collection management with an ostensibly more relevant content management. Among those arguing for a content-based approach, John Budd and Bart Harloe claim that "there needs to be a transformation, characterized by a new vocabulary, from a concentration on the thing (the book, the article, the Web site) to the content communicated"; the "medium, then, is not exactly irrelevant..., but it is certainly of secondary, if not tertiary, concern."¹⁴ This argument, made in an article published in 1997, continues to be favorably cited in discussions of the future of collection development.¹⁵

There are several problems with such an approach, including its very name. When one calls collection management "content management," librarians are encouraged to think about content in the abstract, as if it existed apart from any particular physical embodiment. Budd and Harloe claim that librarians should choose the most appropriate

format for the delivery of content, but even this language obscures the extent to which content is shaped by format. Budd and Harloe may acknowledge that “the medium does affect the message,” but they also object to the ways in which traditional librarianship is “entrenched in the management of physical artifacts.”¹⁶ What gets missed in this explanation is that electronic objects are physical artifacts, and we will better understand them if we come to terms with the nature of their materiality. The term “content management” suggests that we have somehow moved beyond mundane considerations of physical reality when, in fact, the electronic environment introduces a whole new set of questions about the material aspects of library collections.

The vocabulary of content and container is misleading because it suggests that these can or must be considered separately. This way of framing the discussion about the transmission and distribution of digital objects is being contested by a growing literature outside of library and information science (LIS) that argues that there is no textual object apart from any particular instantiation. In book history, media studies, and the digital humanities, many critics have abandoned the notion that text or content can exist in some pure platonic form ready to be poured into whatever format or container is most convenient. Collection librarians must remain sensitive to the implications of format decisions because format inevitably shapes content. A new field of scholarship is exploring precisely this question of how knowledge is shaped by the means through which it is developed and transmitted.¹⁷ I will be discussing some of this scholarship later in this essay. In any case, this is not a moment to be pursuing something called “content management,” when its name suggests a diminished concern with the implications of format and less appreciation of the physical artifact.

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“The Tactile Fallacy”

From a library perspective, materiality has its own unique implications. In the past, questions about the materiality of textual objects have mostly concerned librarians insofar as they might influence the ways in which these objects lend themselves to being acquired, classified, preserved, and made accessible. The structures and functions of modern libraries have been designed to accommodate discrete physical objects that can be selected, purchased, cataloged, shelved, circulated, and preserved according to systems developed over many generations. In the case of printed books and journals, microforms and even CDs and DVDs, one is dealing with objects that can be held in one’s hand, that can exist in only one place at a time, and that, whatever their physical manifestation, have distinct boundaries. This is not the case with networked electronic resources.¹⁸

A primary characteristic of networked information is that it is not apparent nor does it matter to the user where and on what computer the information resides. An electronic document owned or housed by a library can be accessed simultaneously by

dozens of users on different continents. To libraries this may well look like a form of immateriality, but Matthew Kirschenbaum has described this as “the tactile fallacy,” the assumption that electronic objects are immaterial because we “cannot reach out and touch them.”¹⁹ In order to illustrate this abiding materiality, Kirschenbaum describes an early set of instructions that the Department of Defense (DOD) provided for destroying classified electronic documents. Options provided by the DOD include simple overwrites involving overlaying random information on data to be eliminated; degaussing, which involves neutralizing the magnetic fields on data storage media; and, finally, an option to “Destroy—Disintegrate, incinerate, pulverize, shred, or smelt.”²⁰ The physical processes required to destroy electronic objects attest to their stubborn materiality.

Format Matters

The database *Early English Books Online (EEBO)* provides an interesting demonstration of the importance of physical format. *EEBO* contains digital images of printed works that were originally produced between 1473 and 1700.²¹ The project has a long history beginning with the release in 1938 of microfilm versions of a group of these texts. In 1998, a subset of this microfilm was digitized, creating an online database comprised of reproductions of the microfilm images of the pages of roughly 100,000 works printed before 1700. Both the database and the microfilm set enable researchers to see what the actual pages of these works look like. However, those unfamiliar with early typography and spelling may find it difficult to read this material, either on a microfilm reader or on a computer screen. Moreover, as the texts in the electronic database are merely digital reproductions of page images, they, like the microfilm versions, are not searchable except by author, title, and a limited number of subject headings.

This situation led to the creation of yet another version of some of these texts. For this newer database the texts have been keyed in by hand so they can be read more easily on screen and so they are fully searchable.²² The works included in this database thus exist in four different material forms: as original pre-1700 books and pamphlets, as microfilmed reproductions of the originals, as digitized versions of the microfilmed images, and as keyboarded versions of the digital images.

Why are there four different instantiations of the works in the *EEBO* full-text database? These exist because different modes of material embodiment produce different objects. Many researchers simply cannot get access to the print originals. Microfilm provides access for much greater numbers of users than could ever examine the print versions; digitization generally provides even broader accessibility. But consulting a page in a 400 year-old book, deciphering a microfilmed image of that page while sitting at a microfilm reader, deciphering a digital image of that same page on a computer screen, and reading a modernized digital version of that page on screen are significantly different experiences.

Roger Chartier, who applauds the benefits of widespread digitization, nevertheless declares that it is “fundamentally wrong” to assume “an equivalence between media and that a text is still the same regardless of its form: printed, microfilmed, or digital.”²³ Chartier claims that it is essential to preserve the ability “to consult texts in their successive forms.”²⁴ To lose access to original texts, whether canonical or mass produced, is to

risk “losing the intelligibility of a textual culture that is inseparable from the objects that have transmitted them.”²⁵ Databases like *EEBO* provide tremendous value to libraries, but it is crucial that we understand that multiple versions of texts are not interchangeable and that responsible decisions about what to purchase, keep, or discard must be made with these factors in mind.

Librarians seeking to license, acquire, organize, provide access, and preserve digital objects are in a position to develop their own understanding of these objects that may differ from those of theorists of electronic text and from those of scholars creating electronic texts. Unfortunately, this may sometimes translate into the assumption that libraries simply cannot afford to maintain both print and electronic versions, that they cannot afford to create the kind of metadata for electronic objects that they do for print objects, or that they have neither the money nor the know-how to archive electronic and mixed media productions. In addition, some librarians are rushing to identify funds that can be freed by canceling print subscriptions that are duplicated in electronic formats. Others are eager to jettison paper back-files in order to free up shelf space without much consideration of the reliability of the back-files or the digital archive. This represents a significant shift on the part of the library community away from its commitment to preserving the historical record.

Moreover, there is a tendency among many libraries that purchase electronic texts or databases to simply accept whatever metadata the vendors provide, to create their own absolutely minimalist metadata, or to forgo it entirely. Given the much greater level of metadata libraries provide for print objects through, for example, Library of Congress cataloging data, this represents a tremendous retreat from earlier standards of bibliographic control. Does the putative immateriality or ephemerality of electronic text function as an excuse for different standards of bibliographic access? Is this because we can claim that the items are not really in our libraries, at least not in the way printed objects are? Or is it that in a world dominated by Google, we have come to question whether easy access trumps more sophisticated access? Have we already made the decision to forgo the level of bibliographic control that is possible in the print environment but not possible or not yet possible in the electronic environment?

I am not arguing that we can or should save everything or provide full bibliographic description of everything we own or access. I do see, however, a need for much more careful weighing of the issues involved in our decisions about what to keep and what formats to keep them in, as well as a consideration of how much metadata to provide. An important first step is an acknowledgement that print and electronic versions of books, journals, and documents are not fully equivalent. There are times when electronic versions of print books and journals may be adequate substitutes; there are times when they clearly are not; and there are times when this determination requires a certain amount of investigation. In fields like art and architecture that rely heavily on the reproduction of images, scholars and researchers often require access to print subscriptions. In other fields, electronic subscriptions may provide access to multimedia content or graphics that are superior to anything that can be produced in print. Format decisions must be made by staff prepared to carefully consider these issues; and decisions must often be made on a title by title basis. A crucial factor in any decision to retain electronic-only subscriptions should be the availability of digital back-files, their equivalence to the

print version, their long-term sustainability and the functionality they may be able to provide 50 or even 100 years hence. Although there are many players now serving up

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electronic content, libraries have a unique responsibility to ensure the integrity of the historical record regardless of format. We abandon this responsibility at our peril.

Platform Dependence and Cultural Apocalypse

Some librarians and archivists are attempting to find ways to preserve and provide sophisticated access to digital objects. But the materiality of these objects forces them to confront two kinds of obstacles. As physical artifacts, digital media are prone to degradation over time. This kind of disintegration is sometimes called bit rot or data rot. A more critical obstacle to preservation is that a particular document or digital object may no longer be accessible because the machine or platform on which it was created is no longer viable. Digital media are often dependent on particular configurations of hardware and software. This platform dependence is both a manifestation of their materiality and a challenge to their preservation.

Novelist Bruce Sterling addressed this issue in a talk he gave at a conference for designers of computer games. Sterling summed up the stakes involved in platform dependence when he declared, "Don't tie my words and thoughts to the fate of a piece of hardware, because, hardware is even more mortal than I am."²⁶ Sterling claimed that the obsolescence of platforms would eventually lead to the inability of game designers to access and experience the work of their predecessors. He proposed that the lack of artistic respect accorded computer games might be attributable in part to the instability of the medium, and he declared that "every time a platform vanishes it's like a little cultural apocalypse."²⁷ The challenge for libraries is to find ways to preserve platform dependent digital works and to prevent the loss of complex digital media. Again, since we cannot possibly save everything, we need to carefully consider which digital materials are the most important to preserve and try to anticipate the needs of future scholars and researchers.

The simplest form of digital preservation involves saving content by storing the bits independently of whatever hardware or software are used to display or configure it. The problem with this approach is that the more complex the digital object, the less effective this strategy becomes. Even reasonably simple Web sites, for example, lose their defining characteristics as hyperlinked documents if their content is merely saved as discrete bits of information. A truly effective preservation strategy would allow future users to consult a Web site, a document created in an obsolete word processing system, or run a program or a simulation and have them all look and feel just as they did to their original users. The Internet provides dynamic content, including sound, motion, and hyperlinks. Preserving this content as a series of separate files would strip it of precisely those characteristics that distinguish it from the more fixed and stable technology we know as the printed book.²⁸

“Print is Flat, Code is Deep”

Examining our assumptions about the distinctions between digital and print objects as well as the metaphors we use to describe them may allow us to make more informed collection decisions. Espen Aarseth has pointed out that one major difference between print and digital media is that the book both stores and delivers text, whereas the computer distributes these functions.²⁹ To put it another way, the storage and display of electronic texts are separate processes. The content or text of a book cannot be separated from the physical object that houses it. As Mats Dahlström puts it, digital texts are not “absolutely fixed to their carriers, are transportable between carriers, machines, environments and file formats.”³⁰ Moreover, the computer has the additional capacity to process and manipulate text and data. Books and computers store, display, and distribute text in very different ways. Yet, as Paul Eggert makes clear, “Whether the textual carrier be the physical page, a computational capacity, or the sound waves that transmit orally declaimed verse, there is always a material condition for the existence of text.”³¹

In order to address the material differences between print and electronic objects, Hayles proposes what she calls media-specific analysis premised on the notion that “all texts are instantiated and that the nature of the medium in which they are instantiated matters.”³² Hayles goes on to describe some of the qualities of electronic texts that distinguish them from printed texts.

One major distinction is the dynamic nature of computer images that are constantly being refreshed even to project an ostensibly stationary text on screen. In a printed book, each page can be seen at once in its entirety. This is not necessarily the case with a page or image projected on a monitor. Computer coding allows for the layering of images and the movement of those images. New text or images may appear by moving a cursor or without any intervention on the part of the user. Moreover, the coding of a page remains largely invisible. Hayles thus declares that “print is flat, code is deep.”³³ Others have used a similar metaphor, describing electronic texts as having a kind of verticality in their coding structure: “Beneath the alphanumeric language of the electronic text proper are layers of alphanumeric codes, from the system software of the computer to the word-processing programs or software packages in which the linguistic text was generated and through which it is being read.”³⁴ Even simple programs may be hundreds of functions deep.

Hayles contends that electronic texts are bilingual—that is, they are written in code as well as language. This code is itself a kind of language. The text we view on the screen is “logically, conceptually, and instrumentally entwined” with the programming code that produces it.³⁵ Moreover, a growing number of theorists are suggesting that computer coding should be treated as an extension or component of text and that we need to develop techniques to analyze code as we do other cultural artifacts.

Hayles argues that we will understand digital objects better if we view electronic textuality as a process—one that involves a variety of machine functions. When a user summons a text to her computer desktop, it comes into existence “as a process that includes the datafiles, the programs that call these files, and the hardware on which the programs run, as well as the optical fibers, connections, switching algorithms and other devices necessary to route it from one networked computer to another.”³⁶ All of these

work together to assemble and instantiate a text that is otherwise invisible and exists in a dispersed fashion, whether or not it is housed on a single machine. The material complexity of digital objects warrants as much scrutiny as historians have accorded the technology of the book.

Part of this complexity involves the computer interfaces that create our experience of the digital world. Søren Pold, building on the work of Steven Johnson, declares that "the interface changes what and how we see, how we experience and interact with reality, and how this reality is reconfigured through the computer."³⁷ Interfaces promote the illusion of transparency even as they shape our experience of the online environment. This means that we need to maintain an awareness of how our library Web pages and portals and the databases we provide affect users' experience of the materials that we offer. Our interfaces are not transparent windows; they are designed mechanisms that provide students and researchers with very specific and not necessarily neutral choices about accessing our resources.

Computer Networks Shape Discourse

Alan Liu argues that artistic productions, academic scholarship, and commercial discourse are all being reshaped by current advances in computer coding and interface development.³⁸ Liu describes the constraints of electronic communication networks driven by the needs of our postindustrial moment. He claims that growing demands for standardization in Internet protocols have important consequences for the production of both aesthetic and intellectual works. Liu maintains that an increasing proportion of the world's documents and media are "encoded in, or are managed by, standardized text-based markup schemes (especially XML, or Extensible Markup Language)."³⁹ Liu attributes this, as well as the expansion of standards and metastandards, to a desire to make the transmission of data as efficient and flexible as possible. He finds, however, that while the measure of postindustrial efficiency is "the ability to say anything to anyone quickly—the measure of academic knowledge is...the ability to say anything to anyone fully, richly, openly, differently, kindly, or slowly."⁴⁰

Problems arise from what Liu sees as a strict division between form and content that is mandated by both text encoding and the creation of databases. Liu observes the development of "an ever more fulsome complement of standards, specifications, DTDs, schemas," and so on, in order to support the broadest system compatibility and interoperability.⁴¹ This, in turn, has fostered a new model of authorship based on technologies that enforce an ever greater separation of content from presentation.⁴² Content is extracted, mediated, structured, encoded, optimized, transmitted, and distributed. Authors thus have less control over how their work is packaged and presented. Liu claims, therefore, that early debates among hypertext theorists about whether readers were newly empowered at the expense of authors are obsolete. According to Liu, both readers and authors are disempowered by machinery that allows them only to choose among options that have been pre-scripted. Author and reader are both subject to what he calls the "technologic" of postindustrial production.⁴³

Also addressing this issue, but from a slightly different angle, Jerome McGann speculates that at least within the realm of the digital humanities, new non-hierarchical

schemes of text encoding will eventually be developed that will allow for fuller representation and searchability of complex textual objects.⁴⁴ McGann claims that we need such schemas because the texts that most interest humanist scholars are not organized in a hierarchical fashion. Like the aesthetic productions described by Liu and Drucker, humanities texts are resistant to, or at least cannot be fully accommodated in, current encoding schemes. McGann thinks that the more humanists work with current encoding structures, the more likely we are to see the development of alternative methods. These concerns suggest that it is not productive for libraries to think of content management as a replacement for collection management. At the very least, libraries must address the implications of the enforced separation of format and content mandated by current encoding systems. They will need to understand content as something shaped by and inseparable from its physical embodiment.

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Historical Perspectives

Liu and McGann both approach the study of the digital environment from a historical perspective. Such an approach is still relatively uncommon in the library literature but considered mainstream in fields like media studies. In an inaugural volume of a series called *Media in Transition*, co-editor David Thorburn eloquently makes the case that the “new grows out of the old, repeats the old, embraces, reimagines and extends the old. To understand the Web, I’m saying—to understand our emerging digital culture—we need a continuity not a discontinuity principle.”⁴⁵ This collection makes the case that media transition always involves both tradition and innovation, and it describes contemporary media systems as “unique neither in their instability nor in their complex, ongoing transformations.”⁴⁶ Since our current moment of media development can only be understood as part of a broader cultural and intellectual history, I would argue that libraries can only understand their current role in the context of this larger history.

A historical perspective on contemporary communication technologies has been the impetus for scores of recent books, articles, and special journal issues outside the field of library and information science. Much of this literature focuses on the material aspects of the production, dissemination, and consumption of texts. One influence has been the work of Jacques Derrida, who claimed in the mid-90s that knowledge is shaped by the technologies used to create and transmit it.⁴⁷ In an earlier essay, I have described Derrida’s claim that psychoanalysis and its history have been determined in part by the reliance of Freud and his colleagues on their exchange of a large volume of letters.⁴⁸ Derrida contends that if Freud and his circle had had access to telephones, fax machines, computers, printers, and e-mail, it would have completely transformed the history and development of psychoanalysis “in its very events.”⁴⁹ The use of these technologies would have altered the nature of the work done by early practitioners of psychoanalysis and the kinds of records and documents available to posterity. Both

the knowledge produced by these psychoanalysts and our access to that knowledge are mediated by the technologies that were available a hundred years ago. Similarly, future scholarship will be shaped by our ability to preserve research conducted using current technologies.

A recent example of this historical approach is a special issue of *Critical Inquiry* devoted to the "Arts of Transmission" in which Alan Liu's and Roger Chartier's essays (cited above) appear. This collection proposes a new field centered on an exploration of how knowledge is shaped by the means through which it is developed, organized, and transmitted.⁵⁰ These means are defined as broadly technical, including the printing press and the Internet but also as a group of "skills and crafts that must be learned and transmitted from generation to generation."⁵¹ These skills include those of archivists and librarians as well as those of writers, editors, publishers, educational institutions, and learned societies, among others. This is why it remains crucial for librarians to concern themselves with the package, container, or format and not just the content of collections; the container and the technologies that support it are themselves increasingly the subject of scholarly attention.

The editors of this special issue of *Critical Inquiry* acknowledge the crisis in scholarly publishing in contemporary academia but choose to take a long view and to extend their project to include ancient, early modern, modern, and contemporary periods across a variety of cultures. The goal was to generate new historical and theoretical perspectives on our current modes of creating, distributing, and preserving knowledge. The editors claim that print, oral, manuscript, and digital information cultures are rarely discrete; "they are mutually defining through complex historical processes."⁵² Thus the topics range from the transmission of archaic Greek songs to the alarming expansion of the proportion of U.S. government information that is classified as secret.

One essay addresses the diminishing role of the scholarly monograph as a result of its refusal to engage with the educated general reader.⁵³ An essay by Friedrich Kittler describes how the printing press and the growth of the nation state eventually undermined the monopoly on knowledge and knowledge transmission held by European universities in the Middle Ages.⁵⁴ Kittler proposes that our current electronic environment provides an opportune moment for the university to again assume a central role in the production, storage, and transmission of knowledge. In the face of the growing privatization of information, Kittler holds out the possibility of the university claiming its own intellectual output from huge scientific publishers that he speculates may be "doomed to failure" because academic scholars and PhD students have more immediate and direct access to new knowledge.⁵⁵

Libraries and Changing Modes of Transmission

The essays in this special issue of *Critical Inquiry* devoted to the arts of transmission ask questions that libraries would do well to ponder and address: how do changes in modes of providing access to knowledge alter the ways in which knowledge is created and used? This translates into questions about what responsibilities libraries have to support or enable access to research and data in a variety of formats or to original material in any format. We need to think more about where and how users can access library

information, about what we do and do not collect, about the extent of the cataloging and metadata we provide, and about reformatting and preservation decisions. As the editors of this special issue claim, changing practices of knowledge transmission require different practices of knowledge making and compel us “to reassess our approach to everything from institutions to forms and genres to intellectual content and structures.”⁵⁶ We need to understand that the nature of the research experience we are providing is transforming the ways in which study and research are conducted, even as it is changing the kinds of knowledge being produced. In charting new paths, libraries must be aware of their role in the cycle of knowledge creation, and they must be prepared to consider the broad implications to academia and the culture at large. Finally, we need to educate future librarians to understand their role in transformations that are inseparable from the history of technological and cultural development.

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Notes

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